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IDENTIFIERS *Rehabilitation Engineering Center CA

ABSTRACT

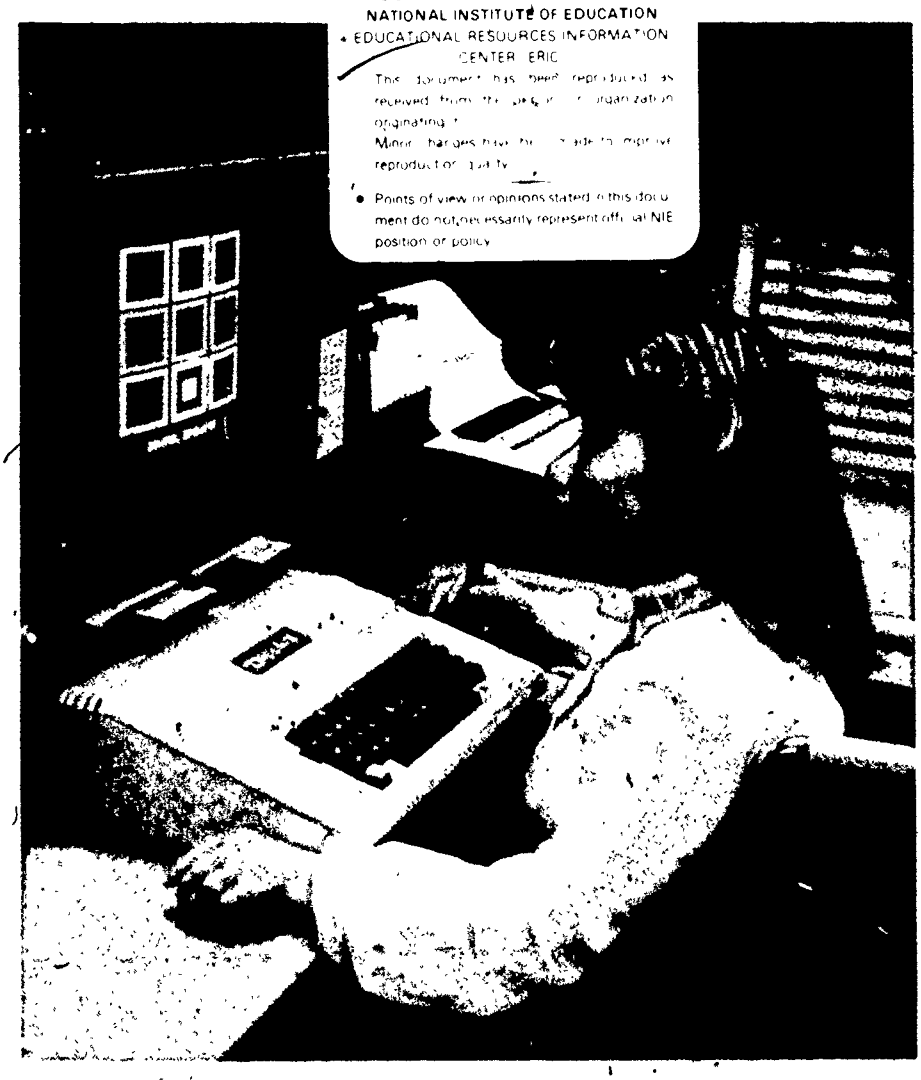
The Rehabilitation Engineering Center (Palo Alto, California) has developed a wide range of patient services which provide assistance to the disabled community in northern California and various research activities which have had impact on the disabled population nationally. The Center has three philosophical goals: to assist each child toward as normal growth and development as possible, to assist each adolescent to bridge the transition between childhood and adulthood, and to assist each adult to develop a life style which maximizes his/her potential and quality of life. Patient service activities involve the areas of orthotics (plastic, vacuum formed, custom systems); seating and mobility; prosthetics; communicaton and controls; prevention of tissue trauma; and special projects (such as occupational and physical therapy). Other reseach activities focus on seating systems for body support and prevention of tissue trauma, versatile portable speech prosthesis, and control and display design principles. NIHR (National Institute for Handicapped Research) research activities are divided into five categories: research and development activities, clinical evaluation activities, interaction with industry activities, education and training activities, and dissemination of information and research utilization activities. Activities are usually described in terms of the objective, impact, personnel involved, progress to date, dissemination of information, and utilization of the research. Appendixes contain assessment forms for evaluation of clients' control abilities, an assessment form for evaluation of clients' need for and use of rehabilitation engineering services, a report on a followup study on communication aids, a description of the rehabilitation engineering clinical internship, a list of inservice programs, a table of miscellaneous projects, and a mobility device evaluation form. (SW)

PROGRESS REPORT
September 30, 1980 ~ September 29, 1981

Children's Hospital at Stanford
Palo Alto, California

Rehabilitation Engineering Center with Research in Controls and Interfaces for Severely Disabled People

Funded by National Institute of Handicapped Research



MEMBER OF REHABILITATION ENGINEERING SOCIETY OF NORTH AMERICA

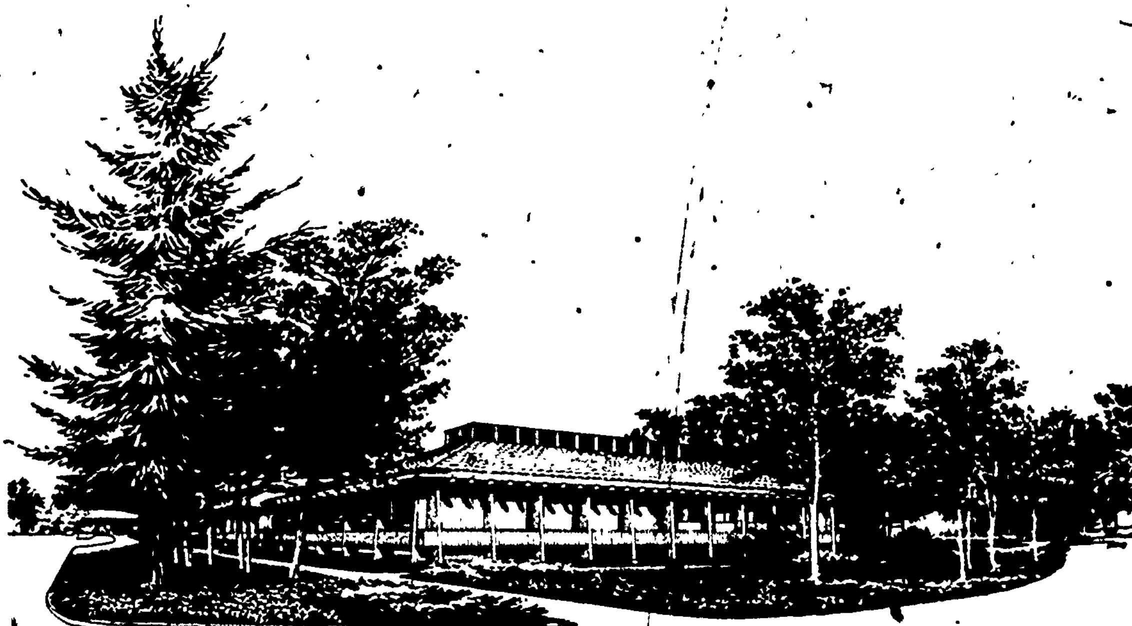


Figure 1. Children's Hospital at Stanford

Rehabilitation Engineering Center
With Research in Controls and Interfaces
for Severely Disabled People

Progress Report for
Third Year Grant
September 30, 1980 - September 29, 1981

Children's Hospital at Stanfrod
520 Willow Road
Palo Alto, California 94304
(415) 327-4800, x 560

John R. Williams, Executive Director, CH@S
Eugene E. Bleck, M. D., Medical Director, REC
Maurice A. LeBlanc, Principal Investigator

Funded by

U. S. Department of Education
National Institute for Handicapped Research
Five Year Project

Grant No. G008005817

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I. Background

Brief History

The Rehabilitation Engineering Center was envisioned by Eugene E. Bleck, M.D., Chief of Orthopaedics and Rehabilitation at Children's Hospital at Stanford and Professor of Clinical Surgery at Stanford University Medical Center. With an initial grant from the Fleischmann Foundation, the Center was built, equipped, staffed and opened for client services in 1974.

Over the past seven years the Center has developed a wide range of patient services which provide assistance to the disabled community in Northern California and various research activities which have had impact on the disabled population nationally. There is about an equal division of the Center staff and budget being devoted to services and research.

The Center and/or its staff are:

* a member of the Rehabilitation Engineering Society of North America
* Certified in Orthotics and Prosthetics by the American Board for Certification
* designated by California Children's Services as the Child Amputee Center for Northern California
* a member of the American Academy of Orthotists and Prosthetists
* a member of the American Orthotic and Prosthetic Association
* a member of the International Society for Prosthetics and Orthotics

Through patient care, teaching and research, the philosophical goals of the Center are:

* to assist each child pursue as normal growth and development as possible
* to assist each adolescent bridge the transition between childhood and adulthood
* to assist each adult develop a life style which maximizes his/her potential and quality of life

During the past year the Center has seen over 1000 clients for various rehabilitation engineering services. The Rehabilitation Engineering Center is housed in a 8320 square foot modular building on Children's Hospital at Stanford grounds and has a staff of about 30 people.

Organization

The organizational chart for the Center is shown in Figure 2. It reflects having a physician Medical Director and bifurcation of client services and research activities which are financially separate and distinct.

Community Relationships

As shown in Figure 3, the Santa Clara Valley is a resource-rich area in which the Center encourages collaboration. The connection with other facilities shown will be explained in the description of specific tasks in the report. The relationship which is becoming the strongest is with the Rehabilitative Engineering R&D Center at the VA Medical Center, Palo Alto, being directed by Professor Larry Leifer of the Stanford University School of Engineering.

The VAMC RER&D Center is now about three years old and has quickly gained momentum in staff and activities. The staffs of the VAMC RER&D Center and the Children's Hospital at Stanford REC interact in an attempt to promote complimentary and synergistic activities. At the present time, the strength and thrust of the VAMC RER&D Center leans toward basic, academic research and the CH@S REC toward applied, clinical research. It is the intent of each center to build upon these strengths as much as possible for mutual benefit.

Personnel

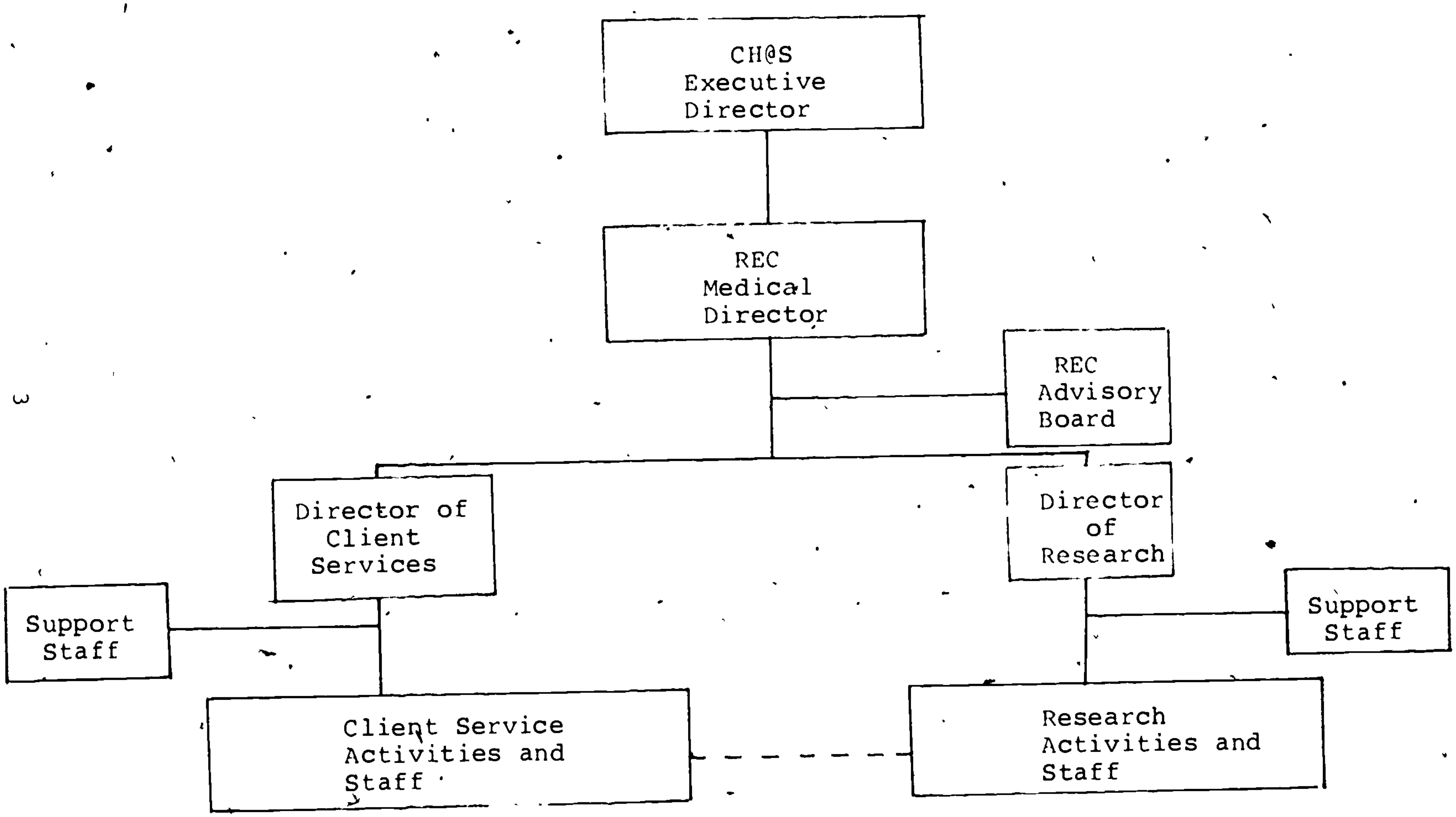
As shown on page 5, personnel in the REC are in Client Services or Research with some people performing in both capacities. The Rehabilitation Engineering Internship is sponsored under the NIHR Grant. Volunteers, most of them at present being senior gentlemen retired from industry, are extremely helpful and beneficial to the Center.

Advisory Board

The list on page 8 shows the membership of this Board. It is composed primarily of people from the community with whom the Center has a working relationship. The Board normally meets twice a year, once in spring at the time of grant renewal application and once in fall at the beginning of the new grant year. The last meeting was held on 4/23/81.

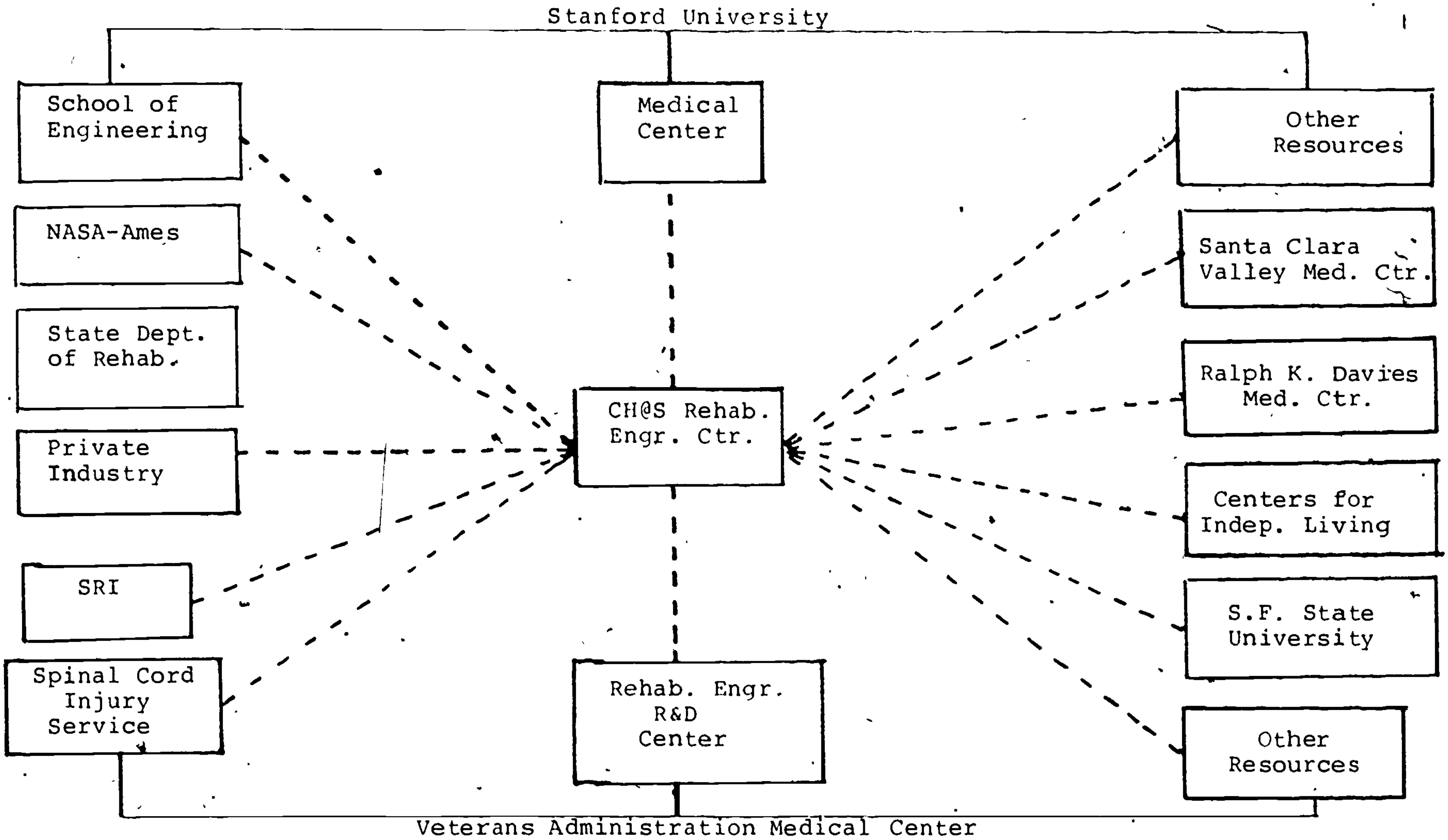
Rehabilitation Engineering Center
Children's Hospital at Stanford

Figure 2.
Organizational Chart



Rehabilitation Engineering Center
Children's Hospital at Stanford

Figure 3.
Community Relationships



CHILDREN'S HOSPITAL AT STANFORD
REHABILITATION ENGINEERING CENTER

Personnel - September 1981

Medical Director
John Csongradi, M.S., M.D.

Client Services

Eve Rubio
Elaine Taniguchi, B. S.
Sandy Tetzlaff

Orthotic Service

Gary Bedard, B.S., L.P.N.
Carrie Beets, B.S.
Gretchen Hecht, A.A., C.O.
Sean McGinnis
Greg Moore, C.O.(T)
Larry Mortensen, A.A., C.O.
Clare White, B.S., C.O.

Seating and Mobility Service

Tom Hockridge
Patrick Kenny
Bella Shapero, B.A.
Michael Walsh, A.A.

Prosthetic Service

Dennis Swigart, B.S., C.P.O.

Communication & Control Service

Margaret Barker, M.S.
William Hastings, A.A.
Leslie Roberts

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Eileen Hunt
Sharon McMills

NIHR Grant

Margaret Barker, M.S.
Eugene Bleck, M.D.
Sandra Enders, O.T.R.
Kelly Flanagan, M.Ed.
William Hastings, A.A.
Jean Kohn, M.D.
Maurice LeBlanc, M.S., C.P.
Larry Mortensen, A.A., C.O.
Hugh O'Neill, B.S.
John Preston, M.S.W.

VA Contract

Maurice LeBlanc, M.S., C.P.
John Pacciorini, B.S.
Richard Pasillas, C.O.
Donna Politi, O.T.R.

NASA-Ames Grant

Maurice LeBlanc, M.S., C.P.

Tissue Trauma Service

John Pacciorini, C.O.
Richard Pasillas, C.O.

OSE Grant

Margaret Barker, M.S.
William Hastings, A.A.
Maurice LeBlanc, M.S., C.P.

Special Projects Service

Allen Siekman

State Department of Rehabilitation
Stationed at Rehabilitation Engineering Center

Rosemary Murphy, B.S., M.S.
ABLEDATA Information Broker

Volunteers

Percy Dowden
Austin Ellmore
Ray Seibert
Lyman Drown

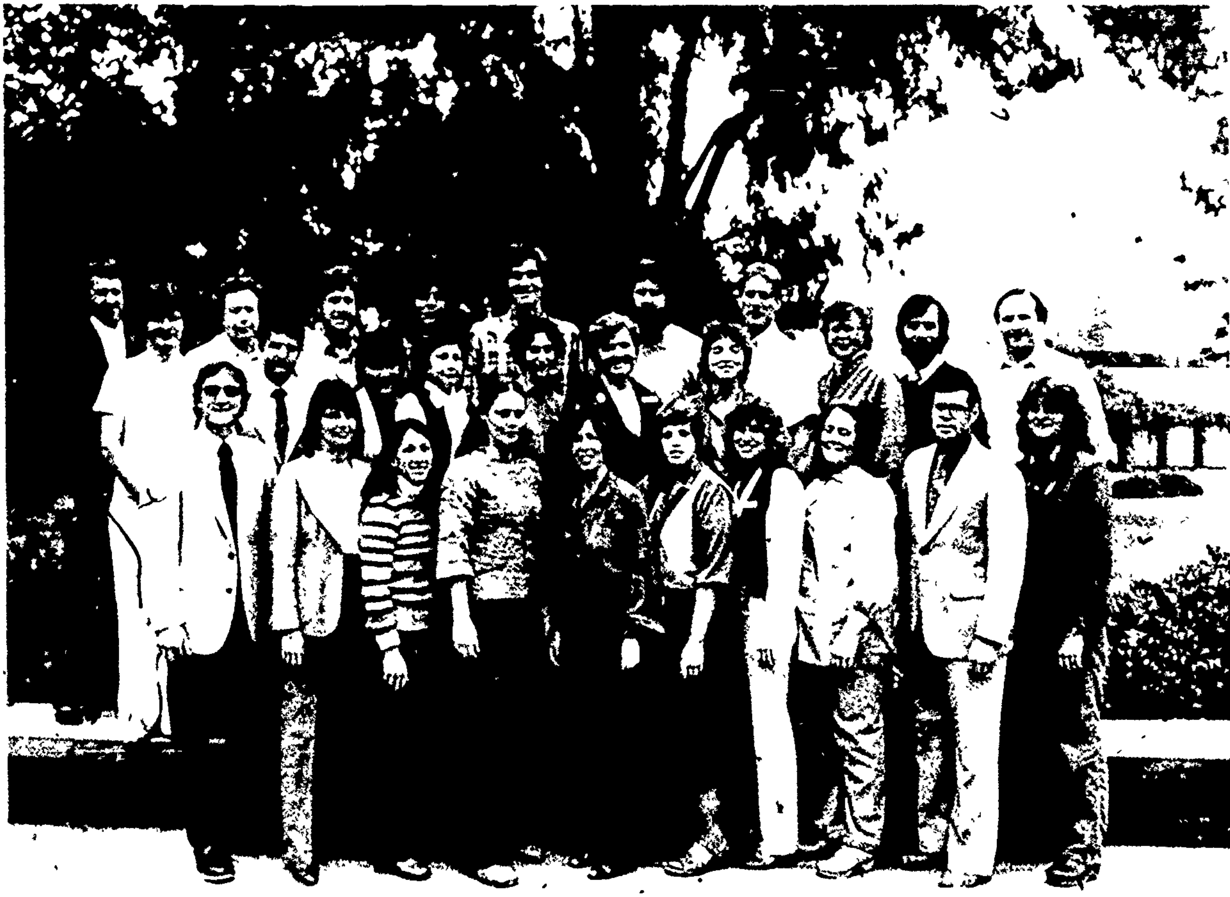

Figure 4. Rehabilitation Engineering Center Staff

Front row (L to R): A. Seikman, S. Enders, D. Politi, C. Beets, R. Murphy, L. Roberts, S. Schaezlein (C), S. McMills, J. Csongradi, D. Wells (C).

Middle row (L to R): S. McGinnis, J. Pacciorini, E. Taniguchi, E. Rubio, B. Shapero, S. Tetzlaff, K. Flanagan.

Back row (L to R): M. LeBlanc, D. Swigart, P. Kenny, T. Hockridge, C. White, L. Mortensen, G. Bedard, J. Kohn, H. O'Neill, W. Hastings.

Absent: P. Barker, G. Hecht, G. Moore, M. Walsh, E. Hunt, J. Preston, E. Bleck R. Pasillas.

(C) designates Consultant.

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II. Patient Service Activities

The first several years of the Center's existance were spent in developing comprehensive patient services primarily for Children's Hospital at Stanford children. Since that time and particularly since NIHR support and designation as a national Rehabilitation Engineering Center, the Center has grown to be a regional resource for rehabilitation engineering services in Northern California.

The Center presently serves about 1000 patients/clients a year with an average of 4-5 visits per client. Current estimates are that 40% of the total are adults, and two-thirds are referred from physicians and community sources outside the Hospital.

All patient services are provided on a fee-for-services basis and are operationg at or near to a break even point. These services are strictly accounted for and are separate from research activities.

Orthotics

The Orthotic Service specializes in providing plastic, vacuum-formed, custom systems for people with congenital conditions such as cerebral palsy, spina bifida, muscular dystrophy, and lower-limb anomalies. Orthotic systems provided include:

- Lower-limb orthoses
- Spinal orthoses
- Upper-limb orthoses
- Custom cuirasses
- Biofeedback orthoses

The custom cuirasses are provided in collaboration with the Respiratory Therapy Department, and most splints and ADL devices are provided by the Occupational Therapy Department.

Seating and Mobility

The Seating and Mobility Service specializes in providing maximum independence through proper body positioning and mobility aids. This frequently is achieved by means of an orthopedic seat insert fitted in a wheelchair to maximize arm function, comfort, relaxation, and stabilization of spinal curvature. The Service has a large selection of mobility aids for display, demonstration and assessment with patients.

