NTID Research Bulletin

Center for Research, Teaching and Learning • National Technical Institute for the Deaf • Rochester Institute of Technology

Vol.6 No.1 Winter 2001

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Parasnis has conducted and published research in deafness on visual cognition, cultural and language diversity, learning disabilities and attention deficit disorders, and applications of personal captioning technology in the classroom. Her current research interests include assessment of ADHD and poor reading skills in deaf people using visual tests, and studying the implications of cultural diversity for deaf education. For more information, contact her at IMPNCR@RIT.EDU

Evaluating ADHD in the Deaf Population: Challenges to Validity

By Ila Parasnis, Vincent J. Samar, Gerald P. Berent

Attention Deficit Hyperactivity Disorder (ADHD) is a highly heritable, neurobiologically based disorder of attention and self-control that can seriously impair an individual's ability to learn and succeed in school and life. Survey studies broadly estimate an incidence of ADHD in the deaf population of 3.5% to 38.7%, with the highest rates of ADHD occurring in children with acquired deafness as opposed to hereditary deafness (see Samar, Parasnis, & Berent, 1998). Regardless of the exact incidence, ADHD is one of the most frequent and pressing secondary disabilities requiring evaluation and services for affected deaf individuals.

ADHD is associated with two distinct behavioral patterns. The first pattern is characterized by *inattentiveness*. ADHD individuals who display this pattern have severe difficulty concentrating on information and events in daily life. For example, their attention may wander during reading, or they may be easily distracted by competing conversations or irrelevant sounds. The second behavioral pattern is characterized by *hyperactivity* and *impulsivity*. ADHD individuals who display this pattern may fidget frequently, leave their seats at inappropriate times during classes or meetings, or interrupt others often. They also may have difficulty discriminating relevant from irrelevant information and events. Generally, they may act impulsively rather than reflectively, exercising indiscretion and poor self-control. Based on these two distinct behavior patterns, the *Diagnostic and Statistical Manual of the American Psychiatric Association IV* (1994) has defined behavioral criteria for three major types of ADHD: ADHD – Primarily Inattentive Type, ADHD – Primarily Hyperactive/Impulsive Type, and, ADHD – Combined Type.

Children with ADHD have a recognized risk of developing a variety of problems, including school failure, low self-esteem, antisocial behavior, psychiatric disorders, social rejection, drug and alcohol abuse, and juvenile criminal behavior. Concern about these sweeping educational, personal, and social consequences of ADHD underlies existing government policy obligating school districts to provide appropriate services and special education to children with ADHD (Davila, Williams, & MacDonald, 1991). Currently, to be eligible for federal assistance under the Individuals with Disabilities Education Act (IDEA), states must have policies and procedures in place to ensure that school children with ADHD are identified and evaluated to determine if they need special education and related services.

The development of valid and reliable assessment tools and protocols to diagnose ADHD is crucial for schools to meet this obligation. No single tool or protocol is currently reliable or valid enough to ensure accurate diagnosis. Hence, the IDEA has mandated that schools must use a variety of tools and assessment strategies, and now schools commonly base their evaluations on convergent data from several of the following sources:

1. Good clinical judgment by a qualified evaluator.
2. A detailed history including medical,

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Notes of Note

Harry Lang has received funding for two grant projects from the National Science Foundation. The first, "Clearinghouse On Mathematics, Engineering, Technology and Science (COMETS): A Comprehensive Resource in the Education of Deaf Students" will become a major resource to provide asynchronous information through interactive components, and will build a network for systemic reform in the education of deaf students in science, engineering, mathematics and technology. Field-testing of the applicability of the information and dissemination strategies, and evaluation of the World Wide Web as a strategy for distance teacher education are major components of the project. **Gail Kovalik**, currently grants coordinator at NTID and editor of the *NTID Research Bulletin*, will serve as project coordinator for the grant project.

Lang will also serve as a Co-PI on an integrated science curriculum project for deaf students ("Classroom of the Sea") using interdisciplinary

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Jeffrey Porter
Interim Director, CRTL

Making Assumptions…and Beyond

Like the rest of us in the species, researchers make assumptions constantly about this and that in their daily lives…from assuming that *you* were going to stop off for the bread to assuming that the stock market eventually *will* rebound. Assumptions are the "reality lubricant" we all use to navigate through our day.

