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Part VI

Department of Education

National Institute on Disability and Rehabilitation Research; Rehabilitation Engineering Research Centers; Proposed Funding Priorities for Fiscal Years 98–99; Notices

DEPARTMENT OF EDUCATION

National Institute on Disability and Rehabilitation Research; Rehabilitation Engineering Research Centers; Proposed Funding Priorities for Fiscal Years 1998–99

AGENCY: Department of Education.

ACTION: Notice of Proposed Funding Priorities for Fiscal Years 1998–1999 for Rehabilitation Engineering Research Centers.

SUMMARY: The Secretary proposes funding priorities for four Rehabilitation Engineering Research Centers (RERCs) under the National Institute on Disability and Rehabilitation Research (NIDRR) for fiscal years 1998–1999. The Secretary takes this action to focus research attention on areas of national need. These priorities are intended to improve rehabilitation services and outcomes for individuals with disabilities.

DATES: Comments must be received on or before December 1, 1997.

ADDRESSES: All comments concerning these proposed priorities should be addressed to Donna Nangle, U.S. Department of Education, 600 Maryland Avenue, S.W., room 3418, Switzer Building, Washington, D.C. 20202–2645. Comments may also be sent through the Internet: comment@ed.gov

You must include the term ''Engineering Research Centers'' in the electronic message.

FOR FURTHER INFORMATION CONTACT: Donna Nangle. Telephone: (202) 205–5880. Individuals who use a telecommunications device for the deaf (TDD) may call the TDD number at (202) 205–2742. Internet: Donna__Nangle@ed.gov

Individuals with disabilities may obtain this document in an alternate format (e.g., Braille, large print, audiotape, or computer diskette) on request to the contact person listed in the preceding paragraph.

SUPPLEMENTARY INFORMATION: This notice contains proposed priorities under the Disability and Rehabilitation Research Projects and Centers program for RERCs related to information technology access, communication enhancement, ergonomic solutions for employment, and hearing enhancement.

The authority for RERCs is contained in section 204(b)(3) of the Rehabilitation Act of 1973, as amended (29 U.S.C. 762(b)(3)). Under this program the Secretary makes awards to public and private agencies and organizations, including institutions of higher education, Indian tribes, and tribal organizations, to conduct research, demonstration, and training activities regarding rehabilitation technology in order to enhance opportunities for meeting the needs of, and addressing the barriers confronted by, individuals with disabilities in all aspects of their lives. An RERC must be operated by or in collaboration with an institution of higher education or a nonprofit organization.

These proposed priorities support the National Education Goal that calls for every adult American to possess the skills necessary to compete in a global economy.

The authority for the Secretary to establish research priorities by reserving funds to support particular research activities is contained in sections 202(g) and 204 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 761a(g) and 762).

The Secretary will announce the final priorities in a notice in the **Federal Register**. The final priorities will be determined by responses to this notice, available funds, and other considerations of the Department. Funding of a particular project depends on the final priority, the availability of funds, and the quality of the applications received. The publication of these proposed priorities does not preclude the Secretary from proposing additional priorities, nor does it limit the Secretary to funding only these priorities, subject to meeting applicable rulemaking requirements.

Note: This notice of proposed priorities does *not* solicit applications. A notice inviting applications under this competition will be published in the **Federal Register** concurrent with or following the notice of final priorities.

Description of the Rehabilitation Engineering Research Center Program

RERCs carry out research or demonstration activities by:

(a) Developing and disseminating innovative methods of applying advanced technology, scientific achievement, and psychological and social knowledge to (1) solve rehabilitation problems and remove environmental barriers, and (2) study new or emerging technologies, products, or environments;

(b) Demonstrating and disseminating (1) innovative models for the delivery of cost-effective rehabilitation technology services to rural and urban areas, and (2) other scientific research to assist in meeting the employment and independent living needs of individuals with severe disabilities; or

(c) Facilitating service delivery systems change through (1) the development, evaluation, and dissemination of consumer-responsive and individual and family centered innovative models for the delivery to both rural and urban areas of innovative cost-effective rehabilitation technology services, and (2) other scientific research to assist in meeting the employment and independent needs of individuals with severe disabilities.