Patient Service Activities

Services include:

- Seating systems
- Manual and powered wheelchairs
- Lap trays and special accessories for wheelchairs
- Parapodiums and standing frames
- Weight relieving ambulators
- Headgear
- Potty seats

Prosthetics

The Prosthetic Service provides a full array of progressive artificial limbs. Major focus is on increasing independence by fabricating light-weight, functional prostheses. While patients of all ages and all reasons for amputation are seen, the majority involve congenital anomalies.

- Lower-limb prostheses
- Upper-limb prostheses, including myoelectric
- Special prostheses
- Devices which require prosthetic technology to fabricate

Communication and Controls

Emphasis in this service is on the assessment for and provision of communication aids for people who are non-speaking and/or non-writing. Also, for communication aids, mobility aids and environmental control systems, assessment and provision of controls is done. The service has a comprehensive selection of communication aids and controls for display, demonstration and assessment.

- Communication aids and systems
- Special controls
- Environmental control systems
- Special electronic projects
- Page turners

Prevention of Tissue Trauma

The objective of this service is to provide customized orthotic systems which will diminish or redistribute pressure sore-producing forces for thos people who are asensory and prone to this debilitating condition. Thorough evaluation of the skin and sitting circumstances is done prior to recommendation for technical assistance.

Seating systems for prevention of tissue trauma
Body support systems for patients who are asensory
Special protective systems
Unweighting or suspension orthoses

Special Projects

This service is for unique or difficult projects which either are not covered above or need special attention for one reason or another.

III. Related Hospital Activities

Orthopaedics and Rehabilitation

Under the direction of Eugene E. Bleck, M.D., this major medical service in the Hospital currently has about 5000 outpatient visits per year in addition to inpatients and a heavy surgery schedule of 350 operations per year. Emphasis is on pediatric-orthopaedics for chiildren with cerebral palsy and includes children with all neuro-musculo-skeletal disabilities as well. Referrals come primarily from Northern California and from out-of-state and overseas. Orthopaedics has a Motion Analysis Laboratory which is being used clinically to assess gait and other motion and to conduct various research activities.

Occupational Therapy

The Occupational Therapy Department provides developmental assessment, sensorimotor evaluation, vocational training, homemaker assessment and training, and is a very active part of the Hospital Child Life Program.

Physical Therapy

The Physical Therapy Department provides ROM and strength testing, gait training, exercising and ranging, training in use of crutches and walkers, and training in biofeedback techniques such as heel beepers for discouraging toe gait.

Social Services

The Social Services Department provides psycho-social assessment, counseling, Spanish interpreting and assistance with funding sources.

IV. Other Research Activities

Seating Systems for Body Support and Prevention of Tissue Trauma

The Rehabilitation Engineering Center has a research contract with the Veteran's Administration Medical Center, Palo Alto, to develop a low-cost, modular seating system for people with spinal cord injury. Inder Perkash, M.D., Chief of Spinal Cord Injury Service, is the principal investigator. Mr. Richard Pasillas, Head of the Tissue Trauma Service at the Rehabilitation Engineering Center, is Project Leader. "Progress Report III, Seating Systems for Body Support and Prevention of Tissue Trauma, May 1979 - December 1980" is available. The project is at the point where the paraplegic seat has been successfully clinically evaluated and a company is being sought to manufacture and market it.

Versatile Portable Speech Prosthesis

Under a research grant from NASA-Ames Research Laboratory and joint support from NIHR, the Center has developed the VPSP, or "Talking Wheelchair." It is a speech prosthesis for non-vocal people whereby the user can create, store, and speak his own vocabulary. The project is at the point that a prototype has been developed and successfully clinically evaluated. Negotiations are underway to transfer the VPSP technology to a manufacturer for commercial availability. A "Progress Report, Research and Development of a Versatile Portable Speech Prosthesis, May 1978 - November 1979" is available.

Control and Display Design Principles

With a research grant from the Office of Special Education, U.S. Department of Education, the purpose of this project newly underway is to investigate control and display design principles to increase the speed and accuracy with which communication aids can be accessed with one or two switches by people with severe physical limitations.

V. NIHR Research Activities

Core Area of Research

The specific area of research on which the Center has chosen to focus is "Controls and Interfaces for Communication and Other Systems for Severely Physically Disabled People." This area was chosen because:

* It is an area which is important and has not been approached comprehensively.
* It relates to many of the Center's client services, from which needs are generated and subjects for clinical evaluation can be found.
* Communication devices; mobility aids, and environmental control systems have controls, but little attention has been given to "mixing and matching" controls and aids/systems from different manufacturers so that (1) one control can operate several aids, or (2) one control can be switched among aids.

Direction of Work

The third year of the project has just been completed. The project was initially kicked off by conducting a survey to determine (1) what controls existed, (2) what controls were being developed and, (3) what controls were needed. This survey produced a wave of activity which has resulted in:

* Preparation, publication and distribution of a catalog of controls commercially available in the U.S. and abroad.
* Preparation, publication and distribution of a directory of R&D projects on controls (i.e., "who's doing what" in research.)
* Information from which the Center is able to make rational decisions of where to focus its own R&D effort and what controls developed other places to clinically evaluate here.

Thus, much of our work-to-date has been "software" rather than "hardware" to determine for ourselves and others what the state-of-the-art is and where to jump in. An obivous need will still exist for dissemination of information, but the project will become more R&D hardware intensive to develop and test specific needed controls for the severely physically disabled population.

Research and Development Activities

Task: Development of Control Evaluator and Trainer Kit

Objective

The objective is to design and build a low cost, portable system to evaluate the control abilities of the disabled. The controls evaluator and trainer is envisioned as a self-contained, battery-powered system with sound and light response in the top section and an assortment of switches in the bottom. The system features simple operation, a brightly colored display and audio output, and will be approximately the size of an attache case.

Impact

The controls evaluator and trainer simulates many different types of control situations. For example, a joystick for wheelchair control, switches for communication and control, response time with a scanning system, visual perception and audio response. The intention is that hospitals, schools, and other medical/rehabilitation/educational facilities could have one of these relatively inexpensive units to test and train physically limited people for best control. It would also serve to screen people with standard controls to determine if modification or a special control is needed.

Personnel

Margaret Barker, M.S., Biomedical Engineering
William Hastings, Senior Electronic Technician
Doris Wells, Consultant
John Eulenberg, Ph.D., Consultant

Progress to Date

The prototype was completed in June 1981. It is a microprocessor-based (6502), self-contained unit including a 3 x 3 matrix display, an examiner's control box and several types of switches. The control box allows the user of the system to configure the number of switches used (scanning and direct selection), the scanning rate and type of data collected (number of switch closures per unit time, response time, duration of activation). The prototype is being evaluated in this Center and has been critiqued by professionals regularly providing control evaluations. The critiques have resulted in modifications to the original design. These modifications are currently being incorporated into the device. The revised design is being used to build five more Kits that will be used in clinical evaluation.

Dissemination of Information

Progress was reported at the REC Annual Rehabilitation Engineering Services Conference held March 20-21, 1981 and at the RESNA Annual Conference on Rehabilitation Engineering held in Washington, D. C. August 31 to September 3, 1981, both in an exhibit and a paper entitled "A Systematic Approach to Evaluating Physical Ability for Control of Assistive Devices" by Margaret R. Barker and Albert M. Cook, Ph.D. (Photographs and the flyer prepared for the RESNA Annual Conference are shown in Figures 5 - 7, pages 16 and 17, respectively.)

Utilization of Research

Waiting completion of task.

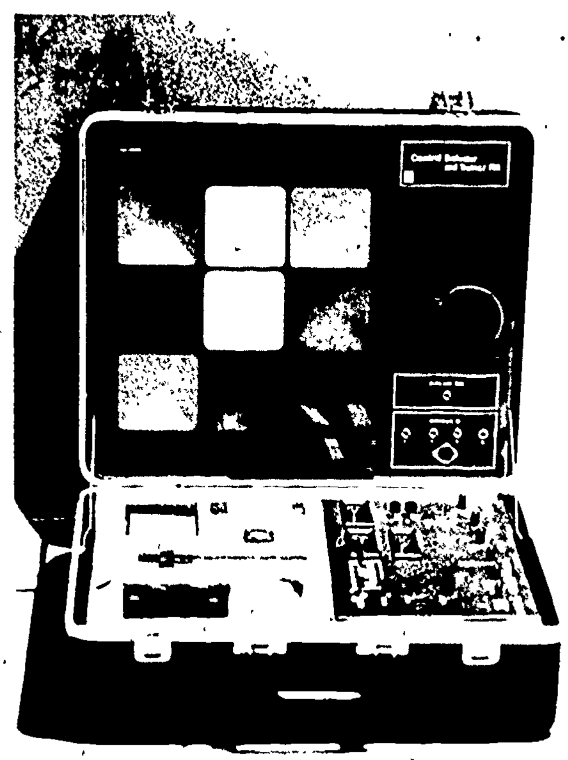


Figure 5.
Control Evaluator and Trainer Kit showing inside top display

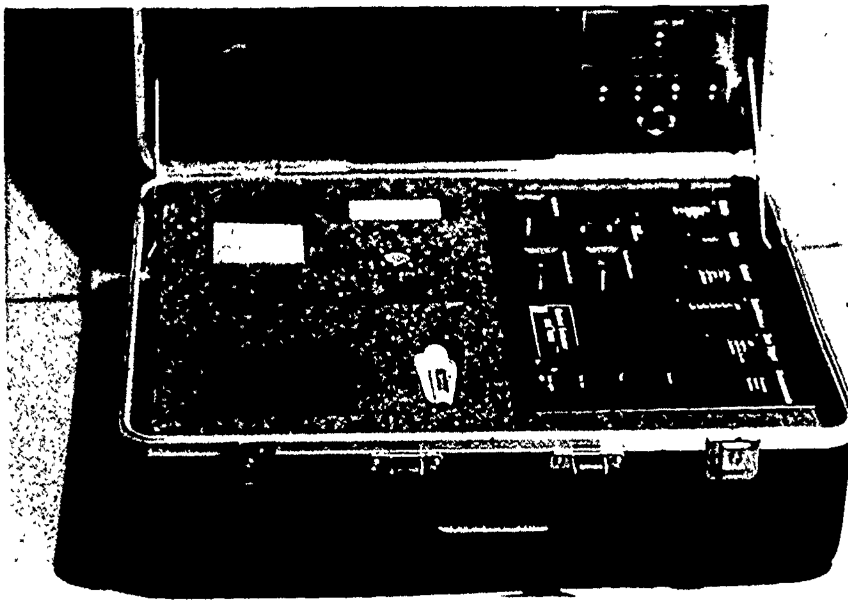


Figure 6.
Control Evaluator and Trainer Kit
showing switches and control panel
on inside bottom.

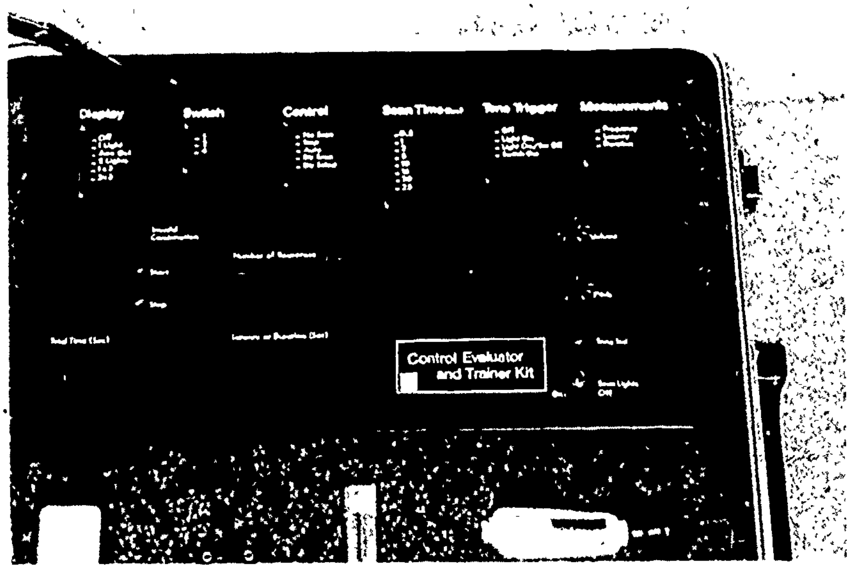
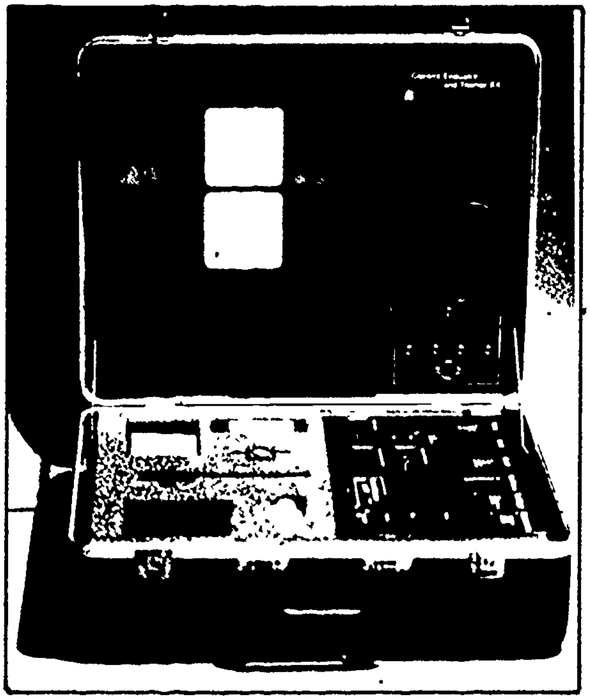


Figure 7.
Control Evaluator and Trainer Kit
showing closeup of control panel.

Control Evaluator & Trainer Kit

REC/CH@S

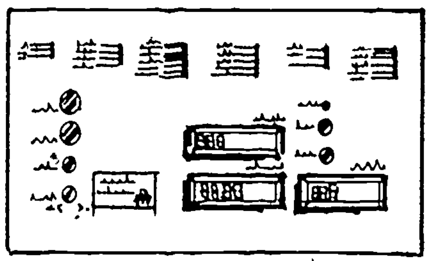
The Control Evaluator and Trainer Kit facilitates systematic, quantitative assessment and teaching of control required of an individual with physical disabilities to operate assistive devices for mobility, communication and environmental control. The Kit enables a professional in any setting (school, hospital, home, etc.) to present an array of interface/output combinations while making precise quantifiable measurements of a client's or student's performance and/or progress. The Kit provides the client with an opportunity to use an array of commercially available interfaces. This actual experience is necessary to make informed decisions concerning assistive device selection and purchase.



Special Features

The Control Evaluator and Trainer Kit consists of:

- INTERFACES
  - single switches
  - 2 switches (for tasks involving choices)
  - 4 switches (joystick)
- VISUAL OUTPUTS
  - 3x3 matrix (overlays can be varied)
  - 1x3 matrix (for scan of 1 row)
  - single light
  - 2 lights
  - Auxillary output for use with a toy or aids such as the ZYGO 16
- AUDITORY OUTPUT
  - adjustable volume and tone
- STEP AND MANUAL SCANNING MODES
- QUANTITATIVE MEASUREMENTS
  - reaction time (latency) for both activation and release of a switch
  - Number of repetition of switch closure in a given time (frequency)
  - Length of time a switch can be held down (duration)
- A CARRYING CASE CONTAINING ALL OF THE ABOVE



CONTROL EVALUATOR AND TRAINER KIT

Status/Funding

The current device is a prototype that will be undergoing clinical evaluation during fall, 1981 and is not for sale. Potential manufacturers interested in producing this device are being sought.

Research, development and clinical evaluations are funded by the National Institute of Handicapped Research, Grant No. G008005817 under the Department of Education.
For further information

For further information contact:
Margaret R. Barker, or
William R. Hastings
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520 Willow Road
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Research and Development Activities

Task: Development of Control Simulator

Objective

This task initially started as a demonstration to utilize a computer program to evaluate a patient's ability to master proportional electric wheelchair controls. Software is used for the evaluation rather than time-consuming and expensive hardware. The expanded objective is to set up a system to test patients on a CRT screen before deciding to invest time and money in providing hardware, much as a driving simulator to teach/screen for automobiles.

Impact

One computer program was used to test a patient navigating a maze with a joystick. The program displayed the errors and total time when completed. For this one patient, about $3000 was saved in the services approach taken versus what had been anticipated and authorized. By incorporating simulations of assistive devices into assessment methodology, educated decisions can be made about the equipment required by an individual, consequently avoiding any unnecessary investments of time and money in providing hardware.

Personnel

Margaret Barker, M.S., Biomedical Engineering
Albert Cook, Ph.D., Consultant
Sandra Enders, O.T.R.
Jean Kohn, M.D., Consultant

Progress to Date

Software programs are being developed and acquired from other centers. Existing programs include:

* Method of controlling the Apple Computer with the Express I communication aid by modifying commercially available software.
* Method of testing reaction time using the graphics, data collection, and external interfacing capabilities of the Apple Computer.
* Simulation of the Control Evaluator and Trainer for in-house use to determine if it is useful for assessment. This program has been tested in

clinical evaluations in the Communication/Control Service in the REC and will be further developed for dissemination.

* Commercially available programs that have been designed for users interfaces other than keyboards for the Apple Computer are being accumulated.
* See Figures 8 - 10.

Dissemination of Information

Two articles appeared in 1980 about this control simulation scheme, and software programs are being shared with other groups such as the TRACE Center, the Artificial Language Laboratory at MSU, the Pacific Northwest Communication Group, and the San Francisco Bay Area Communication Group.

Utilization of Research

This task has contributed to the current use of these software programs now in several clinical settings and to the expanded awareness of this capability.

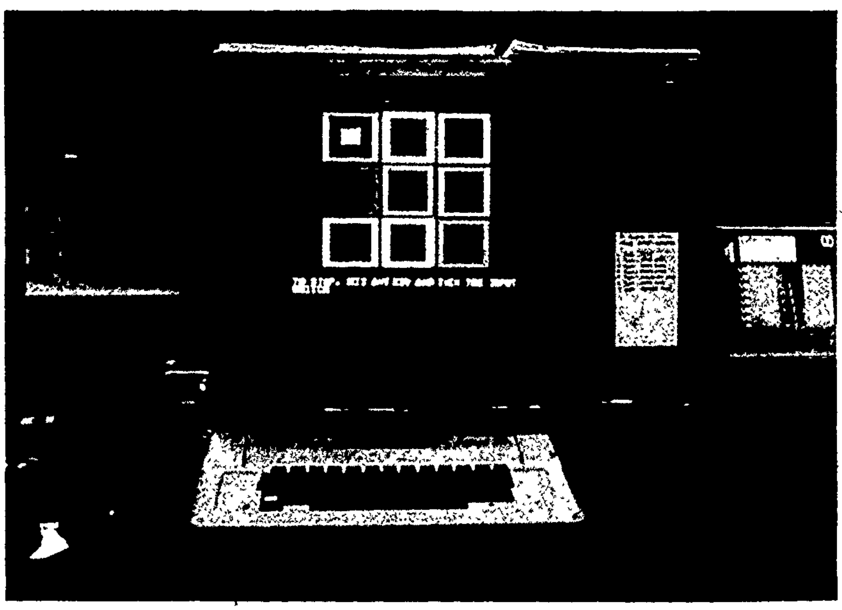


Figure 8.
Simulation of Control Evaluator 3 x 3 matrix. Scanning movement of cursor controlled with single switch.

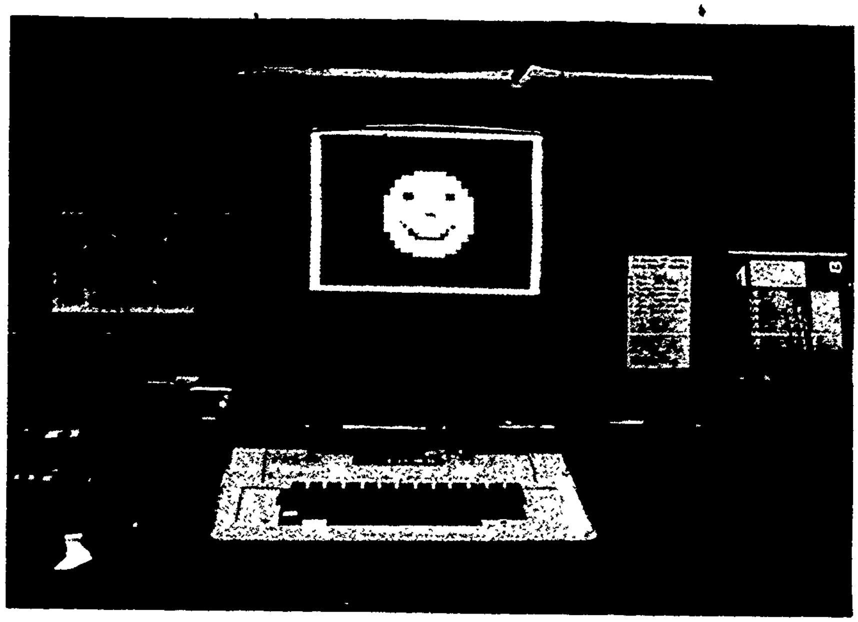


Figure 9.
Using Control Simulator to measure reaction time with a single switch.

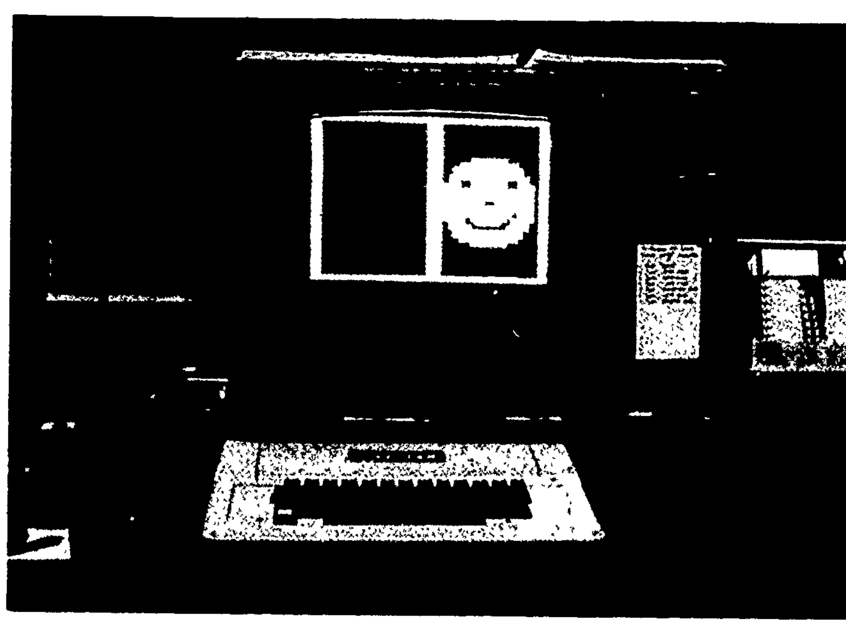


Figure 10.
Using Control Simulator to measure reaction time, and ability to make choices with two switches.

Task: Develop a Process for Assessment of Control Sites

Objective

Most health and educational professionals who have other main job responsibilities are not sure how to assess what methods of control might be best for the disabled people they are working with. Considerations often include voluntary movements, force, range of motion of joints, and excursion of body parts. The objective of this task is to develop a process with rationale for assessment of optimum control sites.

Impact

This is another area where existing knowledge and methods can be brought to a larger number of people at low cost (little or no hardware cost) to benefit the disabled population by making rehabilitation engineering systems more useful to them.

Personnel

Margaret Barker, M.S., Biomedical Engineering
Albert Cook, Ph.D., Consultant
Sandra Enders, O.T.R.
Jean Kohn, M.D., Consultant

Progress to Date

Working primarily with Dr. Cook of the Assistive Device Center at California State University at Sacramento, Ms. Barker contributed to the development of comprehensive forms to assess head and upper/lower limb function to operate assistive devices. These forms are now being evaluated in clinical service and are included as Appendix A.

Dissemination of Information

The assessment forms under evaluation will be shared with other centers upon request. A joint paper was presented at the RESNA Annual Conference on Rehabilitation Engineering held in Washington, D. C. August 31 to September 3, 1981.

Utilization of Research

The assessment forms/procedures are seeing initial use by the two centers in which they were developed. If the forms prove worthwhile, they will be shared more widely to reach other facilities with disabled clients needing controls to operate aids.

Research and Development Activities

Task: Work with TRACE Center on Standardization of Controls and Interfaces

Objective

The TRACE Center has been working on standardization of connectors and has had a long and continuing interest and effort in standardization of controls/interfaces so people can "mix and match" controls and assistive devices and can operate multiple aids with one control. The objective of this task is to work cooperatively with the TRACE Center to promote and achieve standardization where possible and feasible.

Impact

Controls could be interchanged and therefore become more useful. Also, some benefit would be derived cost-wise because fewer controls would be needed for given devices with economy of reduced need for adaptors and modifications.

Personnel

Margaret Barker, M.S., Biomedical Engineering

Progress to Date

This effort is a long, continuing one in which the TRACE Center has the lead role. They have formed a Task Force, of which Margaret Barker is a member, and met most recently at the RESNA Annual Conference on Rehabilitation Engineering held in Washington, D.C. on August 31 to September 3, 1981.

Dissemination of Information

The TRACE Center Task Force has produced a Handbook on standardization of connectors for controls and interfaces. The Handbook is being used to disseminate information on the project and as a working document.

Utilization of Research

Not yet applicable.

Research and Development Activities

Task: Special Projects

Objective

To work on special projects as they may be presented and as time and finances allow.

Impact

Such projects usually have little direct impact on clients of the Center but promote enthusiasm and awareness. Also, they frequently serve to demonstrate what can be done with current technology and pave the way for additional work.