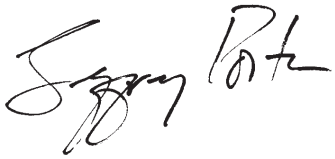
But when it comes to matters of professional interest and intellectual curiosity, people who do research live out a peculiar "habit of mind" that compels them not only to make, but to test, assumptions. By "testing assumptions," I mean simply (and there is nothing simple about it) determining whether or not the way the world actually works conforms to our individually and collectively held beliefs and practices, and going about it in ways that make it hard to fool ourselves, and others, about the results and meaning of such testing. Actually, with experience, we all learn to appreciate the wisdom of testing the assumptions we hold near and dear, being as honest with ourselves as possible in deciphering the results. Researchers just do it in more formal and rigorous ways (no doubt reflecting the assumptions of their craft).

The notion of both making *and* testing assumptions nicely sets the stage for what you'll come across in this issue of the *NTID Research Bulletin*. Ila Parasnis, Vince Samar, and Jerry Berent report on the use with deaf individuals of a well-known assessment tool designed and normed for detecting ADHD with hearing individuals. The article succinctly demonstrates the importance of testing *every* assumption regarding how deaf and hearing learners are the same and different.

In addition, Ken Nash and Alan Hurwitz report on Project Access, an innovative experiment undertaken by Hungarian and US colleagues that bursts the assumption that expertise and commitment to improving the education of students who are deaf and hard of hearing are confined by national boundaries. Project Access is a masterful example of deaf education and, the research supporting it becoming more and more global, bridging national interests and efforts.

And finally, included in the insert is a compilation of last year's research activities undertaken by members of NTID's Department of Research (complete with a sampling of outcomes) with a glimpse of this year's ongoing research projects. The assumption played out here, and proven again and again to be true, is that the meaningfulness and impact of research often is greater when it jointly reflects the needs and interests of both practitioner *and* researcher. It is in this spirit that your feedback in light of these past and current activities is most sincerely requested in helping to shape the Department of Research's future research agenda. (Please refer to the insert for "who" and "how" to send along such feedback.)

Making assumptions allows us to make our way through the day; testing assumptions lets us do so effectively. I trust you'll find the contents herein engaging and relevant…test this assumption for me!



NTID Research Bulletin
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Opinions expressed in the *NTID Research Bulletin* do not reflect those of NTID or RIT. Your comments, questions, and requests for more information are welcome. See following address.

If you wish a copy of the *NTID Papers & Publications 2000* or if you know of colleagues who would enjoy receiving the *NTID Research Bulletin*, please send names and addresses to:

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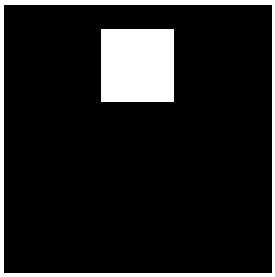
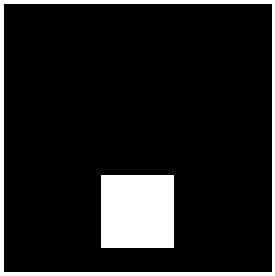
Gail Kovalik, Editor

Figure 1.
Target and non-target stimuli for the T.O.V.A. Several hundred stimuli flash in random order on a computer screen. The viewer presses a button when a target appears and withholds any response when a non-target appears.



Target: Press the button quickly! Be accurate!



Non-Target: Don't press the button!

Vince Samar is an associate professor in the Department of Research at NTID.

Samar has conducted and published research in deafness on learning disabilities, language assessment, the neurocognitive mechanisms of language and visual attention, and applications of personal captioning technology in the classroom. His current research focuses on neural and psychophysical markers for reading disability in deaf individuals. For more information, contact him at VJSNCR@RIT.EDU

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psychological, developmental, social, educational, and familial factors.
3. Evaluation of academic achievement.
4. Use of standardized and objective assessment measures, including:
   a. Self, parent, or teacher rating scales to evaluate ADHD-related behaviors.
   b. Psychometric tests of intellectual and cognitive functioning.
   c. Continuous Performance Tests (CPTs) that directly evaluate inattentiveness and impulsivity.