Each RERC must provide training opportunities to individuals, including individuals with disabilities, to become researchers of rehabilitation technology and practitioners of rehabilitation technology in conjunction with institutions of higher education and nonprofit organizations.

General

The Secretary proposes that the following requirements apply to these RERCs pursuant to these absolute priorities unless noted otherwise:

The RERC must have the capability to design, build, and test prototype devices and assist in the transfer of successful solutions to the marketplace. The RERC must evaluate the efficacy and safety of its new products, instrumentation, or assistive devices.

The RERC must provide graduate-level research training to build capacity for engineering research in the rehabilitation field and to provide training in the applications of new technology to service providers and to individuals with disabilities and their families.

The RERC must involve individuals with disabilities and, if appropriate, their family members in planning and implementing the research, development, and training programs, in interpreting and disseminating the research findings, and in evaluating the Center.

The RERC must share information and data, and, as appropriate, collaborate on research and training with other NIDRR-supported grantees including, but not limited to, the Americans with Disabilities Act (ADA) Disability and Business Technical Assistance Centers, other related RERCs and RRTCs, and grantees under the Technology-Related Assistance for Individuals with Disabilities Act.

The RERC must conduct a state-of-the-science conference in the third year of the grant and publish a comprehensive report on the final outcomes of the conference in the fourth year of the grant.

The RERC must develop and implement a utilization plan for ensuring that all new and improved technologies developed by the RERC are

successfully transferred to the marketplace.

The RERC must develop and implement in consultation with the NIDRR-supported National Center for the Dissemination of Disability Research a plan to disseminate the RERC's research results to disability organizations, persons with disabilities, businesses, manufacturers, professional journals, and other appropriate parties.

Priorities

Under 34 CFR 75.105(c)(3) the Secretary proposes to give an absolute preference to applications that meet the following priorities. The Secretary proposes to fund under this competition only applications that meet one of these absolute priorities.

Proposed Priority 1: Information Technology Access

Background

High speed computers, high speed modems, sophisticated telecommunication networks, cable networks, intranets, the Internet, the World Wide Web (www), and satellites constitute an unparalled global information network. However, the proliferation of information technology has also created problems of accessibility for persons with disabilities (Paciello, M., *People with Disabilities Can't Access the Web*, Yuri Rubinsky Insight Foundation, 1997). Persons with disabilities will be significantly disadvantaged if this new generation of information technology is inaccessible. Promoting accessibility to this dynamic field is a highly technical and complicated task that will place unique demands on an RERC to serve as a resource to a wide range of industry and government officials, as well as persons with disabilities.

The Internet is expanding at a phenomenal rate. There were 1,000 Internet host computers worldwide in 1980. That number increased to 200,000 in 1996 and is expected to reach 12 million by the year 2000. The number of Internet users has virtually doubled every year over the past three years from an estimated 16 million in 1995 to 68 million in 1997 (*Computer Industry Forecasts,* Third Quarter, 1997). Emerging nomadic technologies will enable individuals to access information systems from virtually anywhere, at anytime, and in entirely visual, audio, or mixed modes.

The Internet and World Wide Web are also undergoing dramatic structural changes. Internet 2 is a consortium of academic institutions planning to interconnect its members with a new high-bandwidth Internet that will support advanced applications that are not possible or practical on the current Internet (Kennedy, K., Testimony Before the Senate Commerce, Science, and Transportation Committee; Subcommittee on Communications, June 3, 1997). Once developed, the Next Generation Internet will interconnect 100 Federal research institutions and their research partners with a network capable of operating at speeds 100 to 1000 times faster than today's Internet (Lane, N., Testimony Before the Senate Commerce, Science, and Transportation Committee; Subcommittee on Communications, June 3, 1997). In spring of 1997, the International World Wide Web Consortium held special workshops at their Sixth International World Wide Web Conference that focused on developing strategies for designing accessibility into the Web core environment.