Personnel

Margaret Barker, M.S., Biomedical Engineering
William Hastings, Senior Electronics Technician

Progress to Date

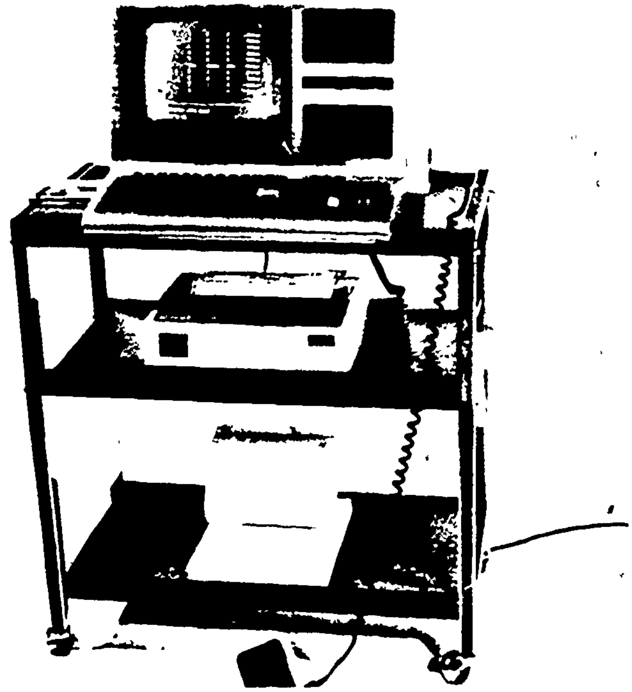
* Page 25 describes Word+ Living Center. REC staff is working with Mr. Walt Woltosz to critique software he has developed for a single-switch controlled communication system.
* Page 26 describes Help-Mate (TM). The REC staff has provided input regarding the Help-Mate.

Dissemination of Information and Utilization of Research

In these specific cases, the information has been given to the developer for his use in improving the products/items involved.

WORDS+ LIVING CENTER

A one-switch communication, control, education, and entertainment center for the severely physically handicapped



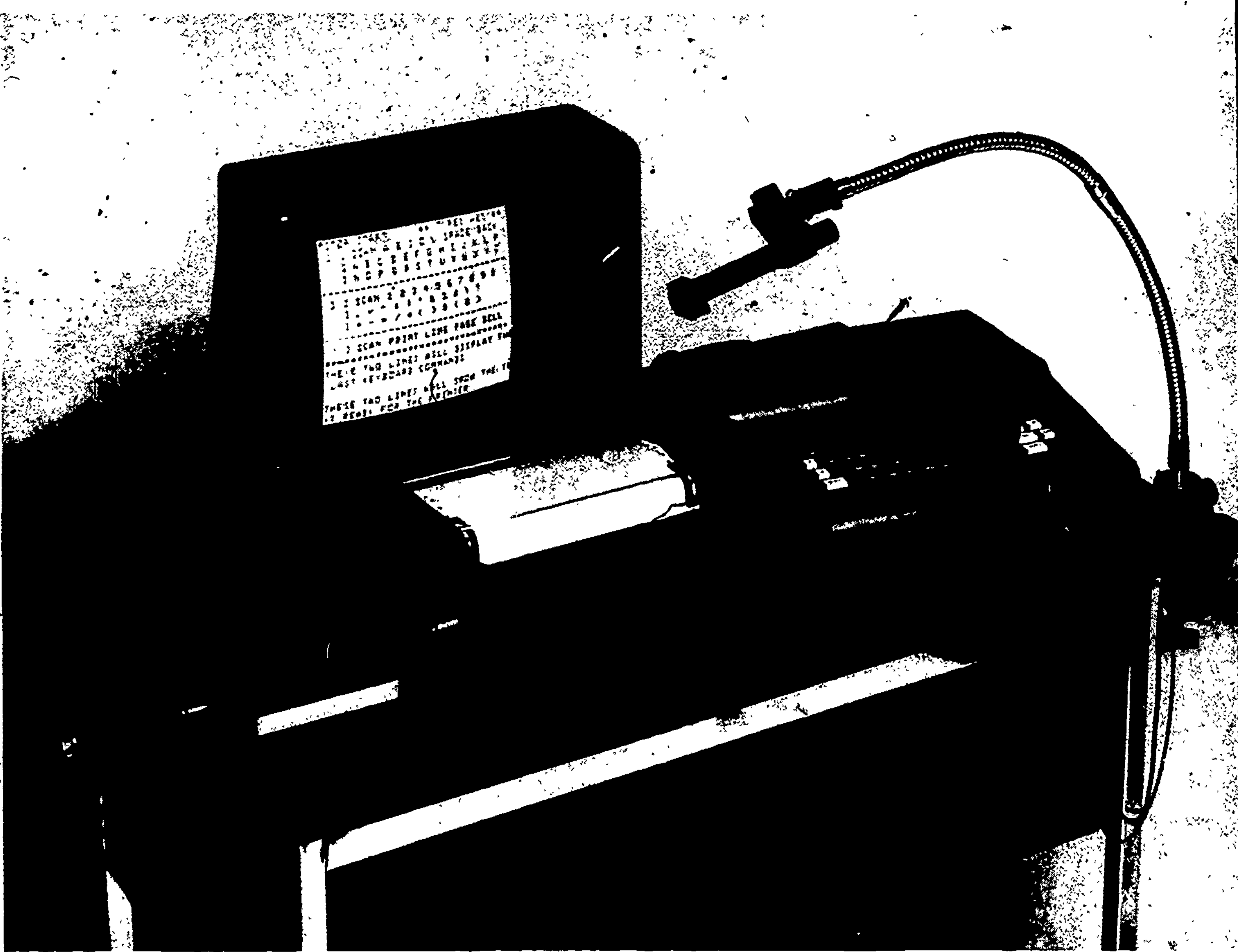
- "Talk" to others in the room!
- Write notes, letters, even a book!
- Read prerecorded articles!
- Control appliances and other devices!
- Play games!
- Modify the vocabulary!
- Display the date and time
- "Talk" to others by telephone!
- Use national computer networks by telephone!
- Generate voice output!
- Make drawings!
- Use as a calculator!
- Run educational programs!

......AND ALL WITH ONE SWITCH !!

The WORDS+ Living Center is designed for handicapped persons who can read and who can activate at least a single switch of some kind. Many types of switches are available, including push switches, "sip-and-puff" switches, breath switches, tilt switches, and others. Complete telephone assistance, as well as new releases of the WORDS+ computer program, are provided for a period of one year. Continued support will be available at a low annual rate.

For more information on the WORDS+ Living Center or on financing or leasing arrangements, call or write:

WORDS+ Inc.
655 S. Fair Oaks, M-213 Sunnyvale, CA 94086 408-733-6358



The Help-Mate™, a new computerized communication aid for the physically handicapped. By use of mass produced microcomputer modules, the cost is kept very low, and nationwide service is available. A Multi-Sensor switch is activated by a puff and by lip or tongue motion. Printed copy is produced by simplified word processing software.

G+W Applied Science Laboratories
GULF + WESTERN RESEARCH AND DEVELOPMENT GROUP

Research and Development Activities

Task: Development of Augmented Feedback Spinal Orthosis (formerly Scoliosis Feedback Orthosis)

Objective

This project involves the use of an augmented tactile feedback orthosis to obtain optimal therapeutic function in correcting curvature of the spine through a dynamic force system for patients with idiopathic scoliosis. The goas is to improve and simplify the treatment of idiopathic scoliosis in adolescents.

Impact

Feedback instrumentation is being used in combination with a low profile spinal orthosis. The Sensors are placed on the paraspinal muscles of the back, on the convex side of the curvature. Movements are performed by the patient until he/she is able to interpret the feedback signal and to develop control over the muscle group. When patients learn to do this, hopefully they will be able to correct their own scoliosis through voluntary musculoskeletal actions rather than conventional treatment of external forces only.

Personnel

Eugene E. Bleck, M.D.
Larry Mortensen, C. O.
Margaret Barker, M. S., Biomedical Engineering
William Hastings, Senior Electronics Technician

Progress to Date

Of the 20 patients in the current series, 12 have been followed longer than six months. Nine, or 75%, of the 12 have had stable (< than 10 degrees progression) curves. There have been several that did not comply with the regimented utilization of this device and have been taken off the protocol as progress of their curves indicated surgical intervention.

It is apparent that the results are no worse than anticipated with conventional Milwaukee bracing or plastic under-arm orthoses (TLSO). In curves less than 20 degrees, they may be better, but clearly sufficient time has not elapsed to allow statistical validity.

We have had no time and event counter to certify if the patient indeed had done the trunk shifts, let alone worn the orthosis. (In the Carr, Moe, Winter follow-up study (1978) 38 patients were "uncooperative" and 28 came to surgery.) A time and event counter is a "must" and urgently needed.

It may be possible to improve the orthotic design somewhat, although our present orthosis is lightweight and satisfactory. Within two or three years we should have enough subjects in the study to indicate positive or negative results (see Figures 11 - 14.)

Dissemination of Information

The project has been presented at:

* Rehabilitation Engineering Services Seminar March 21-22, 1980, Stanford Univ. Medical Center
* Meeting of Northern California Chapter of the American Academy of Orthotists and Prosthetists on July 19, 1980.

The flyer on page 34 was prepared for the 1981 RESNA Conference.

Utilization of Research

Present plans call for this project to be continued and expanded under a separate, private research grant next year, if possible. An article for Orthotics and Prosthetics is under preparation.

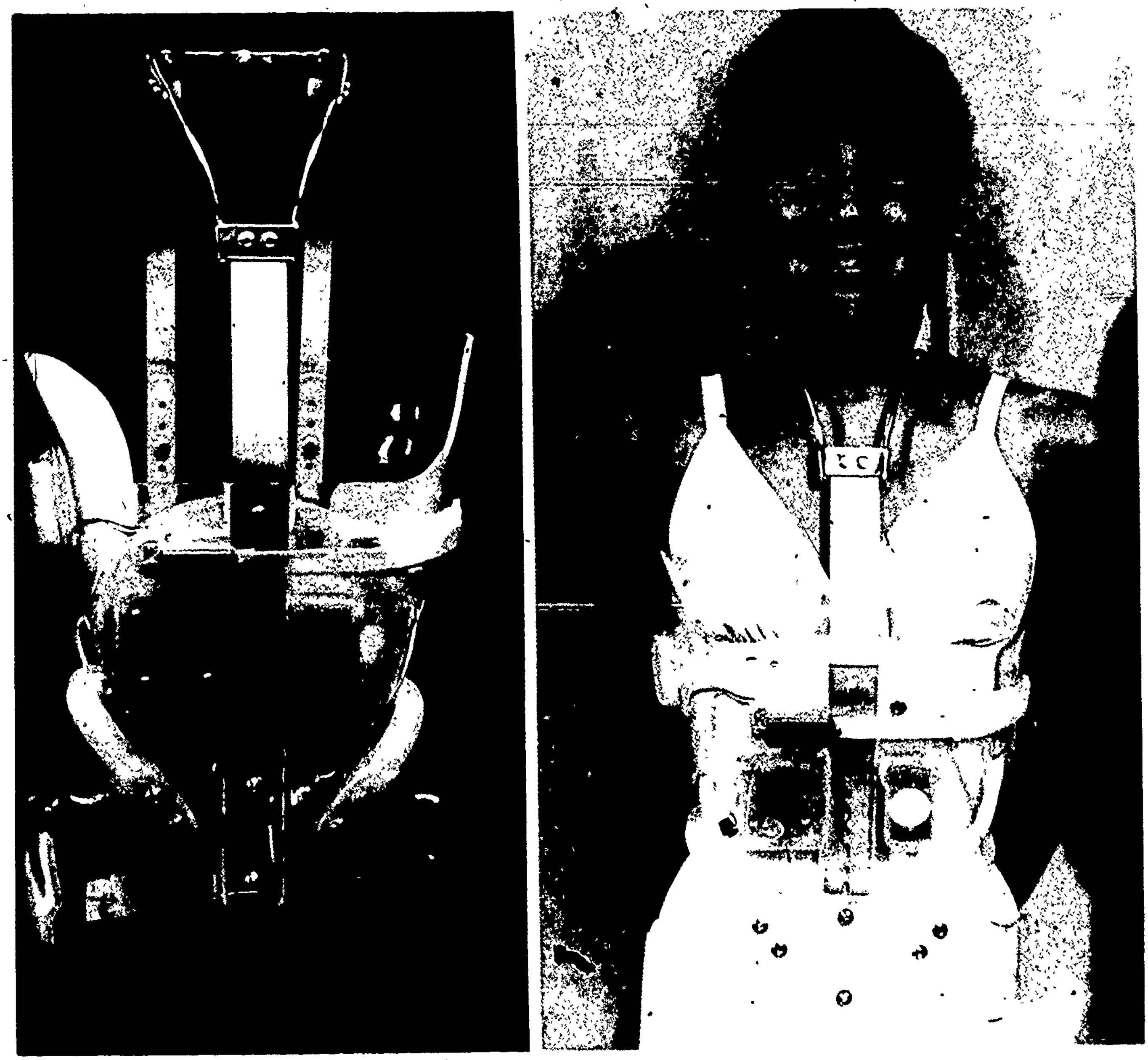


Figure 11.
Augmented Feedback CTLSO showing anterior view off and on patient subject.

Figure 12.
Augmented Feedback CTLSO showing left lateral view off and on patient subject.

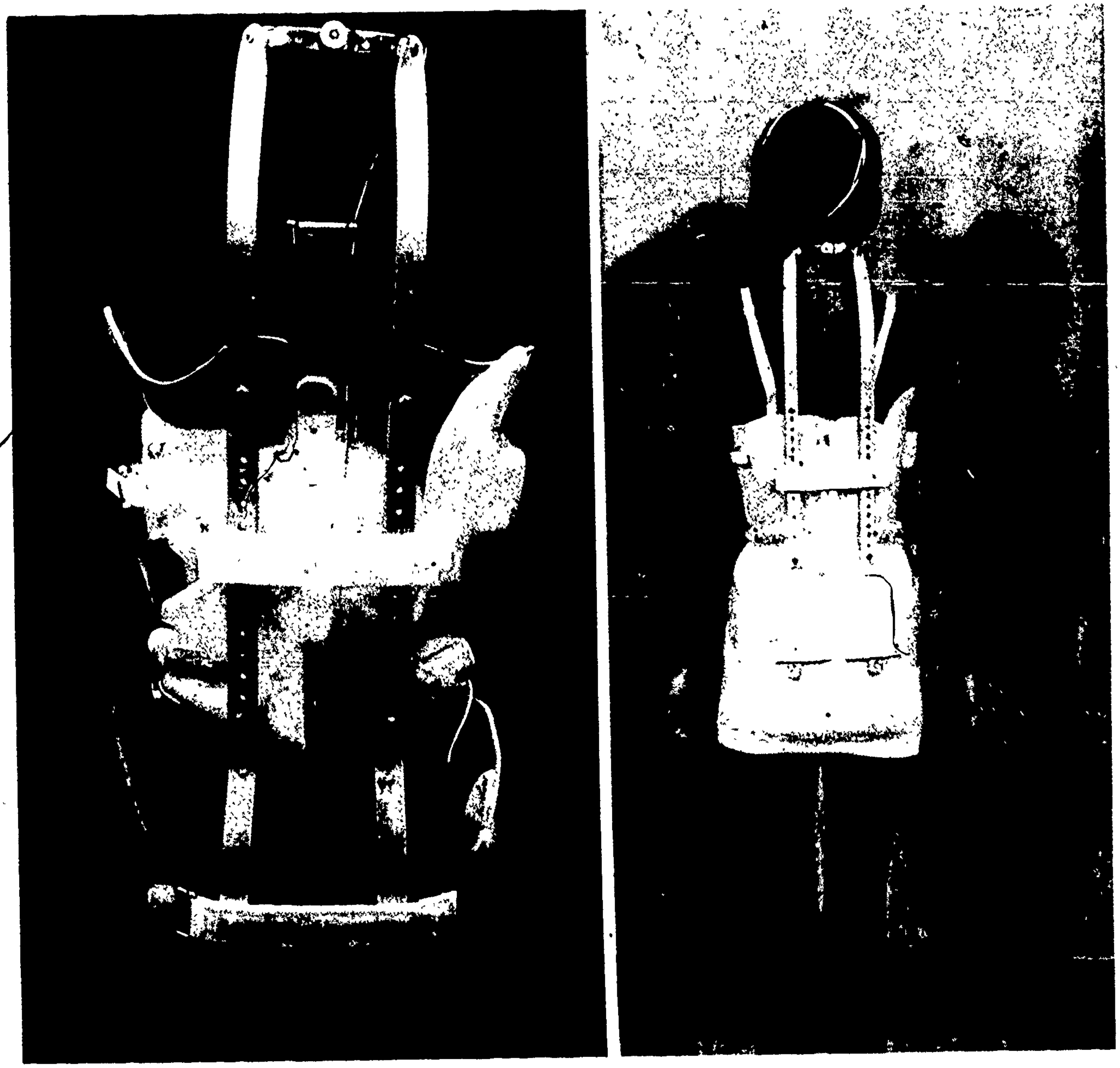


Figure 13.
Augmented Feedback CTLSO showing posterior view off and on patient subject.

Figure 14.
Anterior abdominal view of Augmented Feedback CTLSO showing tactile stimulator (A), electronic board (B), battery (c), and pull switch (D).

(Please note: there is no page 33.)

Scoliosis Feedback Orthosis

REC/CH@S

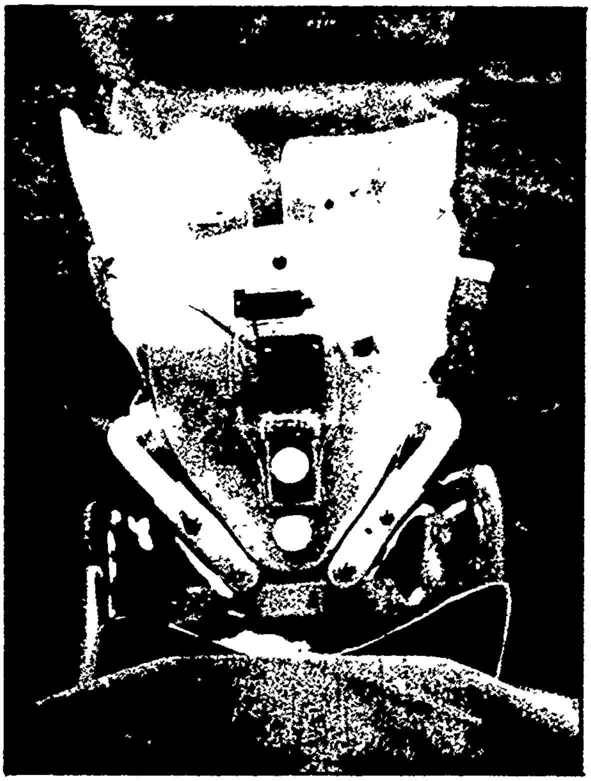
The Scoliosis Feedback Orthosis uses tactile feedback to motivate patients with idiopathic scoliosis to perform a specific spinal exercise while wearing the orthosis. It also provides passive correction when the person is not doing the exercise.

The conventional thermoplastic T.L.S.O. relies on purely passive correction. The conventional Milwaukee orthosis is often prescribed in conjunction with an exercise program to encourage the patient to actively decrease his/her scoliotic curve for brief periods each day. The Feedback Orthosis combines the features of passive correction with a "built-in" electronically monitored exercise program. When the person performs the "lateral shift" spinal exercise correctly, a timer inside the orthosis is activated which unobtrusively reminds them to do the exercise again in about forty minutes.

Of the seventeen patients in the current series, twelve have been followed longer than six months. Nine of the twelve have had stable curves. Of the remaining three, two were considered brace failures and were treated surgically and one stabilized with the end of growth before a surgical level was reached. It is apparent that these preliminary results are no worse than anticipated with conventional Milwaukee bracing or plastic T.L.S.O.s. In curves less than 20 degrees, results may be superior to the Milwaukee system but insufficient time has elapsed to allow statistical validity.

Status

The current orthoses are prototypes that are under clinical evaluation. The device has not been proved clinically effective and is therefore not yet ready for release as a treatment mechanism.



SCOLIOSIS FEEDBACK ORTHOSIS

Funding

The Research and Development and Clinical Evaluations have been funded by the National Institute of Handicapped Research, Grant Number G008005817 under the Department of Education.

For further information contact:
Eugene E. Bleck, M.D. Chief of Orthopedic and Rehabilitation Service, or Larry Mortensen, C.O., Head of Orthotics Service
Rehabilitation Engineering Center
Children's Hospital @ Stanford
520 Willow Road
Palo Alto, California 94304
(415) 327-4800 x345

Clinical Evaluation Activities

Task: Team Evaluation of Device Effectiveness--
A Retrospective Study

Objective

This clinical research study is an attempt to determine if it is possible to: (1) define and document the benefits of assistive devices; (2) relate benefit to cost; and (3) develop an initial assessment procedure that identifies accurately both technical and psychosocial requirements of the client. An additional objective is to identify economic aspects related to provision of devices: costs, source of funds, time sequences from requests for funds to authorization to payment, and financial obtstacles to provision.

Impact

The assessment and clinical evaluation instruments developed are useful throughout the rehabilitation engineering field to broaden clinical evaluation beyond technical specifications and in-house trials to include more consumer-oriented measures of device effectiveness. Information on cost/time factors, and funding mechanisms adds much needed input to discussions of cost-benefit ratios, life expectancy of equipment and fee-for-service. Within the target area, working relationships between rehabilitation engineering, therapists, parents and consumers have been enhanced; and the need for follow-up procedures has been documented.

Personnel

The study team was multi-disciplinary and covered four areas of concern:

Medical	-	Jean G. Kohn, M.D., M.P.H.
Functional	-	Sandra Enders, O.T.R.
Psychosocial	-	John Preston, Jr., M.S.W.
Technical	-	Wallace M. Motloch, C. O.

Progress to Date

The study has been completed and results have been reported. A proposed assessment form (Appendix B) has been subjected to field trial on client services at this Center and is in the process of revision before being incorporated into routine assessment procedures.

As funding for client services becomes more difficult to obtain, careful evaluation and clear presentation of reasons for requesting assistive devices will facilitate approval for funding and will result in benefit for people who require assistive devices.

The measured effectiveness of devices in the study was 79%. A goal of 85-90% effectiveness is desired. It would be appropriate to consider a review of the effectiveness of devices in one to two years.

Dissemination of Information

* Monograph on "Team Assessment of Device Effectiveness," 74 pages, October 1980 (550 copies distributed to date.)
* Article "Assistive Devices" in Rehab Brief, Vol. IV, No. 9, August 7, 1981.
* Presented at Rehabilitation Engineering Services Conference, March 20-21, 1981, Stanford University Medical Center.
* Presented at annual RESNA Conference, August 30-September 3, 1981, Washington, D. C. and included in Proceedings thereof.
* Presented at annual meeting of American Academy of Cerebral Palsy and Developmental Medicine, October 1981, Detroit, Michigan.
* Submitted for publication in Developmental Medicine and Child Neurology.

Utilization of Research

The Center has established a Rehabilitation Engineering Clinic for client evaluation of children and adults with severe and/or multiple physical limitations. It is anticipated that the revised assessment form will be used in this Clinic.

Clinical Evaluation Activities

Task: Retrospective Evaluation of Communication Aids and Controls Provided by the Rehabilitation Engineering Center

Objectives

To follow-up, analyze, and document the effectiveness of communication aids and controls provided by the Rehabilitation Engineering Center to improve delivery of services.

Impacts

This evaluation, based on the population studies in "Team Assessment of Device Effectiveness," published in 1980, will extend the information on mobility devices, interfaces and controls to communication aids. It will have impact on (1) controls/interfaces prescribed and used; (2) effectiveness of communication devices, and (3) methods of assessment of clients for communication systems.

Personnel

Jean Kohn, M.D., Consultant
Margaret Barker, M.S., Biomedical Engineering
Sandra Enders, O.T.R.
Kelly Flanagan, M.Ed.

Progress to Date

A small study was completed (see Figure 15.) A preliminary report is included as Appendix C. The results are potentially very significant.

Study of the questions raised in the above preliminary study will require a much larger effort beyond the scope of the NIHR grant. Accordingly, a grant application is being submitted to the Office of Special Education for a separate three-year project.

Dissemination of Information and Utilization of Research

As mentioned above, funding is being sought to continue this project on a broader scale. Findings will be used to improve services at the Rehabilitation Engineering Center and will be distributed to other centers involved with communication systems and controls for the nonspeaking population.

Figure 15.
Two of the client subjects participating in the follow-up study on communication systems.

Clinical Evaluation Activities

Task: Investigation of Controls/Interfaces Ready for Clinical Evaluation

Objective

To develop a list of controls/interfaces ready for clinical evaluation for the specific purpose of interesting manufacturers in producing such devices for the disabled.

Impact

The delay in transferring research projects into commercial production had been commented on in The Final Report of Rehabilitation Engineering Center Program Evaluation by Berkeley Planning Associates, 1978, pp. 56-60.

This clinical evaluation study is planned to identify devices which are potentially useful, but for one reason or another, are not yet being provided.

Personnel

John Preston, Jr., M.S.W.
Jean Kohn, M.D., Consultant

Progress to Date

Having completed the Directory of Research and Development Projects on Controls, described later in this report, the list below was made in an effort to select those ready and promising for possible clinical evaluation.

* Brow Wrinkle Switch - The TRACE Center
* Capacitive Touch Plate Controller - O.C.C.C.
* Control Evaluator and Trainer - CH@S
* Damped Joystick - M.I.T.
* Access Video Keyboard Control System - Univ. of Tennessee
* Electric Wheelchair Control by Joystick - Univ. of Virginia
* Eye Blink Switch - Moss Rehabilitation Hospital
* Head Position Control - Case Western Reserve University
* "Hum Controlled" Electric Wheelchair - Univ. of Virginia
* Myoelectric Signal Processor - M.I.T.
* Light Beam Control - New Mexico University, Clovis Branch
* Microprocessor-Based Control Trainer & Evaluator - O.C.C.C.

Dissemination of Information and Utilization of Research

All above listed R&D projects have been published in the referenced Directory. Not until they have been evaluated is it appropriate to say more at this stage.

Clinical Evaluation Activities

Task: Clinical Evaluation of Versatile, Portable, Speech Prosthesis

Objective

The task is to clinically evaluate the Versatile Portable Speech Prosthesis and its "versatile" controls and interfaces. The research and development of the VPSP has been funded by the NASA Technology Utilization Program via Grant No. NSG-2313 from the NASA-Ames Research Center. Two consultants on the NIHR Grant are being used in the clinical evaluation of the VPSP. The NIHR component is an important compliment to the total project.

Impact

This is part of a research and development project with immediate patient benefit limited to specific controls and interfaces for the few patient subjects evaluating the VPSP. The total population of non-speaking/severely speech-impaired people in the United States is estimated at 1-1/2 million, so potential impact is large.

Personnel

Maurice A. LeBlanc, M.S.M.E., C.P.
Doreen Daniels, Speech Pathologist
June Bigge, Ed.D.

Progress to Date

The VPSP has been evaluated with a clinical protocol on five patient subjects and tested informally for feedback with several other non-vocal people. Results were very encouraging. (See Figure 16.) Speed of speech using the system ranged from four words/minute with a single switch control to 30 words/minute with a keyboard control. The VPSP features:

* Unlimited vocabulary
* Fast, easy message construction
* Mountable on, and powered by, standard electric wheelchair

Clinical Evaluation Activities

* Choice of control switches, depending on user capabilities:

  - single switch
  - 5-slot arm control
  - joystick
  - full keyboard

* A large vocabulary of pre-spelled words and phrases
* Blank "user pages" which may be programmed by the user with his own most-used words, phrases and sentences.

Following the clinical evaluation in Spring 1980, a conference was held on 5/28/80 to which manufacturers were invited toward making the VPSP technology commercially available. Computers for the Physically Handicapped, Inc. was selected to manufacture and market the VPSP.

Dissemination of Information

A "Progress Report--Research and Development of a Versatile Portable Speech Prosthesis - May 1978 to November 1979" has been prepared and 250 copies have been distributed. A final report on the project will be prepared in 1982.

The VPSP was dubbed the "Talking Wheelchair," which seemed to add to its public interest. The project has received a great deal of unsolicited press coverage on TV, radio, newspapers and magazines, including:

Wall Street Journal
U.S. News and World Report
Medical World News
Science News
ABC's "20/20" TV Program

Utilization of Research

With final negotiations in process for turning over the VPSP to a manufacturer for commercial availability, the link to users is almost complete. Time and travel was allocated on this project under NASA funding for the transfer of the technology. The estimated number of non-speaking people in the U.S.A., excluding the deaf, is about 1-1/2 million. The percentage of this total who can benefit from the VPSP is unknown.

Figure 16.
Versatile Portable Speech Prosthesis.
Shown is closeup of CRT, keyboard,
and optional single switch control.

Interaction with Industry Activities

Task: Development of Catalog on Controls

Objective

To develop a catalog of controls/switches for reference by people involved in the use or provision of assistive devices. The controls catalog is intended to inform consumers, clinicians, manufacturers, and researchers what is commercially available.

Impact

This catalog is the first in a series of steps to locate, identify and describe different types of controls/switches which can be used as interfaces between severely disabled persons and mobility, environmental control, recreation, educational and vocational devices.

By encouraging researchers, manufacturers, as well as consumers and health professionals, to provide information on controls/switches, we hope to create a continuous information exchange designed to:

* Maintain state-of-the-art of commercially-available controls/switches.
* Enable consumers and health professionals to be better informed of technological options.
* Lessen duplication of efforts among researchers and manufacturers.

Personnel

John Preston, Jr., M.S.W.

Progress to Date

Task is complete. A broad array of commercially available controls have been identified and are included in a catalog entitled "Controls Reference Catalog to Aid Physically Limited People in the Operation of Assistive Devices." (1980.)

Interaction with Industry Activities

Dissemination of Information

To date, approximately 1600 copies of the Catalog have been distributed nationally and internationally.

Notice of the Catalog has been published in several newsletters which has resulted in a wide distribution. Also, the information in the Catalog is being included in ABLEDATA and Accent on Information. The TRACE Research Center has indicated that they will publish all or parts of the Catalog in the "TRACE Resource Book."

Utilization of Research

It is intended that the Catalog will be updated and revised every two years. Shown on pages 45-46 is a one-page, back-to-back form to assist in the collection of data on controls.

Controls & Interface Search

REC/CH@S

CONTROL NAME: ____________________

(check one)

____ A current Research & Development project

____ Commercially available

____ A Concept that needs research

____ Other ____________________

CONTACT PERSON: Name ____________________

____

Address ____________________

City ____________ State ____________ Zip ____________

Phone# ( ) - ext. ____________

DESCRIPTION: ____________________

____

____

____

____

____

____

____

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____

Illustration Available: Yes / No (Circle One)

STATUS/FUNDING: ____________________

(or Retail Price) ____________________

____

____

____

SUBMITTED BY: Name ____________ Date / /

Address ____________________

City ____________ State ____________ Zip ____________

Phone# ( ) - ____________

Where are the Controls???

DO YOU KNOW OF A CONTROL THAT:

- can be used by a physically limited person to operate an assistive device
- is commercially available, under development, or needs research
- is not in our Controls Catalog or in our Controls Research and Development Directory

Please complete this description form, and send it to the address below.

If you have any further comments, please contact: Sandi Enders
(415) 327-4800 x432

-----Fold Here---------------------

-----Fold Here---

CONTROLS AND INTERFACE PROJECT
Rehabilitation Engineering Center
Children's Hospital @ Stanford
520 Willow Road
Palo Alto, California 94304

Interaction with Industry Activities

Task: Compile and Publish a Directory of Research and Development Projects on Controls

Objective

The objective of this project is to assist the overall process of making worthwhile and marketable controls commercially availiable by making known what controls are under research and development by private and public sectors.

Impact

Potential benefit is significant in (1) maintaining state-of-the-art information exchange; (2) disseminating information about controls under development as well as those which are commercially available; (3) assisting the transfer of useful controls from development to commercial availability; and (4) developing working relationships with industry and other centers.

Personnel

John Preston, Jr., M.S.W.
Doris Wells, Consultant

Progress to Date

A broad array of controls has been located, listed, described and published ina "Directory of Research and Development Projects on Controls, May 1981."

Dissemination of Information

500 copies of the Directory have been published and are being distributed to manufacturers, researchers/developers, clinicians, consumers and/or others involved in the provision of use of controls.

Utilization of Research

It is intended that the Directory will be updated every two years. The same form as shown on pages 45-46 will be used to gather information.

Interaction with Industry Activities

Task: Transfer of Technology

Objectives

To aid in the overall process of making worthwhile controls and assistive aids commercially available to the severely disabled.

Impacts

In view of the fact that significant technological advances in the development of controls and assistive aids have occurred during the past several years, it is imperative that such advances be made available to the approximately 6-1/2 million disabled persons who can possibly benefit from them.

A coordinated effort of researchers and manufacturers is essential to this area of technology transfer. It is anticipated that the process will result in a significantly improved delivery system as well as enhance the development of controls and assistive aids which address real needs that have been identified by consumers and clinicians.

Personnel

John Preston, Jr., M.S.W.
Maurice LeBlanc, M.S.M.E., C.P.
Rehabilitation Engineering Center Staff

Progress to Date

Following are the major products from this Center which have been or are in the process of being made commercially available. (See Figures 17 - 21.) While all have not been developed under NIHR support, the NIHR support of technology transfer has allowed significant contribution in this area.

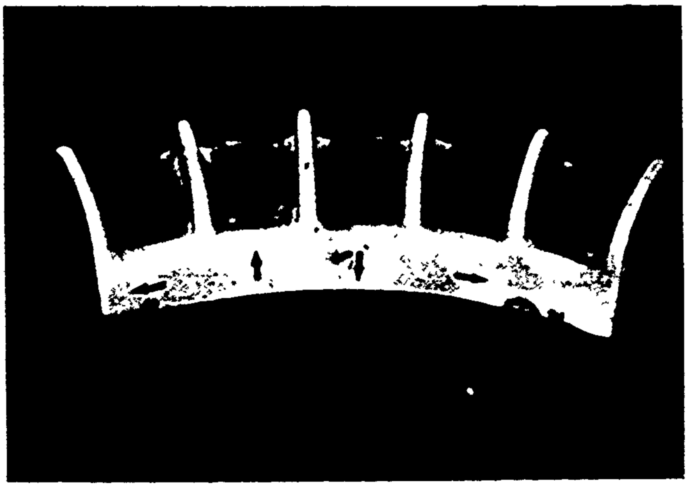

Figure 17. The Stanford Children's Arm Slot Control is commercially available from Medical Equipment Distributors. About 50 have been sold to date.

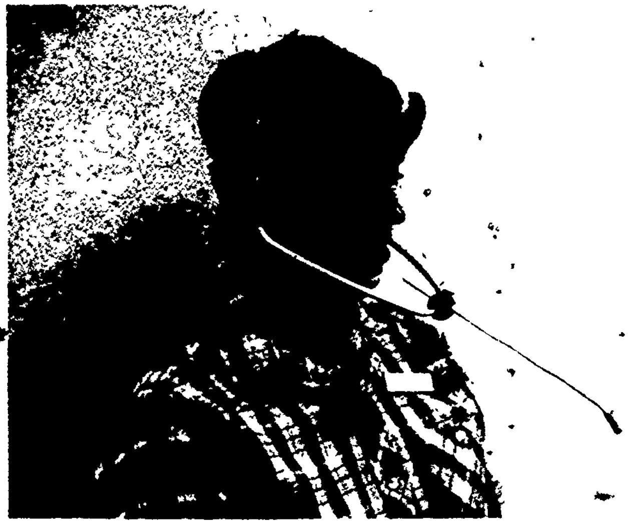

Figure 18. The Stanford Children's Headward is commercially available from Zygo Industries. About 200 have been sold to date.

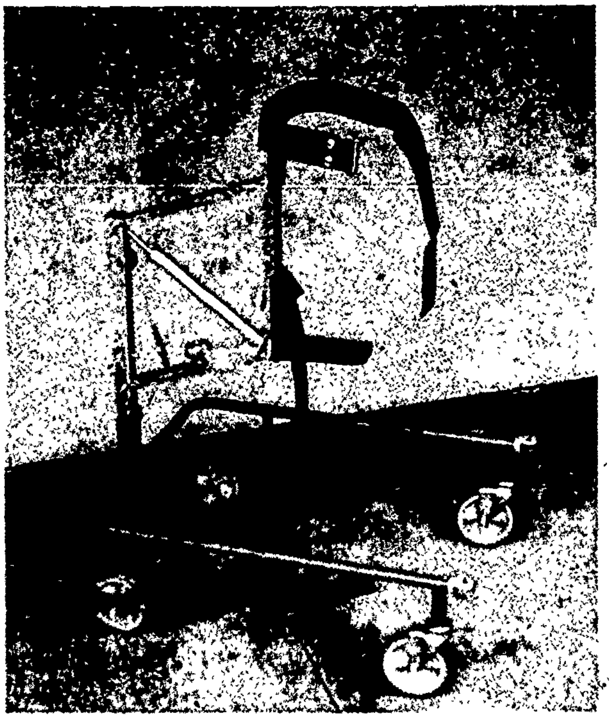

Figure 19. The Stanford Children's Weight Relieving Ambulator is being made commercially available by Everest and Jennings. First units on the market are expected in Spring 1982.

Figure 20. The Versatile Portable Speech Prosthesis. (See pages 40-41). Computers for the Physically Handicapped has been selected to make it commercially available.

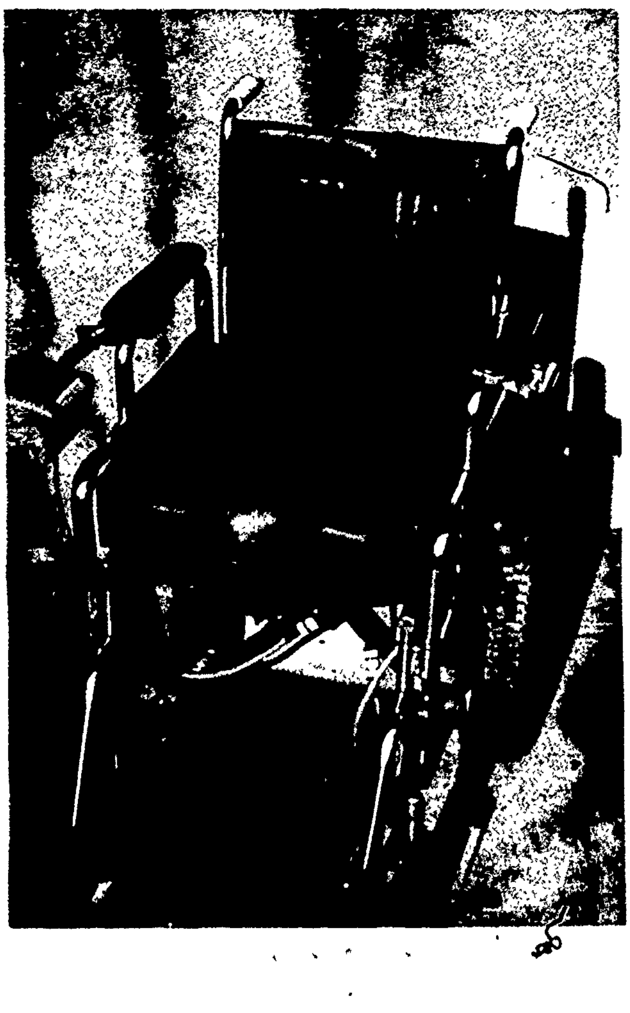

Figure 21. The Veterans Administration Seating Interface Orthosis for Paraplegics has been successfully clinically evaluated and of several manufacturers who have expressed interest in making it commercially available, one will be selected by 1/1/81.

(Other devices such as the Augmented Feedback Spinal Orthosis, Hip External Rotation Orthosis and Control Evaluator and Trainer Kit look promising but have not yet completed development and clinical evaluation).

Education and Training Activities

Task: Conduct Annual Rehabilitation Engineering Services Conference

Objectives

This annual conference is conducted to provide a forum for state-of-the-art information exchange in rehabilitation engineering. The goals are:

* To introduce new professionals to the field of technical aids and services for the disabled.
* To provide information on recent advances in rehabilitation engineering to professionals already in the field and to disabled consumers.
* To facilitate the development of a local resource network in Northern California.
* To demonstrate the scope and cooperative effort of Rehabilitation Engineering.

Impact

The San Francisco Bay Area is resource rich in the area of technology. This is particularly true in the field of rehabilitation engineering. These annual conferences are a valuable and efficient method to increase interaction among the various components of the field: researchers, consumers, service providers in both public and private sectors. This interaction provides:

* cross fertilization of ideas;
* reduced duplication of effort;
* identification of unmet needs, both for services and products;
* increased awareness of local resources; and
* improved service delivery mechanisms.

The 1981 Rehabilitation Engineering Service Conference--"Access to Technology"--was the third annual conference sponsored and coordinated by the Rehabilitation Engineering Center. The conference drew an auditorium capacity audience of 375 participants.

As the conference has grown, and the field of rehabilitation engineering service delivery has expanded, the Rehabilitation Engineering Center's role in this event has changed. The focus has shifted from an emphasis on this Center's programs to a demonstration of the variety of services and strategies available to Northern Californians. The Rehabilitation Engineering Center has become a sponsoring host and functions as a catalyst. This role seems appropriate and in keeping with NIHR support. It could be readily emulated by other centers.

The conference is designed to be a major channel of information dissemination on rehabilitation engineering resources, service delivery systems, and research and development. The conference has continued to be a regional and statewide forum, providing access to information and resources to both professionals and consumers concerned with applying technology to the needs of disabled individuals.

In addition this year, all the California Rehabilitation Center program directors met together formally for the first time at a conference luncheon. They left having made a commitment to have increased interaction.

Personnel

Sandra Enders, O.T.R., Conference Chairperson
Kelly Flanagan, M.Ed.
Rehabilitation Engineering Center Staff

Progress to Date

The conference was held Friday and Saturday, March 20-21, 1981.(Figure 22.) The agenda is shown in Appendix D. Speakers included representatives from all of the major rehabilitation engineering resource centers in California, representatives from funding agencies, professionals in applied research, and disabled consumers of rehabilitation engineering technology. Additionally, equipment demonstrations were provided by 16 invoted manufacturers and developers to display some of the advances in devices.

The Rehabilitation Engineering Services Conference has become an expected Spring event. Most people who are active in the field recognize it as the one-time place they can meet with most of their peers. One wheelchair developer remarked that it was the first time he had seen "all of the really innovative wheelchair designers together in one place at one time."

With a three year track record, the conference is drawing people from a professional base (e.g., this year several representatives of private sector rehabilitation agencies and insurance carriers were in attendance.

Educational activities this year emphasized reaching people living in the community who are not associated with institutional programs. The applications of people in attendance at this conference indicated that those goals had been met.

Consumers and representatives of independent living programs,disabled students programs and public school-based medical therapy units formed a large part of the audience.

Formal feedback on the conference was obtained by having the participants complete critique sheets (Appendix D). The participant response is summarized below.

		Percent Rated 4 or 5 On a 5-Point Scale
1.	The format was varied and interesting.	86%
2.	The content was useful.	75%
3.	Conference faculty was knowledgeable of their materials.	95%
4.	The objectives of each session were met.	75%

Suggestions for the 1982 conference included use of a small group format with more focus on specific topic areas, and inclusion of more equipment demonstrations in the program.

Continuing education credit was made available to physicians, registered nurses, social workers, rehabilitation counselors, certified orthotists and prosthetists, physical therapists, and corrective therapists. 30 participants applied for and received continuing education units for attendance at the conference.

A follow-up mailing was sent out. This mailing (Appendix D) included a summary of the feedback from the critique sheets and a complete address list of conference participants. People have found this information useful in maintaining a resource network related to technology for the disabled.

Dissemination of Information

Tne conference brochure describing the program agenda was sent to 3000 Northern California residents, including physicians, therapists, nurses, rehabilitation counselors, engineers, consumers, parents, educators, administrators, and others interested in rehabilitation engineering. These brochures provide some basic knowledge of the scope of rehabilitation engineering for people who cannot attend the meeting.

Over 700 Rehabilitation Engineering publications were sent to participants in answer to individual requests for information.

A conference proceeding was prepared from audiotapes of the entire two days. Although no papers were formally presented, conference speakers organized their material in such a way as to make this publication stand as a "Guide to Rehabilitation Engineering Service Delivery." Until the first official book is written about rehabilitation engineering services, this spiral-bound edition of the 1981 conference proceeding can easily stand as the first "primer." There are sections by people such as Laurence Weiss, Albert Cook, Ph.D., Barry Romich, etc., speaking to the daily issues of service delivery. We feel fortunate to have documented for public release so much of the "nuts and bolts" of this newly emerging service area by people at the forefront of service delivery. People who, even if they can find the time to publish, rarely address "how to do it" clinical issues.

Utilization of Research

The annual conferences have proved to be effective in facilitating interaction among professionals and consumers of rehabilitation engineering technology. The interaction provides opportunity for:

* Sharing of common problems and solutions.
* Dissemination of information and local resources and services.
* Awareness of advances in technology and service delivery.

The conference is attracting regional and national interest. Requests for information on the Spring 1982 meeting have come from individuals far outside our "target area" (e.g., Washington, Michigan, Texas, New York, Florida.) Inquiries have also been received from other Rehabilitation Engineering Centers interested in providing this type of program with their geographic area.

A workbook detailing procedures for conducting a rehabilitation engineering conference is being prepared. It is hoped that the experience gained in the past three years, along with the conference workbook, wiill be of assistance to other centers in the coordination and implementation of rehabilitation engineering conferences at other sites.

Figure 22.
Annual Rehabilitation Engineering Services Conference

Education and Training Activities

Task: Conduct Clinical Internship

Objective

To provide a comprehensive clinical training program for a graduate engineer which will prepare him/her to be a professional rehabilitation engineer.

Impact

Clinical rehabilitation engineering services have been demonstrably successful. The need for trained engineers to supply these services is increasing.* The program at this Rehabilitation Engineering Center is one approach to providing engineers with practical, clinical experience in a wide variety of conditions. The rehabiilitation engineer trained as a daily clinician will be a consumer of rehabilitation engineering research and will give research-oriented engineers a place to send their developments for use and evaluation.

Personnel

Hugh O'Neill, E.E., Clinical Intern
Sandra Enders, O. T. R., Training Preceptor
Rehabilitation Engineering Center Staff

Progress to Date

The program currently trains one engineer per year. The second intern in the program completed his internship at the end of September 1981. He spent two months in Communications/Control Service, one month in Seating and Mobility Service, one month in Tissue Trauma Prevention Service, one month in Orthotics, one month in Prosthetics. He also reviewed research work at other facilities locally. He did field work: one month with a private practice rehabilitation engineer (with emphasis on job site analysis and modification); one month in the Rehabilitation Unit of Santa Clara Valley Medical Center; one month in the Rehabilitation Unit at R. K. Davies Medical Center; one month at the Center for Independent Living; and a special project related to do-it-yourself electronics. (Figure 23).

*LaRoca, J. and Turem, J. The Application of Technological Developments to Physically Disabled People. Urban Institute, May 1978, pp. 65-66.

Copies of the field work performance report used and of the certificate given at completion of the program are shown in

Dissemination of Information

A workbook is being prepared on this training program. A ten-minute videotape on the Internship is available from NARIC. A paper, "Rehabilitation Engineering Training--A Clinical Approach," was presented at the 1981 RESNA Conference in Washington, D.C. Presentation of the program was also made at the annual conference of the American Society of Engineering Educators in June 1981 in Los Angeles.

Although there has been no advertising done, approximately 20 engineers had expressed interest in entering the program in 1982. Interviews were held with many of them to explore and clarify their interest in pursuing rehabilitation engineering as a career. Gordon Hosoda has been selected to begin clinical training in October 1981 for 12 months.

Utilization of Research

The intern's experience at local rehabilitation units has created increased interest and awareness of the potential for rehabilitation engineering services at their hospitals. The first intern, Greg Shaw, is now employed at the Memphis Rehabilitation Engineering Center. The second intern, Hugh O'Neill, is now employed at Children's Hospital at Stanford Rehabilitation Engineering Center.

Figure 23. Rehabilitation Engineering Clinical Internship

Education and Training Activities

Task: Conduct Staff Inservice Programs

Objective

To develop a consistent comprehensive body of knowledge in Center staff; to educate medical and other professional personnel who train at Children's Hospital at Stanford about the applications and benefits of rehabilitation engineering services.

Impact

Rehabilitation engineering services exist primarily in scattered urban areas across the country. If these services are to reach all the people who need them, trained personnel must become available. Training staff and students at the Center has a ripple effect: it spreads trained individuals out to other areas where services are in demand. These people are just as vital as trained rehabilitation engineers in ensuring that consumers' needs are met.

Education of physicians and other medical staff creates an informed body of "ombudsman" who prescribe and recommend assistive devices for the people they serve.

Personnel

Kelly Flanagan, M.Ed.
Sandra Enders, O.T.R.
Chester Swinyard, M.D., Consultant

Progress to Date

Staff and physician inservice topics including Seating and Mobility, Home Access, telephone equipment for the disabled; Blissymbolics, Pediatric wheelchairs, two weekly inservice series opened to all hospital staff, and periodic equipment demonstrations to display newly available devices. The first series focused upon etiology, treatment and implications of disability in children and was conducted during the lunch hour. (See Appendix F for the specific inservice topics.)

The second inservice series was comprised of weekly equipment demonstrations given by vendors of rehabilitation equipment during the months of May and June. This series was also presented during the lunch hour.

Dissemination of Information

A calendar of events describing the topics for each series was sent to approximately 300 rehabilitation professionals and consumers in the community to inform them of upcoming in-service activities taking place at Children's Hospital at Stanford.

Utilization of Research

Professional development has impact upon service delivery both within the Center and Children's Hospital at Stanford as well as upon service delivery systems in the community. The inservice programs established during the 1980-81 grant year began to set a precedent for ongoing professional staff development programs as well as to provide a forum for the sharing of information between research and service delivery professionals.

Education and Training Activities

Task: Conduct Workshops and Outreach Programs

Objective

To increase awareness and participation in the rehabilitation engineering delivery process, to provide general as well as in-depth information on selected topics in rehabilitation engineering; to respond to requests from the community for more information on technology applications for disabled people; to participate in International Year of the Disabled Person (IYDP) activities of various regional agencies as requested.

Impact

Emphasis for outreach focused on independent living programs, disabled student programs and school medical therapy units. These groups reach large numbers of disabled people who live in the community and are not generally associated with institutional programs, i.e., healthy active people with physical limitations. Programs were derived from requests received from the community.

Personnel

Sandra Enders, O.T.R.
Kelly Flanagan, M.Ed.

Progress to Date

Formal workshops and presentations on Home Access, Mobility through Space, Grass Roots Technology, and Independent Living have been completed. One series of workshops on Home Access proved to be overwhelmingly successful. It was obviously meeting an unmet need, one which we had not fully anticipated.

Presentations have been aimed at training personnel who work with many other consumers and professionals, so we could get the largest amount of return for effort. In an attempt to meet people's requests for evaluative data, a forum of pediatric therapists met to discuss mobility and positioning devices. Again, this rapidly escalated beyond the resources of Rehabilitation Engineering Center staff time, but clearly defined the need and a technique for meeting that need, as well as documenting valuable data.

Education and Training Activities

Dissemination of Information

In addition to programs at Children's Hospital at Stanford, Rehabilitation Engineering Center staff have participated in workshops and meetings and have given papers/presentations throughout the year. The Rehabilitation Engineering Center has effectively responded to community requests for speakers, and has taken an active role in the IYDP programs.

Utilization of Research

These programs have faced the problem of doing "too good a job." Once people recognize we can supply the information and/or training they seek, we are overwhelmed by requests and forced to discontinue for lack of time and/or resources.

Alternative means of meeting these needs will be explored in the future. The Rehabilitation Engineering Center has clarified its role. We hope to become less the provider of ancillary services, and more of a catalyst--identifying perceived needs and facilitating outside, community-based means of filling those needs. This role is felt to be a more appropriate allocation of resources, and an excellent way to develop community resources.

The programs (and the existence of the information service) have intensified requests for an equipment demonstration units where people can have hand-on experience with the devices in the pictures, slides, catalogs, and brochures that are available here at the Rehabilitation Engineering Center. Preliminary planning for the establishment of a technical aids resource center and a mobile demonstration van has been explored. Comprehensive planning for the development of such an independent center will take place next year.

Information Dissemination and
Research Utilization Activities

Objective

The lives of people with physical limitations can be greatly enhanced by the appropriate application of technology. Rehabilitation engineering efforts have expanded both the quality and quantity of these products in the past decade. The Rehabilitation Engineering Center has been committed to helping people keep up with the advances in technology. The Center continues to occupy a central role in the development of an effective information delivery system in Northern California.