New generations of computer and information technologies become available long before anyone has fully grasped the implications of the previous generation (Kelly, H., Testimony Before the Senate Commerce, Science, and Transportation Committee; Subcommittee on Communications, June 3, 1997). Product cycles and lifetimes are measured in months, not years. There are many small high technology firms that remain virtually unknown until they announce their product. These firms may have little, or no experience with design accessibility. In addition, the industry is highly competitive, and companies may not be willing to incorporate accessible design features into their products if they believe it involves additional development time and expense.

Designing accessible features into new information technologies early in the design process provides persons with disabilities with immediate access and is more cost effective than retrofitting. Increasingly, functions are integrated onto single chips and motherboards, obviating the need for third party accessories such as sound cards or voice input devices, and making changes or modifications to these built-in features difficult or impossible. The earlier accessibility occurs in the design process for new products, the easier it is to incorporate accessibility features.

Universal design is a process whereby environments and products are designed with built-in flexibility so they are usable by all people, regardless of age and ability, at no additional cost to the user. While advances in computers and information technologies create new opportunities for some individuals, they create barriers for others. Information presented in graphical modes (i.e., images, photographs, icons) pose problems for people who are blind unless there are built-in ''hooks'' that can be identified by the user's screen reader. Conversely, audio cues (beeps) do not convey information to individuals who are deaf or hard of hearing. The proliferation of public access terminals creates unique accessibility challenges. Access to these terminals requires the use of keyboards, touch screens, telephone handsets, and smart cards and will require the development of flexible, multi-modal interface techniques that can work across all disabilities.

The ability to access computer-based information technologies is quickly becoming a prerequisite for successful employment. Companies are increasingly using internal networks, commonly referred to as intranets, to share information within the company. This presents unique problems for individuals with disabilities if the company uses proprietary software and databases that are specifically designed for their company and do not follow standard protocols. In those cases, the information may be inaccessible to individuals who use assistive devices (e.g., screen readers) to access their computers.

There are emerging information and communications policy issues that will have an enormous impact on technology development. Section 508 of the Rehabilitation Act of 1973, as amended, and the Telecommunications Act of 1996 require the development of accessibility standards and guidelines that direct government agencies, Federal customers and contractors, manufacturers, and developers to address accessibility for new and existing products.

Although computer and information technologies are expanding at phenomenal rates, it is also important to recognize that there are many individuals with disabilities who have problems accessing the current generation of technologies (e.g., integrating assistive devices with existing computer workstations). Continued support and guidance for these individuals are necessary to promote access to the computers and information systems they currently use.

Proposed Priority 1

The Secretary proposes to establish an RERC on information technology access for the purposes of developing technological solutions and promoting access for individuals with disabilities to current and emerging information technologies and technology interfaces,

including hardware, software, networks, nomadic technologies, the Internet and the World Wide Web. The RERC must:

(a) Develop and evaluate technological solutions in collaboration with industry to promote accessibility and universal design at the outset of the development of information technologies including software, hardware, intranets, and nomadic technologies;

(b) Develop through research and in collaboration with industry flexible, multi-modal interface techniques for computer and information technologies that provide universal access for all individuals with disabilities;

(c) Develop and disseminate strategies for integrating current accessibility features into newer generations of computer and information systems;

(d) Develop through research and in collaboration with Federal agencies, universities and industry the technologies necessary to promote access to current and emerging generations of the Internet and the World Wide Web for persons with disabilities;

(e) Develop and evaluate technologies and strategies to promote universal access to intranet systems;

(f) Provide technical assistance to public and private organizations responsible for developing policies, guidelines and standards that affect the accessibility of information technology products and systems that are developed, manufactured, and implemented; and

(g) Provide technical assistance and guidance to individuals with disabilities and employers on accessibility problems affecting current computer and information systems.

In carrying out the purposes of the priority, the RERC shall coordinate on research projects of mutual interest with the NIDRR-funded RERC on Telecommunications.