Impact

Information has often been identified as THE product of the 1980's. The effects of the "information explosion" can be seen in the general population: Never have we been so well informed. Unfortunately, this is not as true of the disabled population. For this group, the impact of lack of information is staggering. Adequate information can mean the difference between independent living and institutionalization, between independence and dependence. The impact of meeting these needs for information can be relatively large and immediate. It can be the most cost-effective money spent.

Personnel

Sandra Enders, O.T.R.
Kelly Flanagan, M.Ed.
Rosemary Murphy, Information Broker
Rehabilitation Engineering Center Staff

Progress to Date

If anything, these activities have been "too successful"! Once people realize the Rehabilitation Engineering Center can provide accurate, useful information, requests skyrocket. Nearly 700 publications were requested as a result of the Annual Rehabilitation Engineering Services Conference to an audience we thought well informed of rehabilitation engineering programs. The Northern California resource list contains over 3000 addresses and continues to grow. It seems everyone wants to be on the mailing list--a good indication that they like what the Center sends them, and want to receive more. With minimum outreach, the Center frequently receives more requests for data, training, publications, etc., than it can readily handle. Specific tasks involved with producting these results include the following and are described in the following pages:

* Rehabilitation Engineering Center Publications Office
* Information Service
* Other Information Dissemination Activities
* Ongoing Activities

Rehabilitation Engineering Center Publications Office

The Publications Office was established in Spring 1981 because of the increase in the number of requests for documents. In the previous three-year period (1978-1981) the Center had distributed over 11,000 publications and reports free of charge. By centralizing this function, the Center is able to cover costs by charging for printing and mailing of most reports, keep accurate records of who is receiving this information, and streamline advertising for new programs and other relevant information dissemination activies.

New Rehabilitation Engineering Center Publications (Appendix G)

* Research Report: Team Assessment of Device Effectiveness. October 1980.
* Controls Research and Development Directory. "Who is Doing What in Current Research and Development of Controls to Operate Assistive Devices." May 1981.
* How to Treat and Prevent a Pressure Sore. 2nd Edition. July 1981.
* Proceedings. Third Annual Rehabilitation Engineering Services Conference: "Access to to Technology," March 20-21, 1981.
* A series of one-page data sheets on current projects (Appendix ?).

Audio Visual Productions

* Children's Hospital at Stanford-Rehabilitation Center-Progress Report 1980-81. 30 minute videotape. Available in 1/2" Beta I, 12" Beta II, and 3/4" V-matic format.

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Information Dissemination and
Research Utilization Activities

* Rehabilitation Engineering Clinical Training Program. 1981. 10 minute videotape. Available in 1/2" Beta I, 1/2" Beta II, and 3/4" V-matic format.
* Rehabilitation Engineering Center staff coordinated and assisted in productions of local television and educational videotape productions, including the local CBS-TV station and the University of California.
* The Rehabilitation Engineering Center maintains an extensive 35 mm slide collection. These slides are made available upon request to local programs for viewing and/or duplication. Some of the groups that have used the Center's slides are: University of California, School of Public Health; Center for Independent Living; Stanford University. They have also been used as part of Congressional testimony and in local, state and federal educational and training events.

Computerized Resource Address List

The new updated computerized mailing list significantly increases the efficiency in disseminating information on conferences, in-services, current research, etc., to professionals and consumers of rehabilitation engineering services in the community at large.

Information Clearinghouses

The publications office routinely sends relevant research results and information for distribution to the large national data bases and clearing houses such NARIC, ERIC, NCHRTM, ICTA, AHRTAG, etc. Some of the Center's reports are on microfiche at these facilities.

Information Service

In conjunction with the California State Department of Rehabilitation, a Rehabilitation Engineering Information Service was initiated at the Center in October 1980. This service is staffed by a fulltime Department of Rehabilitation counselor, designated as an Information Broker in the ABLEDATA system. At the federal level, this program is being coordinated by the National Rehabilitation Information Clearinghouse (NARIC) in Washington, D. C., with overall direction from NIHR.

Information Dissemination and Research Utilization Activities

In its first year of existance, the Service answered close to 600 requests for information. This service maintains a direct telephone line (415-327-1111) to expedite telephone requests.

The Rehabilitation Engineering Center staff has supported this project from its earliest planning stages. Although providing no direct financial support, the Center does contribute "in kind" such services as office space, copying machine, postage, etc., as well as access to files and the library, technical staff support and some secretarial help.

ABLEDATA (Appendix G)

The Rehabilitation Engineering Center staff made entries into ABLEDATA in the areas of (1) aids for children, and (2) controls and interfaces. Approximately 700 adaptive children's aids were described and written up according to ABLEDATA record entry format. These aids included aids for daily living, therapy equipment, recreation, and equipment to facilitate pre-academic skill development. In addition, approximately 50 controls were described and written up in ABLEDATA format. The device descriptions for childrens' aids and controls were sent to the University of Virginia in December 1980, to be input into the ABLEDATA computerized data base. The development and utilization of ABLEDATA as a supplement to the services of an information broker will enable information and services expansion from the local to the national level.

Specialized Information Requests

Rehabilitation Engineering Center staff members continue to provide answers to specialized information requests. Everyone, from the Director of Research down has contributed in their own areas of expertise. Program development, home accessibility, adapted toys, and computer interfacing are just a few of these specialities.

Information Dissemination and
Research Utilization Activities

Other Information Dissemination Activities - Summary

Publications

* Preston, John Jr. "Assistive Devices," Paraplegic News. March 1981.

The following papers were included in the Proceedings of the Fourth Annual Conference on Rehabilitation Engineering, Washington, D. C., August 30 - September 3, 1981:

* Barker, Margaret and Cook, Albert. "A Systematic Approach to Evaluating Physical Ability for Control of Assistive Devices."
* Enders, Sandra. "Rehabilitation Engineering Training - A Clinical Approach."
* Kohn, J.G., Enders, S., Preston, J., Motlah, W., Allison, B. "Provision of Assistive Equipment for Handicapped Persons - A Retrospective Study."
* LeBlanc, Maurice A. "An Incomplete Guide to Establishing a Rehabilitation Engineering Program."
* Pasillas, R. and Paociorini, J. "Pressure Sore Prevention and Biomechanical Support for the Paralytic Wheelchair-Dependent Person."
* Pasillas, R., Politi, D., Perkash, I. "Seating Systems for Body Support and Preventrion of Tissue Trauma."
* Preston, John Jr. "Maximizing Benefits of Assistive Devices - Psycho Social Consideration."

Presentations, Lectures, Television

* LeBlanc, Maurice A. "Aids for the Disabled." ABC-TV's "AM-San Francisco," 10/14/80.
* Enders, Sandra. "Equipment for the Disabled Child." Public Health Nurses Training Seminar, Sacramento, California, 10/30/80.
* Enders, Sandra. "Independent Living and Rehabilitation Engineering." United Cerebral Palsy Association State Conference, Sacramento, California, 11/15/80.
* LeBlanc, Maurice A. "Rehabilitation Engineering." United Cerebral Palsy Association Telethon, San Francisco, California, 1/17/81.
* Preston, John Jr. "Role of Assistive Devices in the Lives of Disabled People." School of Public

Health, University of California/Berkeley, 1/19/81.

* Barker, Margaret. "Assistive Devices for Communication." Glendale Adventist Hospital, Glendale, California, 1/23/81.
* Preston, John Jr. "Rehabilitation and Disability." San Jose State University, San Jose, California, 2/5/81.
* Enders, Sandra. "Mobility through Space." Alameda County California Children's Service Therapists, Oakland, California, 2/10/81.
* Enders, Sandra. "Home Access: Transitions." Chadbourne School P.T.A., Millbrae, California, 2/26/81.
* Preston, John Jr. Disability Seminar. Center for Advanced Studies, Stanford University, 3/25/81.
* Enders, Sandra. "Rehabilitation Engineering Services." California Association of Rehabilitation Facilities Annual Conference, San Francisco, California, 3/23/81.
* Enders, Sandra. "Aids to Independent Living." Berkeley Outreach Recreation Program, Berkeley, California, 3/25/81.
* Barker, Margaret. "Microcomputers for the Disabled." Small Systems Computing for the Handicapped, Johns Hopkins Workshop, Stanford University, 3/27/81.
* Pasillas, Rick. Vocational Rehabilitation Counselor Training. Santa Clara Valley Medical Center, San Jose, California, 4/21/81.
* LeBlanc, Maurice A. "Rehabilitation Engineering." Mechanical Engineering Department, Stanford University, 5/19/81.
* LeBlanc, Maurice A. "Rehabilitation Devices." Walter Hayes Elementary School, Palo Alto, California, 5/28/81.
* Flanagan, Kelly/Preston, John Jr. "Devices for the Disabled." Footsters (a one-day awareness program), Walter Hayes Elementary School, Palo Alto, California, 5/28/81.
* LeBlanc, Maurice A. "Environmental Controls and Adaptive Aids." Advances in Technical Aids for Children with Physical Disabilities. AACPDM, Tufts University, Medford, Massachusetts, 6/5-6/81.
* Enders, Sandra. "Technology for the Disabled." IYDP Program. Department of Education, Region 9, San Francisco, California, 6/8/81.
* Enders, Sandra. "Technology for the Disabled." IYDP Program, Department of Health & Human Services, Region 9, San Francisco, California, 6/8/81.

Information Dissemination and
Research Utilization Activities

* Enders, Sandra. "Independent Living and Technology." Chronic Disease Group, Stanford University Medical Center, 6/15/81.
* Enders, Sandra. "Rehabilitation Engineering Training." American Society of Engineering Educators Annual Conference, University of Southern California, Los Angeles, California, 6/23/81.
* O'Neill, Hugh. "Pacific Currents" (CBS-TV, Channel 5). San Francisco, California, 8/22/81.
* Barker, Margaret. "Speech Synthesis for the Speech Impaired." WESCON/81. San Francisco, California, 9/28/81.
* Barker, Margaret. "Mobility and Alternative Communication Devices, Assessment and Application." California Association of Post and Secondary Educators of the Disabled. Sunnyvale, California, 10/10/81.

Presentations: Rehabilitation Engineering
Sponsored Programs

In addition to the in-service program and annual Rehabilitation Engineering Services Conference (reported on in Education and Training Activities), Rehabilitation Engineering staff also directly organized and presented the following:

* Enders, Sandra. "Home Access." 11/26/80.
* Flanagan, Kelly. "Mobility Through Space." 12/17/80.
* Enders, Sandra. Grass Roots Home Access Workshop. 12/12/80.
* Enders, Sandra/Siekman, Allen. "Mobility Equipment Evaluation Forum." Bay Area Pediatric Interest Group. 1/8/80.
* Enders, Sandra. Grass Roots Home Access Workshop. 1/16/81.
* Enders, Sandra. "Mobility Equipment Evaluation Forum II." Bay Area Pediatric Interest Group. 3/5/81..
* Third Annual Rehabilitation Engineering Conference: "Access to Technology." 3/20-21/81
  - *Enders, Sandra
    Conference Chairperson
  - *Kohn, Jean, M.D.
    "How to Pay for It"

*LeBlanc, Maurice A.
"How to Talk With It - Communication"
"Rehabilitation Engineering Center"
*Barker, Margaret.
"Communications Devices for the Speech Impaired"
*Preston, John Jr.
"Psychosocial Aspects of Using Equipment"

* O'Neill, Hugh. "Basic Electricity." Therapy Staff, R.K. Davies Medical Center, San Francisco, California, 9/21/81.
* O'Neill, Hugh. "Do-It-Yourself Electronics" Workshop. Alameda County CCS Therapists, Glankler School, Fremont, California, 9/25/81.
* O'Neill, Hugh, "Do-It-Yourself Electronics" Workshop. Therapy Staff, R. K. Davies Medical Center, San Francisco, California, 9/28/81.

Exhibits

* California Association Rehabilitation Facilities State Conference. San Francisco, California, 3/22-23/81.
* Disability Awareness Day. Canada College, Redwood City, California, 4/30/81.
* Fourth Annual Rehabilitation Engineering Conference. Washington, D.C., 8/31-9/3/81.
* IYDP Exhibit. San Mateo County Fair, San Mateo, California, 9/13/81.

Ongoing Activities

The Rehabilitation Engineering Center participates on a regular basis in a number of community-based projects related to technology and disability. Among these are:

* Community Health Information Project (CHIP)- which is developing an information utility/ electronic community bulletin board for the disabled and rehabilitation communities in the Santa Clara Valley.
* Bay Area Non-Oral Communication Group - a group of multi-disciplinary professionals and consumers who promote the delivery of communication aids to non-vocal people.

Information Dissemination and
Research Utilization Activities

* Bay Area Pediatric Interest Group - a group of therapists concerned with the needs of severely disabled children.
* Center for the Study of Chronic Illness and Physical Disability. Stanford University Medical Center.
* Disabiility Research Seminar. Boystown Center. Stanford University.

Student and Volunteer Projects

The Rehabilitation Engineering Center sponsors student projects related to technology and disability. The role of the Center has been to encourage such projects, talk to classes about rehabilitation engineering, provide information, arrange for contact with consumers, allow use of Rehabilitation Engineering Center fabrication equipment, and to provide professional advice. Stanford University, San Jose State University, and San Francisco State University are the most frequent cooperating institutions. Exchange covers a broad range of disciplines-- most commonly mechanical engineering and design, but also electrical engineering, occupational therapy, physical therapy, rehabilitation counseling and psychology.

Some of this year's projects include:

* A pressure relief buzzer/alarm.
* A collapsible crutch that can be stowed under a commercial airline seat.
* A wheelchair tire cleaner.
* Collaboration on the Blissymbolic Printer (Appendix G).
* Survey and evaluation of existing "Do-It-Yourself" project plans.
* Development of a Mobility Device Evaluation protocol (Appendix H).

Student Design Competition

As part of the Fourth Annual Conference on Rehabilitation Engineering, Maurice A. LeBlanc was appointed chairman of the Student Design Competition. This effort was initiated in summer 1980 and carried through the year with the goal being to interest students in designing for the disabled, submitting completed prototypes for judging, and selecting winners to participate in the annual conference in 1981.

Visitors

During this reporting period, there were over 350 recorded visitors to the Rehabilitation Engineering Center, and many more who were unrecorded. In addition, 250 people attended the Open House on March 21, 1981.

ASSISTIVE DEVICE CENTER
SCHOOL OF ENGINEERING (916) 454-6422
CALIFORNIA STATE UNIVERSITY, SACRAMENTO
6000 J STREET, SACRAMENTO, CALIFORNIA 95819

Client ____________

Client # ____________

Date ____________

Examiner ____________

INTERFACE ASSESSMENT

HEAD MODULE

1. Screening Data:

a. Range: horizontal. left ________ ° right ________ °

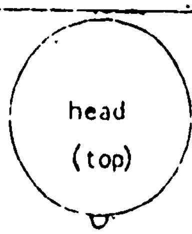
vertical: up ________ ° down ________ °

tilt: left ________ ° right ________ °

b. Restraints to head movement: ____________________

____

Sketch:



c. Headpointer used: type ________ . clients opinion ____________

____

Describe utilities, difficulties, etc. ____________

____

2. If range is adequate try several types of headpointers using the range sheet. Circle the squares reached.

Type 1: ______ Type 2: ______ Type 3 ______ Type 4: ______

Light Beam Indicator	Type 1	Type 2	Type 3	Type 4
1 ABCD	1 ABCD	1 ABCD	1 ABCD	1 ABCD
2 ABCD	2 ABCD	2 ABCD	2 ABCD	2 ABCD
3 ABCD	3 ABCD	3 ABCD	3 ABCD	3 ABCD
4 ABCD	4 ABCD	4 ABCD	4 ABCD	4 ABCD
5 ABCD	5 ABCD	5 ABCD	5 ABCD	5 ABCD
6 ABCD	6 ABCD	6 ABCD	6 ABCD	6 ABCD
7 ABCD	7 ABCD	7 ABCD	7 ABCD	7 ABCD
8 ABCD	8 ABCD	8 [illegible]	8 ABCD	8 ABCD
9 ABCD	9 ABCD	9 ABCD	9 ABCD	9 ABCD

Comment on difficulties, effort, etc. ____________________

____

____

3. If range and resolution are adequate, use a typewriter-like keyboard for the following trials. Use the "best" pointer based on #2. For the light beam indicator, have the client focus on the key and hold for several seconds. For all others have the client press the indicated keys. Type used ____________________.

Asked	Response		Time		False Entries		Comments
	guard	no guard	guard	no guard	guard	no guard	
1							
2							
)							
(							
Z							
X							
?							
O							
G							
H							
1,2							
G,H							
J,K							

Comment on difficulty, etc. ____________________

____

____

4. If the Light Beam Indicator is the "best" choice and is successful in #3, use the Optical Headpointer Strip Printer.

Asked	Response	Time	False Entries	Comments
1				
2				
)				
(				
Z				
X				
?				
o				
G				
H				
1,2				
G,H				
J,K				

Comments: ______________________________

5. If range is not adequate for large keyboard, but resolution is adequate, use a calculator-type keyboard. Place the keyboard at "best" location based on #1. List location # ______.
Type of headpointer (circle one): LBI, 1, 2, 3, 4

Asked	Response: guard	Response: no guard	Time: guard	Time: no guard	False Entries: guard	False Entries: no guard	Comments
0							
5							
6							
7							
27							
35							
49							
015							
345							
536							

Comments (including mountings required, etc.) ________________________

____

____

6. If resolution appears adequate, and chin does not rest on the chest use the chin joystick with lightbox. U=up, D=down, L=left, R=right.

Asked	Response	Time	False Response	Comments
U				
L				
D				
L				
R				
U				
D				
R				

Comment on overall difficulty, etc. ________________________

____

____

7. Other switches may be used with the head (chin). Try switches in the order listed (unless the client cannot use a specific type). Stop once a reliable and accurate switch has been found. Two responses are used: "ON" = turn on and leave on unit. The examiner says to turn off, and "OFF". Feedback = light, tone, computer CRT, voice, etc. Repeat the trial sequence shown with other switches as necessary to find one that works well for the client. Run one extra set of trials with the "best" switch.

Type	Asked	Response	Track Time	Select Time	Location	Mounting Used
		ON				
		OFF				
		ON				
		OFF				
		ON/OFF/ON				
		OFF				

SWITCH RANKINGS

Switch Rank	Type
1	Tread
2	Rocker
3	Wobble
4	Leaf
5	Zygo "Touch"
6	Pad
7	Contact
8	Bulb (Puff/Sip)
9	Mercury

Special mounting used for testing ______________________________

____

____

Recommended mounting for final system ______________________________

____

____

8. If eye movement is good and no other switch seems feasible, proceed with this part.

A. Horizontal. Estimate degrees from forward gaze. left: ____ right: ____

B. Verticle. Estimate degrees from forward gaze. up: ____ down: ____

C. Is movement controllable? ________ If not, can it be used in an on/off mode? ________ How? ______________________

____

D. If eye movement is well controlled, try the E-tran gran equivalent system. Comment on the effectiveness ______________________

____

E. EOG. If an electrical signal (hardcopy, select, alarm, etc.) is needed, connect electrodes above and below (if good vertical movement) and/or let outside of each eye (if good horizontal movement). Use an amplifier and readout to record voltages as follows:

Movement	Voltage (units)	Comments (fatigue, difficulty, etc.)
Full left gaze		
Full right gaze		
Up		
Down		
Midline		
Full left gaze		
Full right gaze		
Up		
Down		
Midline		
Full left gaze		
Full right gaze		
Up		
Down		
Midline		

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Full left gaze

Full right gaze

Up

Down

Midline

Full left gaze

Full right gaze

Up

Down

Midline

Full left gaze

Full right gaze

Up

Down

Midline

Full left gaze

Full right gaze

Up

Down

Midline

Full left gaze

Full right gaze

Up

Down

Midline

9. Summary. Prioritize Interfaces.

Type 1 ____________________. Selections/minute: ______ Site: ________

Type 2 ____________________. Selections/minute: ______ Site: ________

Type 3 ____________________. Selections/minute: ______ Site: ________

Type 4 ____________________. Selections/minute: ______ Site: ________

10. Discuss the results and interface types with the client and list his/her preferences ______________________________

____

____

____

ASSISTIVE DEVICE CENTER
SCHOOL OF ENGINEERING (916) 454-6422
CALIFORNIA STATE UNIVERSITY, SACRAMENTO
6000 J STREET, SACRAMENTO, CALIFORNIA 95819

Client

Client #

Date

Examiners

INTERFACE ASSESSMENT

LIMB MODULE

Circle left/right hand/foot

*from screening form

1. Dominance: left/right. Grasps*: cylindrical, lateral, press, palmar spherical, tip, two finger

2. Range*: furthest reach ____" Client preference for location:

closest ____"

left max ____"

right max ____"

Resolution ____" Where?

3. If range and resolution are adequate, use a typewriter-like keyboard.

Type of keyboard

asked	response guard	response no guard	time guard	time no guard	false entries guard	false entries no guard	comments
1							
12							
)(							
ZX							
?.							
GH							
FDS							
JKL							
+23							
.,?							

Type of keyboard ____________________

1			
12			
)(			
ZX			
?.			
GH			
FDS			
JKL			
123			
.,?			

Comment on difficulty, etc. ____________________

4. If range is not adequate for large keyboard, but resolution is good, use the calculator-type keyboard. Place keyboard at the best location based on #2 above. Location number ________. Method of pressing keys: ____________________

asked	response		time		false entries		comments
	guard	no guard	guard	no guard	guard	no guard	
0							
5							
6							
7							
27							
35							
49							
015							
345							
536							

Comment on difficulty, etc. ____________________

5. Does the client use a joystick now?_____ If "yes" comment on how well it works, how it is used, etc. If not, proceed with this part.

____

____

____

____

____

Use the joystick with light box output. (U=up, D=down, L=left, R=right)

Asked	Response	Time	False Entries	Comments
U				
L				
D				
L				
R				
U				
D				
R				

6. Other switches may be used with the hand (foot), elbow (knee), forearm (thigh); etc. Try switches in the order listed (unless the client cannot use a specific type). Stop, once a reliable and accurate switch has been found. Two response types are used: "on" = turn on and leave on until examiner says turn off, and "off". Feedback = light, tone, computer CRT, voice, etc. Repeat trial sequence with other switches as necessary to find one that works well for the client. Run one extra set of trials with the "best" switch.

Type	Feedback	Asked	Response	Track Time	Select Time	Anatomic Site Location	Best Position
		ON					
		OFF					
		ON					
		OFF					
		ON/OFF/ON					
		OFF					

SWITCH RANKINGS

Switch Rank	Type
1	Tread
2	Rocker
3	Wobble
4	Leaf
5	Zygo "Touch"
6	Pad
7	Contact
8	Bulb (Puff/Sip)
9	Mercury

7. Comment on reflex patterns that may affect switch control.

8. Describe any special mounting used for testing and any special mounting recommended for final system. ______________________

____

____

____

9. If range is adequate, configure a slot switch with the "best" switch based on #6. Type used ______. Number of slots ______. Numbers below are left to right. If there are fewer than 5 switches, change the "asked" column appropriately.

Asked	Response	Time	False Entries	Anatomic Site
1				
2				
2				
3				
5				
1,2				
4,5				
2,3				
4,3				
1,5				

10. Summary: Prioritize Interfaces

Type 1 ____________. Selections/minute: ______. Site: ______.

Type 2 ____________. Selections/minute: ______. Site: ______.

Type 3 ____________. Selections/minute: ______. Site: ______.

Type 4 ____________. Selections/minute: ______. Site: ______.

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ASSESSMENT FORM

Explanation:

This proposed assessment form is designed to be filled out by the core team: client/family, rehabilitation engineer and therapist, OR it can be used as a guideline for a narrative dictation to be filed in the record or sent to a referring source.

A letter is to be sent to the client/family at the time an appointment is made for evaluation. (Letter attached.) The purpose of the letter is to help those coming to the REC be better prepared for the evaluation process. Even if the forms attached to the letter are not filled out, the client/family will be encouraged to think about aspects of the device that may be important to consider in their home environment and for what they want it to do for them.

SEATING AND MOBILITY

Examiner:
Date:

CLIENT PROFILE

Name________________________ SUH#___ ___ ___ Sex: M F D.O.B.___ ___ ___

Diagnosis:____ Age:_______

Body involvement: AMB NON.AMB. - MIN. MOD. SEV.

Reason for Visit:

People Present:

Goals: Motor Management

Living Situation: IND. FAMILY FOSTER/GROUP HOME INST.

Distance from REC:_______miles _______ hr.

Current Therapy Program: NO YES--Therapist:____________________

Current Education Program: School: ____________________________

REG. O.H. DEV. CTR. NONE

Referral Source: Funding Source:

Other Agencies Involved:

DEVICE PROFILE

Assessment of current device. Identify device:____________________

Length of use:_____mo. Include: current problems, advantages, disadvantages, etc.

Repair or modification feasible: YES NO Why?_______________

Sitting tolerance in present device: Max. Hr._______ Tot. Hr./Day__________

Describe positioning: Photograph: YES NO

Static:

Dynamic:

Functional: (include restrictions to line of gaze, etc.)

Other considerations:

CHRONIC PROBLEMS which may interfere with function: (check and describe)

Sensory:
- Hearing impairment
- Visual impairment
- Sensation deficit/tissue trauma
- Pain

Control:
- Incoordination/balance problem
- Tone: spasticity/athetosis/ataxia
- Reflexes: extensor thrust, ATNR, etc.
- Head control
- Upper extremity control
- Trunk control
- Lower extremity control

Central:
- Difficulty interpreting information
- Seizures: controlled/uncontrolled
- Speech impairment: (unable to signal, etc.)
- Eating/drinking difficulty

Physical:
- Extremes of size or weight/growth rate
- Spinal deformity: fixed/flexible
- Contracture/limited ROM
- Dislocation
- Unusual fatigue

Other:
- Medication
- Restrictions due to organic disease (as osteogenesis imperfecta-protectic heart disease--exertion)

ENVIRONMENTAL FACTORS

Home Access: HIGH MED. LOW (include narrow doorways, steps, second floor, low tables, tight bathrooms, etc.)

Where used: INDOORS OUTDOORS BOTH

How used: HEAVY MOD. LIGHT

Frequency of use: ________ Hr./Day ________ Days/Wk.

Compatibility: What other devices will it need to fit or work with?