Proposed Priority 2: Communication Enhancement

Background

Speech and language disorders affect the way people talk and understand language, range from mild to significant, and may be developmental or acquired. According to the American Speech-Language and Hearing Association (ASHA), approximately 14 million individuals may be described as having a speech/language disorder (Bello, J., *Communication Facts,* ASHA Research Division, 1994). Two million of those individuals experience significant communication disorders and need access to augmentative and alternative communication (AAC) (Beukelman, D., *Augmentative and Alternative Communication*, Vol. 11, June, 1995). For the purpose of this priority, augmentative and alternative communication refers to all forms of communication that enhance or supplement comprehension, speech, and writing, including electronic devices and communication boards.

NIDRR is proposing to define the target population for this RERC as those persons with significant communication disorders and is particularly interested in receiving public comments on how the field defines significant communication disorders.

Historically, augmentative and alternative communication has been associated with specific technologies that provide individuals who have significant communication disorders with some type of alternative output. Research documenting successful AAC use has been confined primarily to adolescents and adults with reasonably intact cognitive capabilities and moderate to significant motor impairment (Shane, H., Presentation at ASHA Annual Convention, Seattle, 1995). This limited approach does not address the needs of all persons with significant communication disorders such as persons with mental retardation, aphasia, traumatic brain injury, and autism. A more holistic approach to communication enhancement strategies for persons with significant communication disorders must take into account the complexities of human language and incorporate those factors as unique physical, cognitive, and sensory manifestations and individualized learning styles.

There is a need for new and improved AAC technologies that take the more holistic approach to AAC intervention by addressing input technologies, language processing, and output strategies for a wide range of disabilities. These new or improved technologies could address an array of issues, including, but not limited to: speed enhancement and rate of communication that enable the user to operate in or close to real-time; cosmesis and aesthetics of devices; ergonomic and human factors relationships to interventions and technologies for significant communication disorders; quality, diversity, and naturalness of speech output as it relates to a user's actual voice; human and machine interface and multiple control options; using technology to reduce the burden on users with physical disabilities; reliability, portability, and cost; and developing and disseminating measurable outcomes of research.

Studies of the brain and language acquisition emphasize the importance of addressing the language needs of toddlers and school aged children who use or could use AAC (Blackstone, S., *Augmentative Communication News,* Vol. 10, No. 1, 1997). Often children and others with significant communication disorders encounter difficulty in processing and comprehending spoken language. In order to address the needs of these children and adults with significant communication disorders, systems to enhance communication must support comprehension as well as expression.

Reading and writing are interrelated skills that emerge as part of an interactive language and communication process that begins early in life and continues for approximately 6 years. This process is referred to as emergent literacy. Users of AAC in contrast to those who do not use AAC are often found to be in a phase of emergent literacy for many more years (Koppenhaver, D., et. al., *Technology and Disability,* Vol 2., No. 3, 1993). Emergent literacy and AAC use are interrelated processes. This relationship has an impact on the way in that the next generation of technology for communication enhancement should be studied and developed. Research issues related to emergent literacy of AAC users include, but are not limited to: the effects of AAC use on reading and writing development; differences in written language development between AAC users and non-users; the effects of early AAC use on emergent literacy; and the impact of different types of technologies on better understanding and use of written language in AAC users.

Aging presents a unique challenge to AAC researchers because technologies must address linguistic, speech, and sensory deterioration as well as tolerance for technology. As persons age, the need for communication enhancement technology increases, yet, according to data reported by the National Health Interview Survey in 1990 only six-tenths of one percent of individuals aged 65 or older were using AAC technology. Elderly persons with acquired communication disorders encounter a lack of awareness on the part of service providers and an absence of communication services in general.

To date there has been only minimal attention to the job options available for persons with disabilities who use AAC. Anecdotal reports suggest that individuals with severe communication disorders are frequently considered unemployable. The high rate of unemployment results from a number of

factors including, but not limited to: lack of skills, inadequate job preparation; attitudinal barriers; transportation barriers; architectural and accommodation barriers; and limitations in the AAC technology (Light, J., et. al., *AAC,* Vol. 12, 1996). Issues related to unemployment for users of AAC devices include, but are not limited to, compatibility with other technology on the worksite and the ability of the AAC user to transition easily from one task to another.

There are over 40 companies in the United States developing, manufacturing and distributing AAC devices. The next generation of development must challenge conventional AAC approaches and improve the way in that new technologies incorporate and blend principles of communication theories and engineering. Communicative competence ensures that individuals are able to attain communication goals that include expressing needs and wants, developing social skills and routines, and exchanging information (Light, J., *AAC,* Vol. 13, 1997). Communication competence is built over time through improved science, engineering, and the modification of environments, parameters, opportunities and instruction as well as improving communication tools.

Proposed Priority 2

The Secretary proposes to establish an RERC on communication enhancement to improve AAC technologies that can further the development of communication, language, natural speech, discourse skills, and literacy of persons with significant communication disorders. The RERC must:

(a) Develop and evaluate in collaboration with industry improved AAC technologies for individuals with significant communication disorders;

(b) Develop and evaluate strategies that promote literacy proficiency for AAC users;

(c) Develop and evaluate communication enhancement strategies and AAC technologies that factor in the speech, linguistic and multiple sensory needs of the elderly;

(d) Investigate and disseminate strategies to build the capacity of service providers and increase their involvement with elderly persons with significant communication disorders who use or could use AAC; and

(e) Identify barriers that negatively affect the employment status of individuals with significant communication disorders who use, or could use, AAC and develop and evaluate approaches to improve their employment status.

In carrying out the purposes of the priority, the RERC must:

- Coordinate on research projects of mutual interest with the NIDRR-funded RERC on Hearing Enhancement;
- Address the needs of individuals of all ages with significant communication disorders including, but not limited to, toddlers and the elderly; and
- Address the needs of persons with developmental disabilities and acquired disabilities including but not limited to mental retardation, aphasia, traumatic brain injury, and autism.

Proposed Priority 3: Ergonomic Solutions for Employment

Background

The familiar components of the work environment (i.e., tools, machines, and equipment) often are designed without adequate consideration for the people who must use them. Similarly, work tasks may require capabilities that individuals do not have or cannot sustain over long periods of time without injury. Improperly designed workplaces can lead to fatigue, discomfort, and injury that result in reduced productivity and increased costs for employers. These same work environment components may present additional physical barriers to persons with disabilities and negatively impact their employment status.

The Bureau of Labor Statistics estimates that 62 percent of all workplace injuries in 1995 resulted from trauma caused by repetitive stress injuries (RSI) (commonly referred to as cumulative trauma disorders or CTDs)—up from 15 percent in the early 1980s. The National Institute for Occupational Safety and Health (NIOSH) estimates that annual U.S. medical costs from repetitive stress injuries total $13 billion (NIOSH, ''Musculoskeletal Disorders and Workplace Factors,'' July, 1997), and the Labor Department's Occupational Safety and Health Administration (OSHA) has estimated overall costs at nearly $100 billion a year when one considers lost work time, lost productivity, and retraining costs.

Ergonomics is an interdisciplinary field concerned with the performance and safety of individuals at work and how they cope with the work environment, interact with machines, and, in general, negotiate their work surroundings (Scheer, S. and Mital, A., ''Ergonomics,'' *Archives of Physical Medicine & Rehabilitation,* Volume 78, pg. 36, March, 1997). Ergonomic principles are based on a combination of science, engineering, and biomechanics (the study of the body as a system operating under two sets of laws: Newtonian mechanics and the biological laws of life) and are used to promote the proper design of products, workplaces, and equipment (Kroemer, K.H.E., et. al., *Ergonomics: How to Design for Ease & Efficiency,* Prentice Hall, N.J., pgs. 6–7, 1994). When these principles are applied correctly, the incidence and severity of musculoskeletal disorders decrease (Stobbe, T.J., ''Occupational Ergonomics and Injury Prevention,'' *Occupational Medicine,* pgs. 531–543, July, 1996) thereby reducing the likelihood of work related injuries and employer costs.