Transportation modes: CAR VAN SCHOOL BUS/VAN BUS BART AIRPLANE
Other: (Transported whole or in sections, with or without client)

Possible hazards to others (e.g., needs protection to switches, etc.)

Technical/repair services available locally?

<u>Additional Information Needed</u> (psychosocial factors identified in eval.)

CHILDREN'S HOSPITAL at Stanford
520 Willow Road, Palo Alto, California 94304 / (415) 327-4800

We are pleased that you are coming to the Rehabilitation Engineering Center for a seating and mobility evaluation. To provide you with the best service, we need to understand clearly your current needs and expectations. Please look over the attached questions and complete the enclosed forms and bring them with you on the day of appointment. We would like you to have an opportunity to think about some of the areas mentioned, before your visit. In this way we can help you obtain the type of equipment that is best suited to your living and occupational situation.

THINGS TO THINK ABOUT

1. What do you want the equipment to do? There are usually primary needs, and then other considerations.

2. Where will it have to go? Home, community, school, job, indoors and outdoors or primarily one place?

3. What do you use at the present time for mobility?

4. What problems are you having with your current equipment? Why has a change been suggested?

5. What is the widest and longest the device can be? Do you have narrow doorways, tight corners, etc., where the equipment must be used?

6. What is the tallest the device can be with you in it? Is there a short roof height in any vehicle you must use?

7. What is the heaviest the device can be? Consider who will lift the device, either empty or with you in it.

8. Will any parts need to be removable or adjustable? Will you need footrests that swing away, for bathroom transfers, for instance, or arm rests which need to be removed to fit chair under dining room or study table?

9. How will you transport the device? Does it need to go on a schol bus with "tie-downs"? Will it need to fold up or come apart in some way for transport?

10. What other alternatives have been considered or, what have you already tried which has been unworkable in some way?

PROPOSED MOBILITY/POSITIONING SYSTEM

GOALS

- Motor function
  - Independent mobility
  - Increase motor function
    - Increase range/distance
    - Increase community participation
    - Increase independent living skills
    - Improve upper extremity use
    - Increase sitting time
    - Improve sitting stability

- Management
  - Facilitate care/management
  - Improve/stabilize physical status
  - Prevent deformity
  - Control scoliosis
  - Reduce pain
  - Reduce discomfort
  - Provide physical protection
  - Facilitate care by parent/attendant

- Communication Skills (for detailed assessment form see comm. form)
  - Increase communication skills

- Other
  - Portability
  - As transportation
  - Increase independent living skills
  - Improve psychosocial situation
  - Other

IDENTIFY DEVICE:

CONTROL and LOCATION OF CONTROL:

Describe DEVICE: advantages, disadvantages, life expectancy of device; relate to reason for prescription and goals:

NOW, PLEASE FILL IN THE NEXT PAGES:

A. Environment Profile

B. Experience with other special equipment.

C. Functional Level of Independence and Priority of Needs

THANK YOU VERY MUCH. WE WILL LOOK FORWARD TO MEETING WITH YOU.

Note: We are sending you an additional form which can be filled out by a therapist, if there is one currently seeing you or your child. If not, please just bring it with you and it can be filled out on the day of your visit.

ENVIRONMENTAL PROFILE

Describe a typical day: (i.e., time at home, time at school or job, means of transport, general requirements of sitting or activities.

____

____

____

Current Education Program: Mainstream OH Development Center None

Current Therapy Program: NO YES--Goals: ______________________

Name of therapist and where can be contacted: ______________________

____

Other agencies involved: ______________________

____

Distance from Rehabilitation Engineering Center: ________ miles ______ Est. time

Living situation: Independent Family Foster Home Institution

Access to living area: High (ramped, level from street, etc.)
Medium (a few stairs; assistance required)
Low (barriers such as flight of stairs; second floor, difficult doors, etc.)

Estimate of how much wear client will put on device:
Heavy Moderate Light

Frequency of Use: ________ hours/day ________ days/week

How long will you expect the device to last? ______________________
Reason, if known, i.e., growth, expected change in client, etc.

____

Will you need to fit or work with other devices? If so, which ones?

____

Transportation modes: Car Van School Bus/Van Bus
Rapid transit (BART) Airplane Other: ______________

Are there any occupational/educational hazards to be considered?

____

Is someone locally available and known to you who can do minor repairs or help with maintenance, or do you feel capable of doing these yourself?

____

FUNCTIONAL LEVELS OF INDEPENDENCE		INDEPENDENT	INDEPENDENT WITH A TECHNICAL AID	REQUIRES MINIMAL ASSISTANCE	REQUIRES CONSIDERABLE ASSISTANCE	DEPENDENT	PRIORITY OF NEEDS: PLEASE RANK ON A 1-7 SCALE: (1) MOST IMPORTANT TO (7) LEAST IMPORTANT, THOSE SKILLS WHICH ARE MOST IMPORTANT IN YOUR OPINION
MOBILITY	Walking						
	Wheelchair						
	Transfers						
A.D.L.	Feeding						
	Dressing						
	Toileting						
	Communication						

Experience with Other Special Equipment

	Has Ever Used	Still Using	Will Be Acquired
Manual Wheelchair			
Powered Wheelchair			
Caster Cart			
Wheelchair Cushion/Seating Insert			
Braces			
Crutches/Cane			
Tray Communication Device			
Sensory Aid (Glasses, Hearing Aid)			
Toileting Aids			
Bath Aids			
Sleep Aids			
Respiration Aids			
Recreation Aids			
Educational Aids			
Vocational Aids			
Other:			

Follow-up Study of Communication Aids in Persons with Cerebral Palsy - Total Body Involvement

Preliminary Report

by Jean G. Kohn, M.D., M.P.H.; Margaret R. Barker, M.S., B.S.E.; and Kelly Flanagan, M.Ed.

INTRODUCTION

The assessment of communication devices provided to severely involved, nonverbal, cerebral palsied clients has been difficult due to a variety of factors that influence the successful use of a device: the client's physical capability and function; the available educational and therapeutic resources; and the rapidly changing ~~devices~~ on the market. In addition, the client's cognitive ability, "inner language" development, motivation or desire to communicate, and the family climate have a bearing on the use of devices.

Some of these factors were explored in a review of severely involved clients at the Rehabilitation Engineering Center, Children's Hospital at Stanford. The findings appear to be related to use of communication aids, and will require verification in a larger study.

BACKGROUND

Communication involves: 1) Input; 2) Central processing, including decision-making and memory storage; and 3) Output. The child receives messages from the environment, processes them centrally, modifies them with recollection, comparison and discrimination, and makes an effort to respond.

According to Eugene T. McDonald (Vanderheiden and Grilley, 1975): "People want to talk. We should expect non-vocal children to have this need to communicate. We ought to stimulate this drive and take advantage of it. If we do not provide non-vocal children with a means to communicate when they are young, this drive may slowly be extinguished and later intervention attempts will have limited success." (pp. 77-78).

Assuming that "total body involved" children with cerebral palsy have the drive to communicate, how can their communication skills be assessed when no verbal expression is present and physical functions are severely impaired? Are there observable indicators and can the timing of appearance of these indicators guide the selection of communication aids? Does the age at which the indicators appear have predictive value for the level of complexity the child can attain in the use of communication aids?

PILOT STUDY

A follow-up study of a small group of severely involved young people explored these issues.

Seven young people between ten and twenty years were visited in their homes or schools. All had a diagnosis of cerebral palsy, athetosis or spasticity, or both, with total body involvement. All were non-ambulatory and required wheelchairs for transportation and mobility. All but one were totally nonverbal. (One 13-year-old girl had some speech which was understandable by her family and her aide at school.) All were totally dependent in self-care activities, although all were toilet trained, i.e., continent.

All children were visited at school or at home and information was obtained from a parent or caretaker about age of reliable responses. (pediatrician, JK). School personnel or family provided information about current communication devices and language function. All children were observed in person by the team and an estimate was made of: 1) function of communication equipment (engineer MB), and 2) function of child with communication equipment (special education consultant KF and engineer MB).

The chart indicates motor involvement, age of reliable "yes-no" communication, first and second communication systems if known, and the success of these systems as evaluated by family and/or school personnel.

When a reliable "yes-no" response was clearly identified by age 1-2 years, a successful communication system was in place by 9-10 years of age. When the reliable "yes-no" response was identified after 3 years of age, communication systems were functioning uncertainly at 10 years or older. When a reliable "yes-no" response had not been identified, no really successful communication system was functioning, not even direct pointing to pictures or places.

Communication engineers in rehabilitation engineering programs have written about the requirement for reliable indicators of the client's intent (On-off, Yes-no), as a basis for the operation of communication devices. In this study, children varied in the method used to indicate "yes-no": one looked to the right for "no" and smiled for "Yes", one looked right and left, one closed her eyes for "No" and opened them for "Yes". If it was documented that a clear "yes-no" response was present at 1-2 years of age, regardless of the method used, the child subsequently developed the ability to use a communication system. At 4-5 years, the recognition of a clear "yes-no" signal did not predict as successfully the outcome of device usage. When no clear "yes-no" signal could be elicited, no consistent communication system had been developed.

The development of "signals of intent" in normal children has been studied extensively in the past ten years. According to Steckol and Leonard (1981): "It has become evident that the emergence of children as communicators precedes their use of (spoken) language. Several months prior to their first words, children display an intention to communicate." (p. 262).

Early efforts by the children involve adults through eye contact, reaching and vocalizing. Bates et al. (1975) identified the linguistic "Performatives" of declaring and commanding as taking root in the earlier non-linguistic forms of proto-declaratives and proto-imperatives, respectively. From 10 to 12 months of age, children's vocalizations and nonverbal signals were intentional. From approximately 12 to 18 months, children began to name objects to which they were pointing and began to ask adults for objects by name.

Children with profound hearing loss appear to follow a very similar pattern of development. A teacher of deaf pre-school children indicated that deaf children of normal intelligence develop clear "yes-no" signals in response to choices offered, by 9-12 months. They do not read lips well until about 5 years of age, i.e., recognize spoken words which they cannot hear, but do respond to "face-speech-body language" clearly by 18 months. This sort of "language" is a combination of facial expression, body movements, including gestures, and mouth movements. (G. Foley, Personal Communication, 1981).

The pilot study reported suggests a number of questions. Are children who develop clear "signals of intent" between one and two years of age, and subsequently develop the capability to use complex communication devices, different in cognitive level from those who develop "signals of intent" later or not at all? Are early "signalers" treated differently by parents and educators at an early age?

Is it possible to measure more accurately the appearance of "signals of intent"? Is it possible to accelerate the appearance of "signals of intent" by intervention? If so, which intervention is most effective? Finally, can a sequence of increasing complexity in augmentative devices be identified and guidelines developed for their presecription?

DISCUSSION OF COMMUNICATION AIDS

Paraphrasing the Vanderheiden and Grilley report (1975), it can be stated that levels of implementation of communication aids represent increases in complexity of the aid. Unaided techniques involve "guessing" and do not provide the child with any means for asking questions or learning about his environment. They do require a reliable "yes-no" response, which is considered basic to any system of communication, i.e., the child must be able to indicate some "inner processing" of the communication input.

Use of communication boards involves some pointing or indicator system, and someone must be there to "read" the message, just as someone is required for unaided techniques. Scanning aids require that the child use some type of switch, and therefore require physical skill assessment and, usually, some training. "Encoding techniques require some kind of multiple signal that must be either memorized or looked up on a chart." (p. 43). "Some (sort of) encoding schemes must be learned by the child before he is able to use the aid or technique." (p. 59).

Vanderheiden concludes (p. 159): "Communication systems for these children should be dynamic. As the children grow and develop, their communication needs will change and expand....Because of the importance of effective and efficient communication to development, much attention should be paid to this throughout the child's developmental years."

Eugene McDonald comments (Ibid., pp. 107-108): "It would be difficult to exaggerate the importance of a need or desire to communicate....Some of the children we see seem to demonstrate that some of the desire and certainly some of their need to communicate has been lost or repressed....More programs are needed in which we begin working with the parents and the children from birth to help parents learn some ways to encourage children in their efforts to communicate; to avoid making the child a dependent person, (and) to help him realize the social utility of some kind of expression."

The system of expression needs to be closely matched to the individual's motor-functional and cognitive-perceptual level. If a logical sequence of development in communication skills can be identified in "total body involved" cerebral palsied children, a program of communication assistance could be formulated with greater predictability of success.

Eugene E. Bleck developed prognostic signs for ambulation based on the presence or absence of reflexes in the first two years of life. Based upon these signs, a realistic prediction could be made about the need for mobility-assistive devices. Parents could be counseled regarding <u>mobility</u> as opposed to <u>ambulation</u>.

It would be very important to determine whether there are prognostic signs for use of communication devices, especially if these signs were ascertainable during the early years, when verbal ability cannot be determined with accuracy.

RECOMMENDATIONS

I. The preliminary study leads to the development of five hypotheses for further investigation:

   1. Predictive indicators can be identified in "total body involved" cerebral palsied children and can aid in the choice of augmentative communication devices.

   2. The age of appearance of these indicators aids in the prediction of the level of complexity in communication which can be achieved.

3. Interventions in early childhood can be identified and used to facilitate skill acquisition.
4. Outcome in relation to intervention can be documented.
5. The most appropriate intervention techniques can be identified and replicated.

II. A multidisciplinary team is essential for the evaluation of communication skills of "total body involved" cerebral palsied children and for effective intervention. The roles of the respective team members will be:

<u>Medical Specialist</u> - Identification of growth and development factors, of the medical aspects of alteration in physical and sensory capabilities, and of the predictive indicators for functional change.

<u>Speech Pathologist</u> - Assessment of language, communication function and communication needs; recommendation of appropriate vocabulary and/or symbol systems, and of strategies for implementation.

<u>Clinical Engineer</u> - Selection and provision of communication equipment that matches the cognitive and functional capabilities of the child; and verification that this equipment fits with any other supportive equipment the child may have.

<u>Therapist (PT or OT)</u> - Assessment of functional and reflex levels; appropriate positioning for utilization of augmentative communication equipment; and consultation with home caretakers and classroom personnel about appropriate interventions.

<u>Special Education Consultant</u> - Assistance with assessment of cognitive abilities; provision of opportunities for children to use devices in educational and other applied settings, including development of instructional strategies; and provision of family liaison where appropriate.

<u>Psychologist</u> - Review of developmental milestones, assessment of cognitive level in the presence of severe physical limitations (as described by E. Haeussermann) and consultation with family and school personnel regarding behavioral aspects of communication development.

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Barker, M.R.

Bates, E., Camaioni, L., and Volterra; V. The acquisition of performatives prior to speech, Merrill-Palmer Quarterly, 21: 205-226, 1975.

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Snyder, L. The early presuppositions and performatives of normal and language disabled children. Papers and Reports on Child Language Development, 12:221-229, 1976 (Department of Linguistics, Stanford University).

Steckol, K.F. and Leonard, L.B. Sensorimotor development and the use of pre-linguistic performatives, Journal of Speech and Hearing Research, 24:262-268, June, 1981.

Venderheiden, G.C. and Grilley, K. Non-Vocal Communication Techniques and Aids for the Severely Physically Handicapped. University Park Press, Baltimore, 1975.

SUMMARY OF FINDINGS OF RETROSPECTIVE EVALUATION OF CLIENTS PROVIDED WITH COMMUNICATION SYSTEMS

Client Age	Diagnosis	Motor Involvement	Age of Reliable "Yes-No"	Communication System #1	Communication System #2
13 yr. old	Cerebral palsy, spastic quadriplegia <u>some speech</u>	Totally dependent, no transfer ability, hand function suff. for commun.(operation of typewriter, etc.)	1 - 2 yrs.	Bliss Symbols-4 yr. Read words-5 yr. Reading-5-6 yr. Elec. typewriter-9 yr.	Canon comm.-12 yr. (at 8th grade level in school, reg. class--at age level)
19 yr. old	Cerebral palsy, choreo-athetosis <u>nonverbal</u>	Dependent in all act. Toilet trained Eye signals for comm.	1 - 2 yrs.	Vista typewriter-9 yr. Etran-12 yr.	Express I with head switch-19 yr. At 17 yr. tested at 7th grade vocab. (13).
10 yr. old	Cerebral palsy, tension athetosis, total body involvement <u>nonverbal</u>	Dependent in all act. No truncal or head stability. Toilet trained Eye movements controllable	2 - 3 yrs.	Bliss Symbols at 6-8 yrs.	Etran at 8-9 yrs. At mid-1st grade in reading and 2nd grade in math
16 yr. old	Cerebral palsy with mixed tension & spas. Total body involvement <u>nonverbal</u>	Totally dependent Head control fair Toilet trained	3 - 4 yrs. (perhaps earlier; mother not interviewed)	Comm. board-7 yr. Unsuccessful because much easier to get direct "nod" resp. 11 yr.-comm. bd. with pointer	AutoComm.-12 yr. c̄ head wand point (at 16 yr. is at 3rd grade level words-higher in social responses.
11 yr. old	Cerebral palsy, tension athetosis <u>nonverbal</u>	Dependent in all act. Very small for age	4 - 5 yrs.	Etran-6 yrs. Not always reliable response	Zygo #16 at 10 yr. Still not consistent (Psychologists est. 5-6 yr. at 11 yr.)
21 yr. old	Cerebral palsy Severe spastic quad with contractures and severe MR <u>nonverbal</u>	Dependent in all act. Toilet trained, no trunk support, some head support, regressing in physical state prior 2 yrs.	5 - 6 yrs.	Zygo #16 picture unsuccessful-17 yrs.	Pointer to picture on lap trap (currently at 20)
20 yr. old	Cerebral palsy, spastic quad. Severe scoliosis and contractures <u>nonverbal</u>	Totally dependent, but crawls, holds cup is habit trained	No reliable "Yes-No" indicator	Etran tried-not successful-17 yr. Can match colors	

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DATED MATERIAL

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CHILDREN'S HOSPITAL AT STANFORD
520 Willow Road
Palo Alto, California 94304

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Rehabilitation Engineering

SERVICES
CONFERENCE

"Access To Technology"

sponsored by
Children's Hospital at Stanford

MARCH 20 & 21, 1981

Fairchild Auditorium
Stanford University Medical Center
Palo Alto, California

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Appendix D

"Access to Technology"

THIRD ANNUAL REHABILITATION ENGINEERING SERVICES CONFERENCE

FRIDAY, MARCH 20, 1981

8:15 Registration — Lobby

9:00 Introduction and Announcements
Sandi Enders, *Program Chairperson*

9:05 **WELCOME**
John Csongradi, M.D., *Director, Rehabilitation Engineering Center, Children's Hospital at Stanford*

9:15 **KEYNOTE: REHABILITATION ENGINEERING — WHAT IT *IS* AND WHAT IT *ISN'T***
VERNON L. NICKEL, M.D., *MEDICAL DIRECTOR*
SHARP REHABILITATION CENTER, SAN DIEGO

9:45 **WHERE TO FIND IT**
Moderator. **Don McNeal**, *Ph.D., Director, Rehabilitation Engineering Center, Rancho Los Amigos Hospital, Downey*

Seven major rehabilitation engineering resource centers will present information on: Major service and research focus, referral procedures, fee mechanisms, etc.

- **Children's Hospital at Stanford — Rehabilitation Engineering Center**
  Maurice LeBlanc, *Director of Research*
  Rosemary Murphy, *Information Service*
- **Sacramento State University — Assistive Device Center**
  Al Cook, Ph.D., *Director*
- **California Department of Rehabilitation — Rehabilitation Engineering Section**
  Tom Burns, *Section Chief*

10:30 **REFRESHMENTS** — *Wheelchair Demonstration — Lobby*

11:00 **WHERE TO FIND IT, CONTINUED**

- **University of California — Davis — Rehabilitation Engineering Service**
  Worden Waring, Ph.D., *Director*
- **Sensory Aids Foundation**
  Susan Phillips, *Project Director, Projects with Industry,*
- **Smith-Kettlewell Institute of Visual Sciences — Rehabilitation Engineering Center**
  John Brabyn, Ph.D., *Co-Director*
- **Veterans Administration Rehabilitative Engineering Research and Development Center**
  Larry Leifer, Ph.D., *Director*

12:00 **BOX LUNCH** — *Van Demonstration — Parking Lot*

1:00 **WHAT TO GET: Problem Solving**
Moderator. **Wallace Motloch, C.O.**, *Children's Hospital at Stanford, Rehabilitation Engineering Center*
Elizabeth Esterly, *OTR, Consultant, San Jose*
Ralf Hotchkiss, *Center for Concerned Engineering, Oakland*
Barry Romich, *Prentke-Romich, Ohio*

2:00 **HOW TO FIX IT** *(Speakers to be announced)*

2:30 **REFRESHMENTS** — *Wheelchair Demonstration — Lobby*

3:00 **HOW TO PAY FOR IT**
Moderator: **Jean Kohn, M.D., M.P.H.**, *School of Public Health, University of California, Berkeley*

Funding agencies panel will discuss program benefits, eligibility requirements, expediting requests, etc.
Agencies. *Medi-Cal, California Children's Services, Regional Center, California Department of Rehabilitation, Muscular Dystrophy Association, Private Insurance Representative.*

4:00 - 6:00 **OPEN HOUSE** — *Wine and Cheese*
Rehabilitation Engineering Center
Children's Hospital at Stanford

INTERPRETER SERVICES FOR THE DEAF WILL BE PROVIDED

SATURDAY, MARCH 21, 1981

9:00 HOW TO TALK WITH IT AND TO IT: COMMUNICATION

Moderator. **Maurice LeBlanc,** *Children's Hospital at Stanford, Rehabilitation Engineering Center*

- **Communication devices for the speech impaired**
  Margaret Barker, *Communications/Control Service, Children's Hospital at Stanford*
  Colette Coleman, Ph.D., *Assistive Device Center, Sacramento*
- **Communication devices for the visually impaired**
  Greg Goodrich, Ph.D., *V.A. Blind Rehabilitation Center, Palo Alto*
- **Communication Devices for the Hearing Impaired**
  George Attletweed, *Ohlone College, Fremont*

10:30 REFRESHMENTS *TTY Demonstration — Lobby, Telephone Services for the Disabled* — *Lobby*

11:00 COMMUNICATION, *CONTINUED*

- **Controls**
  Larry Weiss, *Zygo Industries, Portland, Oregon*
- **Computer applications**
  John Eulenberg, Ph.D., *Director, Artificial Language Laboratory, Michigan State University*

12:00 BOX LUNCH — *Computer Demonstration — Lobby*

1:00 PSYCHOSOCIAL ASPECTS OF USING EQUIPMENT

Moderator **John Preston, M.S.W.,** *Children's Hospital at Stanford*

1:20 WHAT TO DO WITH IT: APPLYING TECHNOLOGY TO INDEPENDENT LIVING

Moderator **Susan O'hara,** *Physically Disabled Students Program, University of California, Berkeley*

- **Independent Living**
  Judy Heumann, *Deputy Director, Center for Independent Living, Berkeley, National Council for the Handicapped*
- **At home**
  Jim Tobias, *Center for Independent Living, Berkeley*
- **In the Classroom**
  Linda Bowman, *Glankler School, Fremont*
- **At College**
  Helen Jones, *Director Physically Limited Program, De Anza College, Cupertino*
- **On the job** *(Speaker to be announced)*
- **For travel**
  John McLaughin, *Travel agent*
- **For recreation**
  Peter Axelson, *ReRand, Palo Alto, V.A.*

3:45 ADJOURNMENT

Sandi Enders, O.T.R.
Conference Chairperson

DETACH HERE AND MAIL

REGISTRATION FORM: *"ACCESS TO TECHNOLOGY"* ● MARCH 20 & 21, 1981

Please register me for the third Annual Rehabilitation Engineering Services Conference.

NAME

TITLE/PROFESSION

WORK AFFILIATION PHONE

MAILING ADDRESS

CITY STATE ZIP

Registration information:

- Fee covers learning materials, lunches for both days and refreshments.
- Refunds, less $10, are available until 3/15/81
- Continuing education credits have been applied for

CONFERENCE FEE:

- [ ] $30 before 2/20/81
- [ ] $35 after 2/20/81
- [ ] $18 student, with identification

Please make checks payable to:
Children's Hospital at Stanford

Send to:
Rehabilitation Engineering Center
Children's Hospital at Stanford
520 Willow Road, Palo Alto, CA 94304

Attention: Sharon Neal

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<u>Evaluation</u>

1981 REHABILITATION ENGINEERING CONFERENCE

Please rate the following components of this conference. 1-5 rating (5 = high)

1.	The presentors were knowledgeable of their material.	1	2	3	4	5
2.	The content is useful for me as related to my current role/profession.	1	2	3	4	5
3.	The format was varied and sustained my interest.	1	2	3	4	5
4.	The objectives for each session were adequately met.	1	2	3	4	5

5. Please rank the individual panels. 1-7 rating (7 = high)

   a. where to find it _____
   b. where to get it _____
   c. how to fix it _____
   d. how to pay for it _____
   e. communication _____
   f. psychosocial aspects _____
   g. what to do with it _____

   Improvements might include ____

   ____

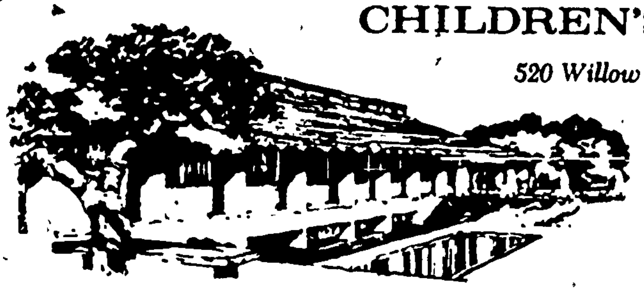
6. Suggested topics for 1982 conference: ________________________________

   ____

   ____

7. Respondent's Identification

   _____ Consumer
   _____ Engineer
   _____ M.D.
   _____ OT/PT
   _____ Orthotist/Prosthetist
   _____ Social Worker/Counselor
   _____ Speech Therapist/Pathologist
   _____ Student, Field __________
   _____ Teacher, Field __________
   _____ Other ______________



CHILDREN'S HOSPITAL at Stanford

520 Willow Road, Palo Alto, California 94304 / (415) 327-4800

May 22, 1981

Dear Conference Participant:

We hope you enjoyed the 1981 Rehabilitation Engineering Services Conference: "Access to Technology". Feedback from the evaluation sheets would indicate that the material covered was useful to most of you. Over 375 people attended the conference, and more than a third turned in written evaluations. The information from these responses has been compiled, and we would like to share the results with you.