Cumulative trauma disorders (CTDs) are a class of musculoskeletal disorders involving nerves, tendons, muscles and supporting bony structures (i.e., back, neck, shoulders, and hands). They represent a wide range of disorders that can differ in severity from mild periodic conditions to those that are severe, chronic and debilitating. Since the early 1980s, there has been a dramatic increase in CTDs. OSHA attributes much of this increase to changes in production processes and technologies, resulting in more specialized tasks with increased repetitions and higher assembly line speeds. Two of the most frequently occurring, occupationally induced CTDs are carpal tunnel syndrome and low back pain.

Carpal tunnel syndrome is a condition caused by pressure on the median nerve as it passes through the carpal tunnel of the wrist; it results in the gradual onset of numbness and tingling in one's thumb and the first two and a half fingers of the hand.

If allowed to continue, carpal tunnel syndrome may cause pain, muscle atrophy at the base of the thumb, and clumsiness (Phalen, G.S., ''The Carpal-Tunnel Syndrome: Seventeen Year's Experience in diagnosis and Treatment of Six-Hundred Fifty-Four Hands,'' *The Journal of Bone and Joint Surgery,* pgs. 211–228, 1996). Carpal tunnel syndrome is recognized as a disabling condition of the hand caused by excessive or repetitive movements, undesirable hand positions, or exertions that impose prolonged loads on the affected tissues (Huenting, H., et. al., ''Constrained Postures in Accounting Machine Operations,'' *Applied Ergonomic,* Volume 11, pgs.145–149, 1980).

Improper working posture is a major factor in the development of lower back pain. The strain on one's body may be caused by external loads (e.g., when one lifts, lowers, pulls, pushes, carries, holds onto heavy objects or any combination of these factors) or by simply moving one's own body or by

maintaining postural support using muscle tension alone. In addition to the loss in function and pain, the direct and indirect costs associated with lower back injuries are significant. There is a need for reliable and validated measurement tools to measure mechanical strains within the body and to incorporate the various findings into models of strains and capabilities (Kroemer, K.H.E., op. cit., pgs. 473–475).

The ability to perform physical work depends greatly upon a number of variables including an individual's age, size, strength, overall health and fitness, training, motivation, and one's physical dexterity. A common approach to matching an individual's work capacity with specific job tasks is to assess the individual's overall energy capacity by measuring heart rate and oxygen consumption while on a treadmill or bicycle ergometer and then comparing that information with the amount of energy it takes for a ''normal'' person to do the specific job tasks (Kroemer, K.H.E, op. cit., pgs. 118–131). Improper matches can lead to early fatigue, and impact a person's ability to do the job tasks safely and efficiently.

Individuals with disabilities present unique ergonomic challenges particularly if they use assistive devices to overcome deficits and function independently. The use of ergonomic knowledge in rehabilitation engineering is widespread, ranging from wrist splints to environmental control systems. Technology for people with significant disabilities depends increasingly on the development and implementation of sophisticated devices including voice input systems, screen readers, and eye tracking systems. However, development alone of those types of devices does not ensure success. It is sometimes necessary to quantitatively measure one's residual capabilities and energy capacity and compare these results with specific job tasks. After selecting the appropriate ergonomic solutions, it is necessary to have the individual demonstrate the usability of those solutions within the worksite environment and make the necessary changes or adaptations to ensure proper use and fit. There are testing devices and procedures that have been developed to quantitatively measure the residual capabilities of impaired persons, such as the Basic Elements of Performance Test and the Available Motions Inventory Test (Smith, R.V. and Leslie, J.H., *Rehabilitation Engineering*, CRC Press, pgs. 127–143, 1990). These tests measure an individual's ability for specific tasks (i.e., reach, grasp, manipulation), but do not measure one's ability to incorporate complex assistive devices into the workplace of people with significant disabilities.

Elderly individuals are working longer than ever before and the proportion of people with work disability (defined as a limitation in work due to chronic illness or impairment) increases with age (Disability Statistics Program, ''People with Work Disability in the U.S.,'' *Disability Statistics Abstract*, U.S. Department of Education, Volume 4, May, 1992). Older workers face unique ergonomic challenges due to other changes that occur naturally as part of the aging process (i.e., changes in biomechanical features, respiratory capabilities, visual functions, hearing, reaction times, etc). Without proper ergonomic design and strategies, older workers could well find themselves at an unnecessary disadvantage due to compromised productivity and health.