	% rated 4 or 5 on a 5 point scale
1. The format was varied and interesting.	86%
2. The content was useful.	75%
3. Conference faculty were knowledgeable of their material.	95%
4. The objective of each session were met.	75%

The highest ranked sessions were. "Communication and the Consumer Panel: What To Do With It". The lowest ranked session was "How to Pay for It"-from comments though it seemed people were reacting to the content of the funding agency presentations rather than the speakers. People obviously didn't like the message they were getting! There were a lot of comments about the Psychosocial Panel, indicating that this is an area people would like more information about.

There were suggestions for next year's conference format-most requesting small group sessions more focused on specific topic areas, and more equipment demonstration. We will try to incorporate these ideas into the 1982 meeting. If there are further suggestions, we encourage you to call or write us.

One of the main objectives of the conference is to develop a network of Northern Californians interested in applied rehabilitation technology. A complete address list of the 1981 Conference participants list has been enclosed. We hope it will help you keep in touch with each other. Your conference packets contained conference faculty addresses and information on the equipment distributors, so they are not included on this list. The conference transcripts are being typed and should be mailed out to those who requested them around the middle of June. Publications requested have been reprinted and are either enclosed, or will be mailed out shortly.

We look forward to seeing you at the 1982 conference next Spring.

Sincerely,

Sandi Enders

Sandi Enders
Conference Chairperson

P.S. We apologize to those of you who received out of date information on motel rates. We are editing and updating our list based on the feedback we received from you.

Appendix E

CHILDREN'S HOSPITAL at Stanford

520 Willow Road, Palo Alto, California 94304 / (415) 327-4800

REHABILITATION ENGINEERING CLINICAL
INTERNSHIP PROGRAM DESCRIPTION

The Hospital

Children's Hospital at Stanford is an independent, non-profit hospital, and is one of the oldest private institutions of its kind in the western United States. It is located on the Stanford University Campus in Palo Alto, California.

Physicians at Children's Hospital treat children affected with cancer and related illnesses, severe orthopaedic disabilities, juvenile rheumatoid arthritis, allergy and pulmonary problems, and certain psychiatric disorders.

The Children's Hospital is a teaching hospital affiliated with Stanford University School of Medicine.

The Rehabilitation Engineering Center

The Rehabilitation Engineering Center at Children's Hospital was established in 1974 as a regional resource in Northern and Central California for children and adults with special needs. The Center uses applied technology to develop and provide appropriate rehabilitation devices.

The Center is certified in Orthotics and Prosthetics by the American Board for Certification, and has been designated as the Child Amputee Center for Northern California by California Children's Service.

In 1978 the Center received official designation and funding as a National Rehabilitation Engineering Center from the National Institite of Handicapped Research (Department of Education). This designation carries with it the responsibility for research, clinical evaluation, education and training, and information dissemination. The Center has a staff of 20 and is located in a 8320 square foot building adjacent to the Children's Hospital. It is supported by reimbursement for patient services and by three federal grants which support research endeavors aimed at improving patient services. In 1979, over 1,000 patients were seen in five clinical services: Orthotics, Prosthetics, Seating/Mobility, Tissue Trauma, and Communication/Control.

Through patient care, teaching and research, the philosophical goals of the Center are:

- To help each child pursue an normal growth and development as possible.
- To help each adolescent bridge the gap between childhood and adulthood.

- To help each adult develop a life style which maximizes his/her potential and quality of life.

The Rehabilitation Engineering Clinical Internship Program

Rehabilitation Engineering is a relatively new field, with formal education and training programs still in the developmental stages. Current concensus and effort in this area focus on the belief that a rehabilitation engineer should first be a good engineer, and then should affect the transfer and application of academic education and professional experience to the clinical setting. The clinical Internship Program was established at the REC in 1979 to provide clinical experience in various and diverse aspects of rehabilitation engineering.

The internship program begins each October and runs for twelve months. It is focused on patient contact in a wide variety of settings and services. It includes:

- Six months of clinical experience at the Rehabilitation Engineering Center, composed of
  one month - Seating/Mobility Service
  one month - Communication/Control Service
  one month - Tissue Trauma Service
  one month - Orthotics/Prosthetics Service
  one month - Special Projects Service
  one month - Gait Lab and a survey of local Research Programs
- Two months of hospital based experience on a rehabilitation unit
  one month - Santa Clara Valley Medical Center, San Jose
  one month - Ralph K. Davies Medical Center, San Francisco
- Two months of community based experience
  one month - under the direction of a rehabilitation engineer in private practice
  one month - Center for Independent Living, Berkeley
- Two months special project. The last portion of the internship focuses on designing, developing and implementing a project in an area of special interest to the intern. Emphasis is on synthesizing the year's experience, tying together any loose ends and generalizing the problem solving process involved in the effective delivery of rehabilitation technology.

Other areas covered in the program include:

- Orientation to the field of Rehabilitation Engineering - local, national, international.
- Information gathering and resource utilization
- Effective written and oral communication skills
- Appropriate use of medical terminology
- Participation in a multidisciplinary team approach to problem solving, evaluation and treatment implementation
- The economics of rehabilitation engineering service - fee for service mechanisms, third party payment, etc.

The Rehabilitation Engineering Center offers no formal didactic program. For some interns, it may be appropriate to enroll in one or more classes at a local community college if their academic course work did not include such basics as: Biomechanics, Design, Elementary Business Administration/Management, etc. The program is flexible in format, and every effort will be made to tailor the clinical internship to the individual experience and needs of each participant. Intern will be expected to take an active role in planning their programs. In addition to the requisite technical and academic skills, interns should possess a high level of flexibility themselves. They will be actively particiapting in a busy service delivery Center where the needs of the patient are the top priority. The intern is likely to be the only student regularly at the Center and will be expected to be self initiating and assertive in assuring that his/her own training needs are being met.

The first intern has completed his program, and is now employed as a Rehabilitation Engineer. The second intern will complete the program on September 30, 1981. Beginning in October 1981, we plan to schedule one or more interns per 12 month cycle.

The intern is employed for the duration of the program by Children's Hospital at Stanford. This entitles the intern to full hospital benefits, including medical and dental insurance. Liability coverage is also maintained through the hospital.

Normal working hours are 8:30 AM - 5:00 PM, Monday through Friday. The hospital has no residential facilities for interns. A pleasant cafeteria is however available. All new employees, including the intern, are given a physical examination.

Financial support

The current reimbursement is commensurate to a Stanford University Research Assistant stipend. The 1980-81 stipend is $12,500, the 1981-82 stipend, is as yet undetermined, but will most likely include a 10% increase.

Further information can be obtained from Sandi Enders, O.T.R. (415) 327-4800 x432.

REHABILITATION ENGINEERING CLINICAL TRAINING PROGRAM

FIELD WORK PERFORMANCE REPORT

Name: ______________________________

Facility: ______________________________

Supervisor: ______________________________

Dates of Service: ______________________________

GENERAL REHABILITATION ENGINEERING SKILLS	Inadequate	Adequate	Above Average	Exceptional	Comments
1. Medical knowledge of various disabilities.					
2. Knowledge of human body mechanics.					
3. Familiarity with the existing aids and solutions available for various disabilities.					
4. Knowledge of engineering principles applicable to rehabilitation.					
5. Knowledge of materials and technology used currently in rehabilitation.					
6. Familiarity with the roles of his colleagues.					
7. Knowledge of psychosocial problems of disable people.					
PROBLEM DEFINITION PROCESS					
8. Data Collection.					
9. Evaluation methods used.					
10. Problem analysis.					
11 Goals include environmental considerations.					
12. Establishes appropriate priorities					
IMPLEMENTATION PROCESS					
13. Solution (device or recommendation) effectiveness					
14. Timely completion of tasks					
15. Planning includes appropriate cost & time factors.					

NA = Not Applicable ND = No Data to Report on

IMPLEMENTATION PROCESS (CONT'D)	Inadequate	Adequate	Above Average	Exceptional	Comments
16. Planning demonstrates creativity					
17. Solution represents the best compromise of priorities					
18. Workmanship of custom device or modification					
19. Installation, etc. follow through					
20. Documentation of the fabrication, operation, maintenance of device					
21. Initiates follow-up evaluation of solution effectiveness					
22. Demonstrates knowledge of funding requirements, billing procedures					
COMMUNICATION					
23. Written reports, documentation					
24. Oral reports					
25. Communication with staff					
26. Communication with client					
27. Understands and uses relevant jargon					
PROFESSIONAL CHARACTERISTICS					
28. Assumes appropriate responsibility					
29. Understands institutional policies and politics					
30. Interacts appropriately with other team members					
31. Interprets rehab engineering to others					

NA = Not Applicable   ND = No Data to report on

ADDITIONAL COMMENTS

Comments might include nature of caseload, notable strengths and weaknesses and potential for work in this area.

I have read this report

____
(Signature of intern)

____
(Date)

Signature of personal completing report

____
Position

Number of persons contribution to report

____

REHABILITATION ENGINEERING CENTER.
CHILDREN'S HOSPITAL AT STANFORD

under sponsorship from the
National Institute of Handicapped Research
and the
Rehabilitation Engineering Society of North America
certifies that

____

has completed a

REHABILITATION ENGINEERING CLINICAL INTERNSHIP

One year of practical experience in evaluation of consumer need, device design, fabrication and fitting was gained in the following service areas at CH@S

COMMUNICATION AND CONTROLS

TISSUE TRAUMA PREVENTION

SEATING AND MOBILITY

ORTHOTICS

PROSTHETICS

In addition, one month of patient service projects were completed at each of the following

Wheelchair Mounted Half Lap Tray

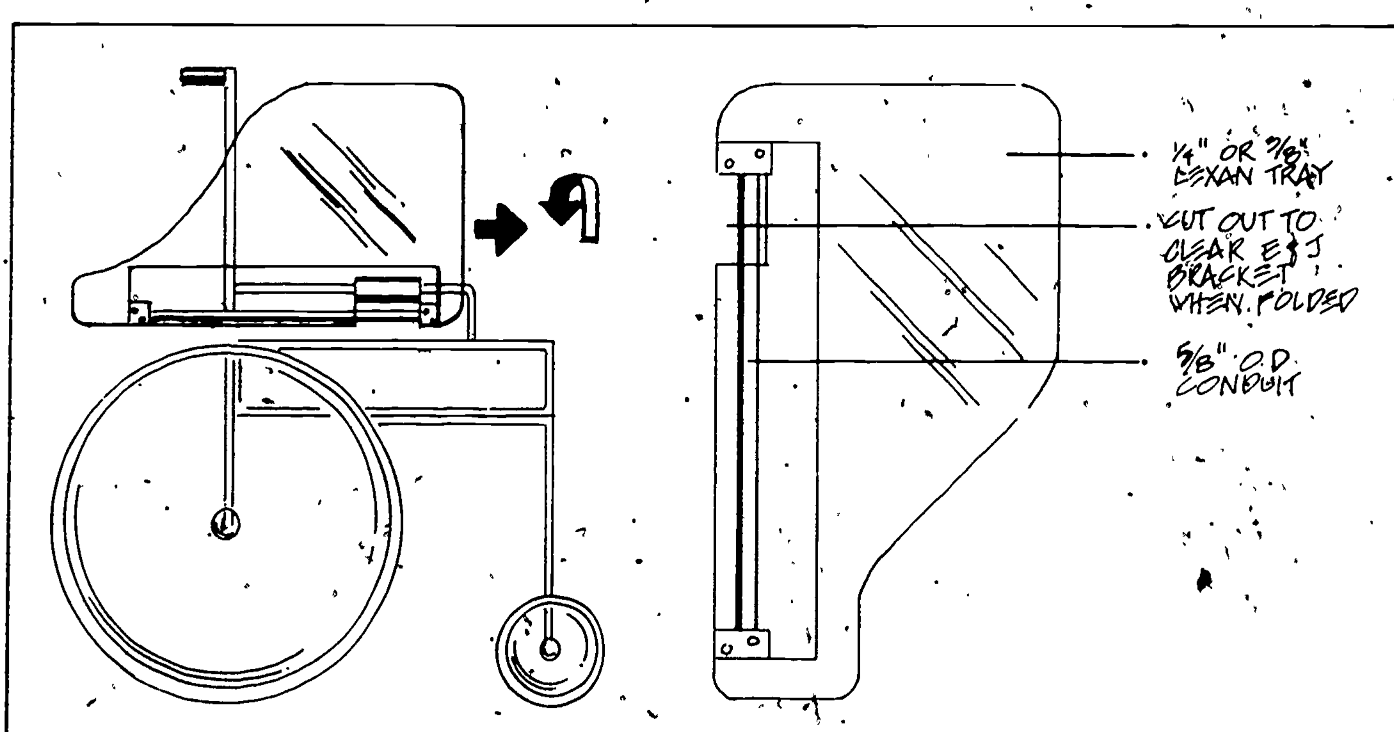
A wheelchair lap tray was developed which can be positioned out of the way easily for individuals who are independent in their transfers. The tray was originally developed for use by hemiplegics as a means of positioning the involved arm nearer to the body midline to inhibit abnormal muscle tone and to enhance body awareness. The tray incorporates an easily fabricated hinged/sliding mechanism which provides the following features:

* The tray can be positioned out of the way in narrow spaces, such as bathroom stalls.
* The tray can be slid back so as not to project further forward than the armrest and thus not impede pivot transfers.
* Attaches to the armrest and is removable with the armrest.

The tray is constructed of clear plexiglass or polycarbonate.

Materials Cost: approximately $35.00
Fabrication Time: 2 hours

Design Team: Denise Foderaro, OTR, Santa Clara Valley Medical Center; Hugh O'Neill, Clinical Intern, Children's Hospital at Stanford



Chin Activated Nurse's Call Button

Spinal cord injured quadraplegics, especially while wearing HALO's, required a nurse's call button which did not interfere with speaking, obstruct vision or require repositioning when the patient is repositioned.

A pushbutton momentary switch was mounted in a small plastic box. Self-stick velcro was attached to the sternal plate of the HALO and to the box. Activation is by fully opening the mouth and depressing the switch with the chin.

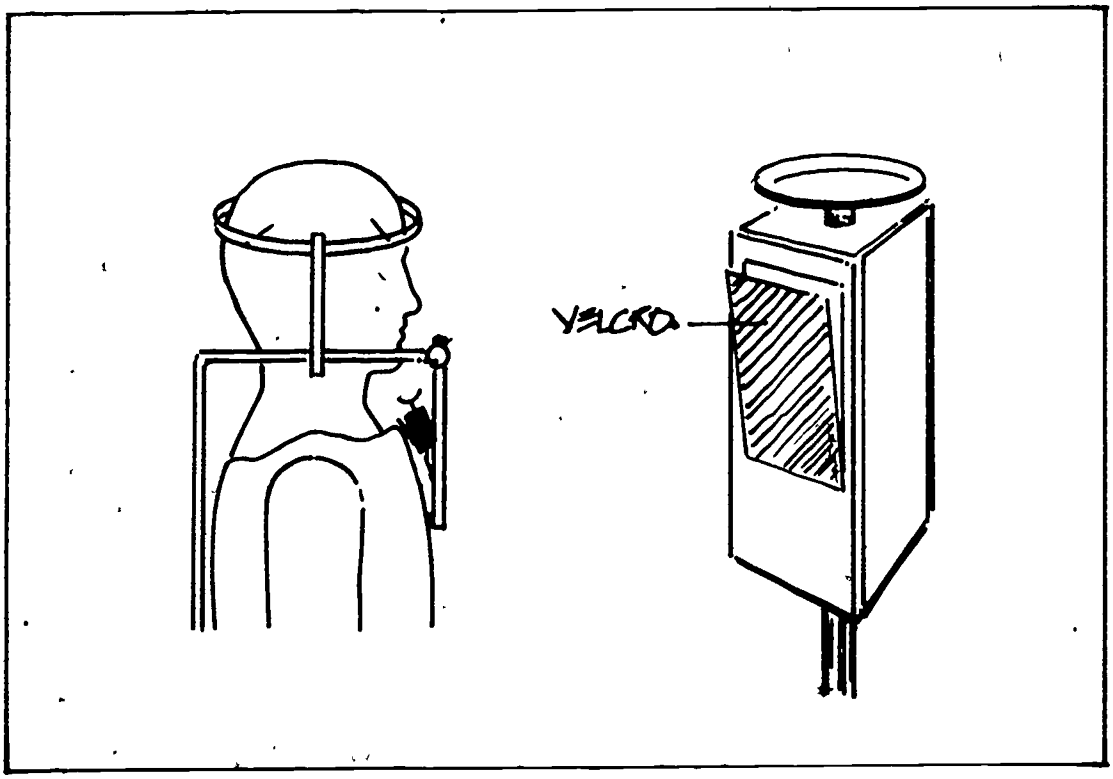
The momentary switch requires very little movement to activate it. The chin switch also provides the following features.

* Reliably activated by patient.
* Does not interfere with visual field or oral activities (speaking, eating, mouthstick, etc.).
* Once proper position has been located, the switch is easily and quickly removed and replaced by the hospital staff or the family (velcro remains on HALO).

Materials Cost: $5.00
Fabrication Time: 1/2 Hour

Design Team: Chris W.
SCI patient
R. K. Davies
Medical Center

Hugh O'Neill
Clinical Intern
Children's Hospital
at Stanford



CRT Terminal Work Station Modifications

The work stations at a computer training program for the disabled were modified to increase accessibility.

Problem:

* The power ON/OFF switch is on the back of the CRT's. Many of the students found it difficult or impossible to activate the switch.
* The MODEMS also had the power switch and the mode switch located on the back of the unit.
* Many students had difficulty lifting the telephone off the hook, positioning it in the MODEM and then dialing.
* When programming, it is often required to activate two keys at once, a two-handed function that many students were incapable of doing.

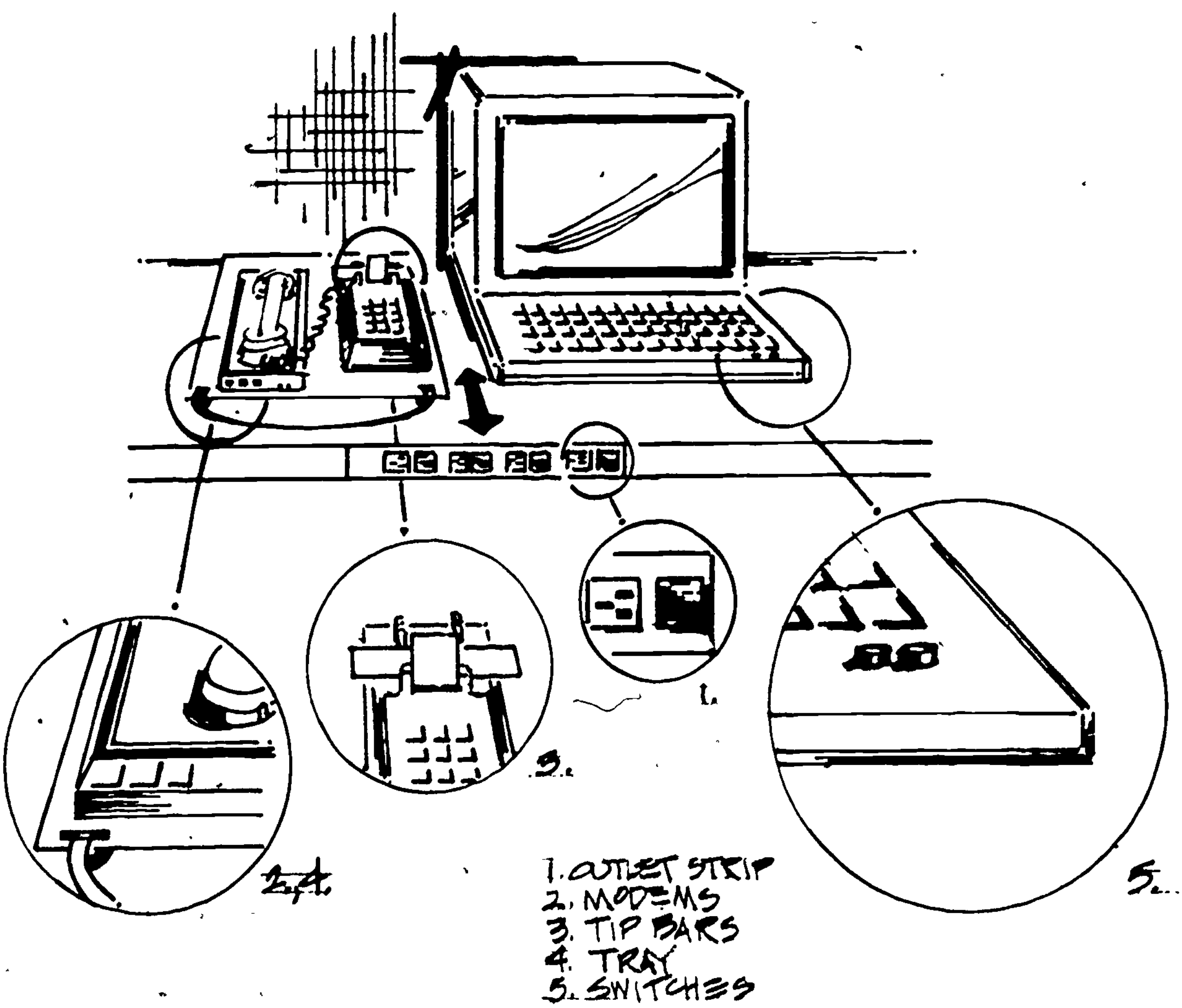
Solutions:

* Mounted an outlet strip, with separate ON/OFF switches, on the front of the table which held the CRT's and plugged the CRT's into it. With each CRT's own power switch left ON, they could then be turned ON/OFF at the outlet strip.
* Turned the MODEMS around so that the switches faced the operators.
* Provided Tip Bars for the telephones, which depress or release the buttons on the telephone so that the handpiece can be left in the MODEM. Tipping the bar forward connects the telephone and then the desired number can be dialed. Tipping the bar back hangs up the telephone.
* Provided a tray upon which to place the telephone and MODEM. Many students need the telephones at the front of the table while dialing or turning on the MODEM, but then they need the front of the table clear for their papers while working. The tray slides easily on the table.
* Mounted PUSH ON/PUSH OFF switches on the CRT chassis next to the keyboard. These switches mechanically lock on when depressed once, and then unlock when depressed again. Two switches were mounted on each terminal and then electrically wired to the SHIFT and CONTROL keys (which can still be used as before.)

The system operation remains unchanged for those users who do not require the modifications.

Design Team:	Jim Tobias Center for Independent Living/Berkeley	Hugh O'Neill Clinical Intern Children's Hospital at Stanford

CRT TERMINAL WORK STATION MODIFICATIONS



Appendix F

CHILDREN'S HOSPITAL at Stanford

Inter-Office Memorandum

TO: ALL REC STAFF

DATE: January 20, 1981

FROM: Sandi Enders

SUBJ: NEW INSERVICE PROGRAM

There will be a weekly series of presentations on:

Medical Implications of Disability

by Dr. Chester Swinyard

These topics will be covered:

January	26	Birth Defects
February	2	Neural Tube Defects
February	9	Cerebral Palsy
February	16	Holiday
February	23	Muscular Dystrophies
March	2	Osteogenesis Imperfecta
March	9	Dwarfism
March	16	Arthrogryposis
March	23	Post Polio
March	30	Open

WHEN: Mondays 12 to 1

WHERE: REC Conference Room

SME/eh

CHILDREN'S HOSPITAL at Stanford

520 Willow Road, Palo Alto, California 94304 / (415) 327-4800

PLEASE POST

6 February 1981

REHABILITATION ENGINEERING CENTER

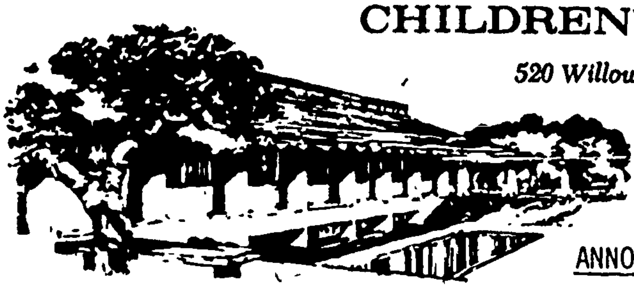
CALENDAR OF EVENTS

FEBRUARY 27, 1981	Blissymbolics - What are they and why use them?
12-1pm	Mary Ida Hunt Non-Speech Program
Faber Auditorium	Western Michigan University
MARCH 5, 1981	An Evaluation of Seating & Mobility Devices
7-9pm Faber Auditorium	Session 2: Manual Wheelchairs, the Mulholland, and commercially available positioning devices
	Bay Area Pediatric Interest Group
	This is a participatory meeting - We are sharing knowledge and experience about specialized equipment for disabled children and adolescents; pooling resources to create our own "consumer's reports".
MARCH 20-21	Third Annual Rehabilitation Engineering Services Seminar: Access to Technology
9am-4pm	
Fairchild Auditorium Stanford University Medical Center	brochure enclosed
MARCH 20	Open House
4-6pm	Rehabilitation Engineering Center
REC Building	Both the building and the staff have grown! We would like to invite you to meet the service and research staff, and to see some of the new and ongoing projects underway this year.

We plan to schedule a regular series of equipment demonstrations beginning in April. If you have suggestions about equipment you would like to see, please contact Kelly Flanagan at 327-4800 X434.

CHILDREN'S HOSPITAL at Stanford

520 Willow Road, Palo Alto, California 94304 / (415) 327-4800



- PLEASE POST -

ANNOUNCEMENT: A NOONTIME EQUIPMENT DEMONSTRATION SERIES

The Rehabilitation Engineering Center (REC), Children's Hospital @ Stanford is sponsoring an equipment demonstration series. Speakers will be manufacturers and distributors of equipment for the disabled and will discuss and demonstrate their products. There will be opportunity for hands on, questions, answers, and discussion.