Proposed Priority 3

The Secretary proposes to establish an RERC on ergonomic solutions for employment to develop ergonomic strategies and devices to reduce and prevent the outset of cumulative trauma disorders and to assist persons with disabilities in obtaining and maintaining appropriate employment. The RERC must:

(a) Investigate the biomechanical factors that lead to cumulative trauma disorders including, but not necessarily limited to, carpal tunnel syndrome and low back injuries;

(b) Develop and evaluate worksite ergonomic analysis tools to determine the causes of ergonomic stress associated with repetitive motions, awkward postures, and excessive energy expenditure;

(c) Investigate and improve existing ergonomic strategies and devices used to prevent cumulative trauma disorders and develop new strategies when appropriate;

(d) Design and develop ergonomic strategies and devices for integration of ergonomic solutions for workers with disabilities; and

(e) Design and develop ergonomic strategies and devices to reduce and prevent cumulative trauma disorders among elderly workers.

In carrying out the purposes of the priority, the RERC shall coordinate on research projects of mutual interest with the RRTC on Workplace Supports to Improve Employment Outcomes.

Proposed Priority 4: Hearing Enhancement

Background

Individuals whose hearing is impaired, but who can understand conversational speech with, or without, amplification are hard-of-hearing (HoH). Individuals classified as HoH range in age from infants to the elderly. The National Center for Health Statistics (NCHS), using the ''Gallaudet Hearing Scale'' that is self-reporting and quantifies the amount of interference with hearing in ordinary day-to-day situations, estimates that the number of persons who are HoH and who might benefit from using a hearing aid ranges from 20 million to 22 million (''National Health Survey,'' Series 10, No. 188, 1994).

Developments over the past five years have resulted in significant growth in digital hearing aid technology, improved evaluation of hearing loss, especially in very young children, improved computer assisted fitting of hearing aids, and more cosmetically acceptable hearing aids that do not sacrifice important functions for the sake of appearance. Modern science and technology continue to offer even greater opportunity for improvements in the simplification and automation of hearing loss evaluation and in the proper fitting of appropriate hearing aids to individual users. Concurrently there have been important developments in related areas, such as assistive listening devices (ALDs) and in automatic speech recognition (ASR), a technology that enables a person to dictate words into a microphone and have those words converted into computer-language text. The 1996 National Strategic Plan of the National Institute on Deafness and Other Communication Disorders (NIDCD) reflects a growing realization that new technology offers potential relief from the symptoms of tinnitus. New developments in ultra-thin circuit boards and chips, flash ROM, better power management, and other forms of emerging technology offer increasing opportunities to expand features available in the next generation of hearing enhancing devices.

While improving, consistent and early identification of hearing loss in small children remains problematic. The diagnostic technology needs to be simplified and made available to pediatric and child care personnel with minimal training in audiology.

The proper fitting of hearing aids ensures that tonal quality, amplification levels, and environmental noise are controlled to the maximum extent

possible. New developments in sophisticated digital hearing technology must be accompanied by new training and fitting procedures to ensure that new multi-channel aids deliver maximum performance.

Tinnitus affects about 17 percent of the general population and about 33 percent of the elderly (Jastreboff, P. and Hazell, J., ''Neurophysiological Approaches to Tinnitus'' *British Journal of Audiology*, 1993). Tinnitus is described as an incessant ringing in the ears or other head noise that is heard when there is no external cause for that noise. Currently, there is no cure for tinnitus (Goldstein, B. & Shulman, A., ''Tinnitus Masking—A Longitudinal Study of Efficacy/Diagnosis 1977–1994.'' Proceedings of the Fifth International Tinnitus Seminar, 1995). Often, tinnitus accompanies hearing loss. However, there are cases of severe hearing loss without tinnitus. Tinnitus also occurs without evidence of other auditory system diseases or disorders.