MAY (Tuesdays) CALENDAR OF EVENTS

DATE	TOPIC	PLACE
May 5 (12:00-1:00)	PERSPECTIVES ON SEATING Ann Blote, C.F. Manager, Abbey Medical Rick Pasillas, C.O. Tissue Trauma Specialist Rehabilitation Engineering Center Children's Hospital @ Stanford Perspectives on seating with regard to tissue trauma prevention, and enhancement of correct body posture and comfort. Commercially available and customized seating options will also be presented.	Central Conference Room
May 12 (12:00-1:00)	VISUALTEC-Low Cost Aids for the Physically Disabled Diane Melendez, O.T.R. Children's Hospital @ Stanford Slide presentation and demonstration inexpensive adaptive aids for the disabled.	Faber Auditorium
May 19 (12:00-1:00)	OVERVIEW OF PROSTHETICS Dennis Swigart, C.O., Service Head Prosthetics Rehabilitation Engineering Center Children's Hospital @ Stanford Slide presentation, film, demonstration, and discussion of state of the art componentry utilized in prosthetics.	Central Conference Room
May 26 (12:00-1:00)	EMERGENCY SYSTEMS FOR THE DISABLED Jean Aureguy, Microlert System Paul Moberg, Teleguard Presentation and demonstration of two remote control, security and emergency call systems.	Central Conference Room

* *

May 13-17 SPINA BIFIDA CONFERENCE, "Independence for All"
Professional Medical Update: Fairchild Auditorium, Stanford Medical Center
Issues in Treatment and Management: San Jose Hyatt House
For information and registration, call (408) 578-7375.

* *

CHILDREN'S HOSPITAL at Stanford
520 Willow Road, Palo Alto, California 94304 / (415) 327-4800

- PLEASE POST -

JUNE (Wednesdays) CALENDAR OF EVENTS

DATE	TOPIC	PLACE
June 3 (12:00-1:00)	VISUALTEC-A Reading System for the Visually Impaired Walt Langosch, Visualtec Demonstration and film presentation of a reading system for the visually impaired.	Central Conference Room
June 10 (12:00-1:00)	MOBILITY AIDS FOR RECREATION Don Milberger, Bicycle Research Products Presentation of a bicycle which attaches to a wheelchair. Wayne Kunishige, Stainless Medical Products Ann Blote, Abbey Medical Presentation of commercially available wheelchairs designed for use in sports. Emphasis will be on newly available models.	Faber Auditorium
June 17 (12:00-1:00)	COMMUNICATION AIDS/CONTROLS: Limitation of and Alternatives to the Keyboard David Thornburg, Innovisions Discussion and demonstration of computerized communication systems emphasizing alternatives to typewriter, keyboard control.	Faber Auditorium
June 26 (12:00-1:00)	PERSPECTIVES ON POWERED MOBILITY Speakers to be announced Presentation and discussion of powered wheelchairs and wheelchair attachments which convert manual wheelchairs into power driven chairs.	Faber Auditorium

Directions: Come to Children's Hospital @ Stanford, 520 Willow Road, Palo Alto. Central Conference Room and Faber Auditorium are both located in the Administration Building.

For further information or if you would like to see additional specific devices or equipment presented as part of the equipment demonstration series in July, call Kelly Flanagan (415) 327-4800 x 434.

Appendix G

Rehabilitation Engineering Center Publications Office

CHILDREN'S HOSPITAL at Stanford

520 Willow Road, Palo Alto, California 94304 / (415) 327-4800

PUBLICATIONS ORDER FORM

QUANTITY	DESCRIPTION	UNIT PRICE	AMOUNT
	Fifth Annual Rehabilitation Engineering Center Services Report. 1979	1 Copy No Charge More Than One $3.00	
	Rehabilitation Engineering Center with Research in Controls and Interfaces Progress Report III. June, '79 - Dec. '80	1 copy No Charge More Than One $4.00	
	Seating Systems for Body Support and Prevention of Tissue Trauma. Research Progress Report III. June, '79 - Dec. '80	1 Copy No Charge More Than One $4.00	
	Proceedings. Third Annual Rehabilitation Engineering Services Conference: "Access To Technology" March 20-21, 1981	$10.00	
	Research Report: "Team Assessment of Device Effectiveness" October, 1980	$5.00	
	"Controls: A Reference Catalog To Aid Physically Limited People In The Operation Of Assistive Devices". April, 1980	$4.00	
	"Controls Research and Development Directory. Who is Doing What in Current Research and Development of Controls to Operate Assistive Devices". May, 1981	$5.00	
	"How to Treat and Prevent a Pressure Sore" July 81	$2.00	
	OUT OF PRINT DUPLICATION CHARGE		
	TOTAL:		

Please remit total payment with order. Make checks payable to: Children's Hospital at Stanford

Please Print Clearly This Will Be Your Mailing Label

Name

Work Affiliation

Address

City State Zip

134

The following publications are OUT OF PRINT.
They can be duplicated for a charge of 15¢ per page.

Quantity	Description	Number of Pages	Amount Pages x .15¢
	Rehabilitation Engineering Center Services Annual Report 1978	30	
	Rehabilitation Engineering Center Services Annual Report 1977	48	
	Rehabilitation Engineering Center Services Annual Report 1976	37	
	Rehabilitation Engineering Center Services Annual Report 1975	25	
	Rehabilitation Engineering Center Research Progress Report I Oct. 1978 - Sept. 1979	55	
	Assessment of Needs for Control and Interfaces to Operate Assistive Devices for the Severely Disabled Sept. 1979	31	
	Research and Development of a Versatile Portable Speech Prosthesis. Progress Report. May 1978 - November 1979	44	
		SUB TOTAL	

ABLEDATA Information Service

Rehabilitation Engineering Center/Children's Hospital @ Stanford, Palo Alto, CA

Since October 1980, Children's Hospital Rehabilitation Engineering Center has been the home of a new and unique Information Service, sponsored by the Information Broker Program through the Rehabilitation Engineering Section of the California State Department of Rehabilitation. The primary focus of the Information Service is the collection, organization and dissemination of information on rehabilitation equipment and adaptive devices and aids for the disabled. Information on local and national resources and services is also available.

The program is designed to provide information to disabled consumers, health and rehabilitation professionals, designers, educators, students and others. The efficient collection and dissemination of information is a developing national trend, the ultimate goal of which via this program is to establish a national communication network of Information Brokers to manage the operation of the Information Services.

In order to effectively manage the tremendous volume of information on devices and to help meet the technical demands of an information service system, a national computerized data base of equipment and devices, called ABLEDATA, was developed. When completed ABLEDATA will contain approximately 10,000 items related to all major aspects of an individual's lifestyle, including personal care; home, educational, vocational management and environment; mobility and transportation; communication: seating; recreation; orthotics and prosthetics.

In filling information requests, the Information Broker utilizes the computer system ABLEDATA, utilizes an on-site library of books, resource directories and catalogues; and numerous resource specialists, including rehabilitation engineers, orthotists, prothetists, occupational and physical therapists, and others. To insure the accuracy of a response, the Information Broker aids the requestor to specifically define a problem task and, through research and brainstorming with resource specialists, may provide various solutions. Information provided can also include product name, cost, description, manufacturer, and local distributors. When available, evaluative data and consumer feedback may also be provided, as well as, local and national resources and services information.

In some cases the Information Broker will be able to answer requests over the phone and when appropriate, a written response will be mailed to the requestor accompanied by product brochures and a computer printout. At present there is no cost for this service and anyone may utilize it. To request, please call or write the Information Broker nearest you.

Rosemary Murphy
Rehabilitation Engineering Center
Children's Hospital @ Stanford
520 Willow Road
Palo Alto, California 94304
(415) 327-1111

Jim Christensen
Department of Rehabilitation
830 "K" Street Mall
Sacramento, CA 95814
(916) 323-2959

Paige Finnerty
Rancho Los Amigos Hospital
7601 East Imperial Highway 500 Hut
Downey, CA 90242
(213) 922-8116

Rebecca Williams
University of Virginia
Department of Rehabilitation
P.O. Box 3368
Charlottesville, Virginia 22903
(804) 977-1378

8/81

Blissymbolic© Printer

Rehabilitation Engineering Center/Children's Hospital @ Stanford, Palo Alto,CA

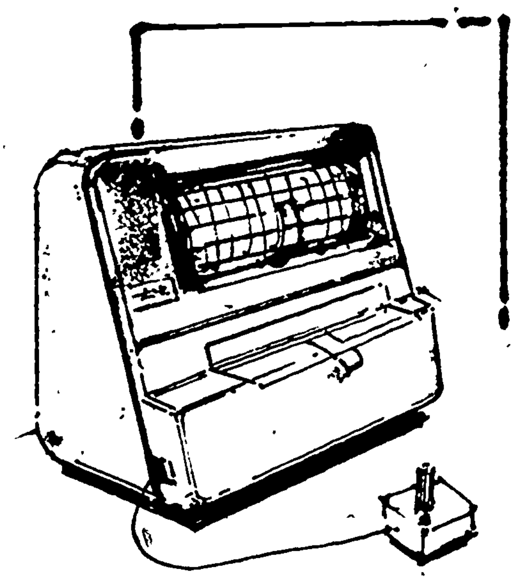
The Blissymbolic © Printer is being developed at the Rehabilitation Engineering Center, Children's Hospital @ Stanford, with the cooperation of the Blissymbolics Communication Institute in Toronto, Canada. This printer offers a less expensive alternative to other systems being developed which uses a micro computer, programmed to print Blissymbols on a dot matrix printer. The Printer provides a choice of 240 Blissymbols arranged on a horizontal cylinder. The symbols are 7/8" square. By using a joystick, five slot arm switch or two single switches, the client can rotate the drum and then scan horizontally along any row to select a symbol. The client then opertates another switch, and the symbol is printed on a 1" wide strip of paper.

Special Features

DRUM DESIGN: This concept provides a large selection of symbols and keeps the machine small enough to fit on a wheelchair lap tray. The original 240 symbols were selected and arranged by the Blissymbolics Communication Institute. Because the rubber stamps are attached to the lower drum with Velcro they can be rearranged by the teacher/therapist to best benefit the client.

AUTOMATIC CONTROLS: The Blissymbolic Printer is equipped with logic circuits which stop the drum in the center of a row or column so that precise switch control is not required. Additional logic prevents the client from rotating the drum and attempting to print at the same time. The therapist/teacher can adjust the scanning speed of the machine to match the skill of the client.

IMMEDIATE VISIBILITY: After each printing stroke the paper tape automatically advances and the symbol becomes visible to the client. The client can see the last six to eight symbols he has printed so he can keep track of the message he is composing.



BLISSYMBOLIC©PRINTER PROTOTYPE

DURABILITY: The production housing of the Blissymbolic © Printer will be made of easy to clean, impact resistant plastic. The internal parts will be shielded from contamination.

Status/Funding

The current model is a prototype that will be undergoing field testing during the fall of 1981.

Funding for this device was provided by Bennett L. and Caroline L. Raffin Rehabilitation Engineering Center Fund.

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Appendix H

MOBILITY DEVICE EVALUATION

Device: ______________________________ Date: ______________

(picture)

SUMMARY

Brief description:

Overall impression of performance:

Advantages:

Disadvantages:

Appropriate users:

Availability:

DEVICE: ____________________

DESCRIPTION

Frame:

Seat and Back:

Wheels, Front:

Back;

Rims:

Brakes:

Arm rests:

Foot rests:

Power system: Motor

Battery

Charger

Controls

Other equipment:

Dimensions: In use:

For transport or storage:

Weight: Total:

Heaviest piece:

Cost:

Special functions:

DEVICE: ____

	FUNCTION	PERFORMANCE RATING low high	COMMENTS
MOBILITY	Indoors	NA 0 1 2 3 4 5	
	Outdoors	NA 0 1 2 3 4 5	
	Uneven terrain	NA 0 1 2 3 4 5	
	Ramps	NA 0 1 2 3 4 5	
	Curbs	NA 0 1 2 3 4 5	
	Distance	NA 0 1 2 3 4 5	
	Manuverability	NA 0 1 2 3 4 5	
POSTURAL SUPPORT	Supports body and its parts	NA 0 1 2 3 4 5	
	Maintains posture	NA 0 1 2 3 4 5	
	Controls abnormal tone	NA 0 1 2 3 4 5	
	Prevents deformities	NA 0 1 2 3 4 5	
	Prevents tissue breakdown	NA 0 1 2 3 4 5	
	Changes position	NA 0 1 2 3 4 5	
DAILY USE	Comfort	NA 0 1 2 3 4 5	
	Ease of use	NA 0 1 2 3 4 5	
	Ease of transfers	NA 0 1 2 3 4 5	
	Access to tables	NA 0 1 2 3 4 5	
	Access to other equipment	NA 0 1 2 3 4 5	
	Access to public places	NA 0 1 2 3 4 5	
ADAPTABILITY	Adjustable parts	NA 0 1 2 3 4 5	
	Changing physical status	NA 0 1 2 3 4 5	
	Different disabilities	NA 0 1 2 3 4 5	

DEVICE: ____________________

FUNCTION		PERFORMANCE RATING low high	COMMENTS
TRANSPORT	Into car unassisted	NA 0 1 2 3 4 5	
	Into car with assistance	NA 0 1 2 3 4 5	
	Into van	NA 0 1 2 3 4 5	
	Use public transportation	NA 0 1 2 3 4 5	
	Can be carried upstairs	NA 0 1 2 3 4 5	
SAFETY	Stationary	NA 0 1 2 3 4 5	
	In motion	NA 0 1 2 3 4 5	
	Inclement weather	NA 0 1 2 3 4 5	
	Electrical system	NA 0 1 2 3 4 5	
DURABILITY	Expected lifetime	NA 0 1 2 3 4 5	
	Upholstery	NA 0 1 2 3 4 5	
	Frame	NA 0 1 2 3 4 5	
	Attachments	NA 0 1 2 3 4 5	
	Power system	NA 0 1 2 3 4 5	
MAINTENANCE	Washable	NA 0 1 2 3 4 5	
	Repair frequency	NA 0 1 2 3 4 5	
	Repair cost	NA 0 1 2 3 4 5	
	Downtime	NA 0 1 2 3 4 5	
APPEARANCE		NA 0 1 2 3 4 5	
SPECIAL FEATURES		NA 0 1 2 3 4 5	
		NA 0 1 2 3 4 5	
		NA 0 1 2 3 4 5	

Evaluated by: ____________________

USER'S GUIDE

This evaluation form is a guide designed to provide a beginning therapist with a way to compare different mobility aids or evaluate the appropriateness of a device for a specific user. The form does not discuss how to fit a wheelchair but is more concerned with what the device is designed to do and how well it works. The items included have been compiled from criteria used by designers, therapists, and consumers to evaluate assistive equipment.

The first page consists of a description and summary for quick referencing of important features. The more detailed information is found on the succeeding pages.

The rating system allows for comparing performance in certain areas such as posture and mobility in a single product or comparing one area in many products in a quantitative manner. The novice may have difficulty rating certain items, such as maintenance or durability, but the form may be used as a guide to obtaining systematic information from experienced users.

The remainder of the user's guide explains each item and provides suggestions for comments. The user may choose to use of ignore these recommendations. However, the usefulness of the form depends on the quality of the comments made on the form by the evaluator.

SUMMARY

This section condenses the information obtained from the description and rating sheets. A brief description may cover appearance and function of the device, e.g. "battery powered, contour customized wheelchair can mount most curbs". The overall impression should include whether the device works well or not and under what circumstances. The evaluator may find a listing of the device's performance for each broad function on the rating sheets helpful. Specific pleasures or aggravations can be listed under advantages and disadvantages.

The appropriate users section may list the types of disabilities or the functional abilities of people who may use this device. (example: For users with good upper extremity and trunk strength and control.)

The section for availability allows space for information concerning the manufacturer, vendor, repair facilities, and the time for delivery.

DESCRIPTION

Fill in this section with short phrases to describe important features such as materials used, actions, and whether it is standard or optional. The addition of a photograph is very helpful and highly recommended

The following suggestions are examples of the variety of styles and helpful information that may be considered in the description of a wheelchair.

Frame: steel, chrome, plastic, aluminum, wood, paint, folding, nonfolding, lightweight, heavyweight, narrow

Seat and back: solid seat, sling seat, zippered back, detachable back, vinyl, cloth, contoured, modular, one piece, reinforced

Arm rests: part of frame, detachable, adjustable, flared, desk style, full length, padded, skirt guards

Foot rests: part of frame, detachable, swing away, elevating, telescoping, wood, metal, plastic, calf pads, heel loops

Wheels: front or back wheel drive; dimensions (width and diameter); solid, pneumatic, semipneumatic tires; type of tread; free wheeling, casters; spokes

Rims: chrome, plastic, wrapped, textured, with extensions, type of bracing

Brakes: Foot or hand control, powered, location, extensions, front or rear

Motor, battery, charger: Battery voltage, number of batteries, variable speeds, covers, plugs and connections, line voltage for charging, charging frequency

Controls: joy stick, pneumatic, proportional, switches, location

Other equipment: list may include straps, pads, head rest, other options

Dimensions: Height, length, width, or other useful measurements. If the item folds or dismantles for transport, include those measurements.

Weight: Heaviest piece when dismantled should be considered. Even when dismantled, one piece may be too heavy for easy transport or mobility.

Cost: Average cost and a range of costs may be useful or attach catalog and price list. Dating is important since changes occur over time.

Special functions: This space is for listing any special functions or purposes the item may have. Examples: sport model, stand-up, stair climbing

RATING SHEETS

The rating system is a sliding scale from 0 to 5. Give a 0 is the item does not function, is most unsatisfactory, or is unacceptable. A score of 5 indicates the item performs very well, is most satisfactory, or is the best. Gradations between the extremes are scored 1, 2, 3, or 4. A category NA is provided for inapplicable functions, e.g. a manual wheelchair has no electrical system to critique.

In general, the comments section should explain why the rating was given, what equipment features or modifications affect the function, or conditions required for the device to work. As much pertinent information that can be included should be. Aspects to conside in the performance of each function follow.

MOBILITY

Indoors: The device should be able to negotiate carpets, linoleum, and thresholds. Doorway width may need consideration with special width requirements getting lower scores.

Outdoors: Concrete sidewalks, asphalt road, dirt, and grass are common surfaces that need to be accessible.

Uneven terrain: Consider uneven sidewalks, thick rugs, sand, gravel, hills, and small obstacles.

Ramps: Limitations to the grade and length of incline should be noted. Energy requirements and the speed of ascent and descent may need attention.

Curbs: Consider the height and assistance necessary to negotiate.

Distance: Any limits and the limiting factor (user, battery, or terrain) should be noted. Example: goes from room to room, works on linoleum only

POSTURAL SUPPORT

Support body and its parts: Support should be neither inadequate or too restraining. Indicate whether special pads, straps, or shaping is necessary to achieve sufficient support.

Maintains posture: The device should not give way under pressure or need constant readjustments.

Control abnormal tone/prevent deformities/prevent tissue breakdown: Consider whether the equipment inhibits or facilitates abnormal patterns of movement or tone, scoliosis, changes of body position to relieve pressure. Any high pressure areas should have adequate padding to avoid tissue breakdown. (Some aids are designed specifically for these functions while others give postural support secondary importance.)

Changes position: If a device can change position, e.g. back reclines, consider if support or pressure distribution is altered and describe changes if significant. The amount of assistance required to change should be examined.

DAILY USE

Comfort: This function implies a good fit is possible. The device should not cause pain or discomfort.

Ease of use: This item must be qualified as to whether the user or an assistant finds the aid simple and smoothly operable

Ease of transfers: Again, consider whether the user and/or any assistants find the device easy to get in and out of.

Access to tables: Table should be within reach as the chair faces it. Special table height requirements should be noted

Access to other equipment: Other equipment may include kitchen appliances, bathroom fixtures, working area, or assistive devices, e.g. respirator.

Access to public places: School, business, and recreational facilities should be accessible. Any special needs e.g. wide electric doors, ramps, or assistance should be listed in the comments.

ADAPTABILITY

Adjustable parts: Parts that can be altered or change position should maintain positions set and change quickly and easily when desired.

Changing physical status: The device should accomodate some growth changes or physical or mental deterioration due to disease processes.

Different disabilities: If the device is extremely specialized for a certain type of patient, give a low score. If the aid can be adapted for many people, score higher.

TRANSPORT

Into car unassisted: Give a high score if a user can get the aid in and out with no help quickly and easily. Indicate the smallest car that will accomodate the user and device.

Into car with assistance: Indicate how much help is required and car size.

Into van: Specify special tie-downs to secure device safely for transport and whether the user remains in or gets out of the chair while traveling. The height of the user in the chair may influence the head room required.

Use public transportation: Specify whether equipment will fit on bus, train, plane, etc. and what special equipment (e.g. lifts) will be necessary.

Can be carried upstairs: This item is included for devices which cannot climb or descend stairs or where no ramps or elevators are available. (This characteristic may be important for safety in emergencies.) Consider the number of assistants required and whether the user is in or out of seat.

SAFETY

Stationary: The device should not tip over, rock, or be easily pushed off balance. The brakes should hold well.

In motion: Progress should be without jerks while going straight or turning. Control must be maintained constantly and easily.

Inclement weather: Consider safety in wind, rain, snow, ice, heat, and cold.

Electrical system: Connections should be good, shock hazards reduced, and charging instructions clear. Watch out for loose wires and battery leaks.

DURABILITY

Expected lifetime: A list of what component or factor determines the lifetime may be helpful. Example: child outgrows device in six months

Upholstery: Indicate whether it tears or wears out. Specify if replacements or reinforcements are possible.

Frame: Although rating of this item is mainly concerned with standing up to daily use, any rattling, bending, or scratching should be examined.

Attachments: Separate pieces should remain firmly attached throughout the life, be replaceable or last as long as the rest of the device.

Power system: Consider which parts last throughout the life, how often batteries need charging and replacement.

MAINTENANCE

Washable: Special cleaning needs should be listed. Rating also includes how often and how easy it is to clean.

Repair frequency: Least often is scored the highest. Comments could indicate which parts require most care. (Repairs may also include routine maintenance.)

Repair costs: The expense will also be affected by who is performing the repair: user, friend, vendor, bicycle shop, distant manufacturer. Item which requires most repairs or most expensive repairs may be useful to note. Average annual costs may also be informative.

Downtime: This concept includes how long repairs take in which the aid is unavailable and how often this occurs.

APPEARANCE

This category is one of the most subjective. Consider both the user's and the public's reaction to the device. One guide suggested is to ask "Would I want to be seen using this equipment?"

SPECIAL FEATURES

Space is allowed for listing any significant feature not previously mentioned. Remember to specify what is being rated.

Developed by Helen Tsuda, M.A. Candidate, Division of Physical Therapy, Stanford University Medical School, April 1981.

REFERENCES

Clearfield, D. Medical Devices and Equipment for the Disabled: An Examination. Disability Rights Center, Washington, D.C. 1976.

This paper discussed the safety, cost and consumer satisfaction of medical equipment. A case study of the wheelchair industry mentioned problems seen by users which include durability, cost, fit, weight, and repairs.

Clinical, Engineering and Work Related Evaluation of Stationary Stand-Up Frames and Stand-Up Wheelchair for the Disabled. Research Project #R-115. New York University Research and Training Center Annual Report, pp. 57-69, 1979-1980.

This project examined the La Berne Gearlift Stand-In Table and LEVO Stand-Up Wheelchair in terms of the assistance needed to use, pressure exerted by straps or structures, tolerance, and user reaction. Balance, stability, mobility, and adjustibility were also considered.

Enders, S. Draft Proposal for Wheelchair Evaluation for the Veterans Administration Prosthetic Center, New York. Center for Independent Living, Equipment Evaluation Program, Berkeley, undated.

This draft provided a list of characteristics of equipment to be examined. Points often overlooked in other critiques included restraints, transfer access, disengagement of the power source and drive, instructions provided, prescriptive indications, comparison to previous equipment, and how it is secured for transport.

Fenwick, D. Wheelchairs and Their Users. Her Majesty's Stationery Office, London. 1977.

The National Health Service interviewed wheelchair users in England and Wales to determine user demographics, disabilities, equipment use, and satisfaction with the equipment and service. The interview questionnaire was included.

Grall, T.B. A Feasibility Study of Product Testing and Reporting for Handicapped Consumers. Consumers Union of the United States Inc., Mount Vernon, NY. March 1979.

The study was designed to show the need and marketability of product evaluations for handicapped consumers. Some consumer concerns often overlooked by designers included durability, utility, ease of use, and repairs--cost, part availability, and service agent competence. Rehabilitation professionals also wanted safety information.

Hotchkiss, R. Left to your own devices: the state of the art of wheelchair design. In Mobility for Spinal Cord Impaired People: Report for a Workshop Held at the Rancho Los Amigos Hospital, Inc., Downey, CA, on February 22-24, 1974, pp. 45-59. National Research Council, Washington, DC, 1975.

This presentation referred to current characteristics of wheelchair designs then discussed advantages and disadvantages of some designs proposed to solve frame, wheel, width, and stair-climbing problems.

Sheredos, S.J., Darlington, J.W., Lyles, M. Evaluation of Stand-Up Wheelchairs. Veterans Administration Prosthetics Center, Clinical Evaluation Service, Castle Point, New York. undated copy

This article reviewed the design of six wheelchairs with respect to weight, controls, transfers, and user reactions. Pictures of all six chairs in use are included.

Stout, G. Some aspects of high performance indoor/outdoor wheelchairs. Bull. Prosth. Res. BPR-10-32, pp 135-175, Fall 1979.

This article studiedthe performance of electric wheelchairs in terms of stability, speed, wheel size, brakes, controls, height, and folding and reclining features.

Team Assessment of Device Effectiveness: A Retrospective Study. Children's Hospital at Stanford, Rehabilitation Engineering Center, Palo Alto, CA, October 1980.

This evaluation considered changes in life style, daily use, life span, effectiveness, and cost of devices. Functional, psychosocial, and environmental need of the user are stressed. Fifteen aspects of good equipment are also included.

VAPC Evaluations of Mobility Aids Past, Present and Future. Veterans Administration Prosthetics Center, New York, July 1978.

Pictures, short descriptions, and findings concerning safety and merits of further examination of some mobility aids are included. No explanations of "standards of acceptibility " were given.

Vash, C.L. Psychosocial and Learning Consideration in using Mobility Systems. in Mobility for Spinal Cord Impaired People. pp136-145. National Research Council, Washington, DC. 1975

This speaker addressed mobility about the home, neighborhood, and beyond. Issues of cost, versatility, cosmesis, safety, and private and public transportation were considered.

Figure 24. Rehabilitation Engineering Center