This variation drives the need for better dual channel hearing aid/tinnitus maskers and single channel tinnitus maskers. Although there are currently some devices on the market that combine amplification and masking, those efforts have not been widely accepted, possibly because recent technical developments in miniaturizing have not been fully exploited (Gold, S., et. al., ''Selection and Fitting of Noise Generators and Hearing Aids for Tinnitus Patients.'' Proceedings of the Fifth International Tinnitus Seminar, 1995).

In recent years there have been significant advances in assistive devices that enhance the ability of individuals to integrate more successfully in personal and business arenas. In a survey by one of the largest organizations for the HoH, Self-Help for the Hard of Hearing (SHHH), it was found that nearly half of its membership used assistive listening devices, both personal devices and large room systems (Sorkin, D., ''Understanding Our Needs: The SHHH Member Survey Looks at Hearing Aids.'' *SHHH Journal*, Vol. 16, No. 4, 1995). Perhaps the most promising new technology for broadening the application of assistive devices is ASR. The potential for using speech-to-print mechanisms based on ASR offers promising benefits including real-time transcription in meetings and automated telephone relay services to HoH persons. However, the mechanisms to realize the full potential of those benefits for this population remain to be developed.

There is a need for improvements in the shielding of hearing aid components from the emission of extraneous electronic signals. The Federal government is working to establish standards to reduce those signals from a multitude of devices regulated by the Federal Communications Commission (FCC). However, the probability of blanket suppression of all sources is low.

Proposed Priority 4

The Secretary proposes to establish an RERC on hearing enhancement to develop new and improve existing technologies for persons who are HoH. The RERC must:

(a) Evaluate current technology available for hearing aids, ALDs, tinnitus maskers, and ASR systems and develop improvements for these technologies including, but not limited to, improved shielding for extraneous electronic signals and new training and fitting procedures for new multi-channel aids;

(b) Develop and evaluate new, emerging technology for integration into more advanced versions of next generation hearing aids and ALDs;

(c) Automate and simplify methods for conducting hearing loss evaluation in infants, children, and adults;

(d) Develop training and technical assistance materials and provide training and technical assistance to hearing aid developers, technicians, and appropriate organizations representing persons who are HoH to enable them to effectively address the hearing enhancement needs of individuals who are HoH;

(e) Develop and evaluate protocols for incorporating improved tinnitus masking technology into next generation hearing aid models;

(f) Develop and evaluate protocols for efficient integration of ASR with interfacing needs of persons with hearing loss including, but not limited to, ''real-time captioning,'' automated relay telephone systems, and personal hand-held communicators; and

(g) Develop training and technical assistance materials and provide training and technical assistance to hearing aid fitters, pediatric and audiology personnel, appropriate counseling organizations, and organizations representing people who are HoH to enable them to address effectively the hearing aid needs and adjustment to hearing loss problems experienced by persons who are HoH and also to provide appropriate counseling and guidance to individuals who experience tinnitus;

In carrying out the purposes of the priority, the RERC shall coordinate on research projects of mutual interest with the NIDRR-funded RERCs on Universal Telecommunications Access and Communication Enhancement and the NIDRR-funded RRTC on HoH/Late Deafened.

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Note: The official version of this document is the document published in the **Federal Register**.

Invitation to Comment

Interested persons are invited to submit comments and recommendations regarding these proposed priorities. All comments submitted in response to this notice will be available for public inspection, during and after the comment period, in Room 3424, Switzer Building, 330 C Street S.W., Washington, D.C., between the hours of 9:00 a.m. and 4:30 p.m., Monday through Friday of each week except Federal holidays.

Applicable Program Regulations: 34 CFR Parts 350 and 353.

Program Authority: 29 U.S.C. 760–762. (Catalog of Federal Domestic Assistance Number 84.133E, Rehabilitation Engineering Research Centers)

Dated: October 23, 1997.

Judith E. Heumann,

Assistant Secretary for Special Education and Rehabilitative Services.

[FR Doc. 97–28693 Filed 10–29–97; 8:45 am]

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