This multifaceted approach generally improves diagnostic accuracy for all children. However, when evaluating *deaf* children, schools are immediately confronted with serious additional validity issues. A qualified evaluator for hearing children may not be qualified for deaf children. A qualified evaluator for deaf children must not only be a certified mental health professional with experience with ADHD diagnosis, but must also be capable of communicating through sign language, when appropriate, and have a broad understanding of the normal behaviors that stem from the typical developmental consequences of deafness. Many normal behaviors of deaf children, such as looking about the room to monitor communication, might be judged as evidence of "distractibility" by an evaluator unfamiliar with the communication and cultural consequences of deafness.

Similarly, the use of rating scales, psychometric tests, and CPTs with deaf children and adults is fraught with language, cultural, and procedural difficulties. ADHD test materials and instructions are generally not available in a signed or bilingual format. Nor are norms for the deaf population generally available for most ADHD assessment tools.

Recently, we have studied the validity of using existing CPT norms to diagnose ADHD in deaf individuals. CPTs are the most recent advance in practical ADHD diagnostic technology. A CPT requires an individual to maintain vigilance while watching a long sequence of letters or shapes presented rapidly on a computer screen. The individual must press a button whenever one particular target letter or shape appears. By analyzing the individual's reaction times and target detection accuracy, the CPT software can detect patterns of responses that indicate either frequent lapses of attention on the one hand or highly impulsive response errors on the other. Thus, CPTs directly assess an individual's behavior on the two major dimensions of ADHD, namely, inattention and impulsivity/hyperactivity.

Because CPTs are quantitative and objective, they are quickly becoming a stock-in-trade tool in the nation's schools and clinics to evaluate both hearing and deaf individuals suspected of having ADHD. However, previous research suggests that the existing CPT norms may not be appropriate for general use with deaf individuals.

Previous Research

Recent studies employing a widely used CPT, the Test of Variables of Attention (T.O.V.A.) (Greenberg & Waldman, 1993) have demonstrated that T.O.V.A. measures of impulsivity/hyperactivity correlated significantly with teacher ratings of

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marine science, based at the University of Connecticut, the National Undersea Research Center, and the American School for the Deaf. He will be responsible for educational research on communication of technical content in the classroom.

For more information about either project, or to be placed on the listserv for COMETS, contact Lang at *HGL9008@RIT.EDU*.

Robert Whitehead's article, "Sentence intonation and syllable stress in speech produced during simultaneous communication," with N. Schiavetti, D. Metz and B. Whitehead, was recently published in the *Journal of Communication Disorders, 33* (September/October), 429-441.

The editor of the *NTID Research Bulletin* has just been notified that our second issue, volume 1, number 2, spring 1995, has been selected as a

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Figure 2.
A still from one videotaped item of the bilingual ASL-English ADSA. The English text preceded the ASL rendition.

Patrick Graybill, NTID Department of Cultural and Creative Studies, and June Reeves, NTID Department of American Sign Language and Interpreter Education, collaborated with the authors to translate the ADSA items into ASL. Patrick presented the ASL items on videotape.

Gerald P. Berent is an associate professor in the Department of Research at NTID.

Berent's current research interests include the description and explanation of deaf students' English language knowledge, the effects of varying levels of grammatical competence on students' reading comprehension and written expression, and the comparison of deaf students' English acquisition with the acquisition of English as a second language by hearing students. His research activities also include the exploration of diagnostic measures for assessing English language knowledge and the identification of learning disabilities and attention deficit disorders in the deaf population. For more information, he can be reached at GPBNCI@RIT.EDU

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hyperactive behavior in deaf children and with self-reported difficulties with inattention and hyperactivity in deaf adults (Sporn, 1997; 1999). These data suggest that the T.O.V.A. might validly assess ADHD in deaf individuals.

However, several studies (e.g., Harris, 1978) have also reported that some subgroups of deaf children (e.g., deaf children of hearing parents) display less impulse control than other deaf children (e.g., deaf children of deaf parents) and than hearing children on various psychological and psychometric measures. More recent studies have shown that a substantially greater proportion of deaf children tend to make more errors on CPTs, than hearing children, especially errors of the impulsive type (Mitchell & Quittner, 1996; Sporn, 1997). The cause of these deaf-hearing differences is unclear. These studies did not screen their participants for ADHD, so different population proportions of ADHD in their deaf and hearing samples might have contributed to their results. However, a number of deafness-related communication, cultural, and social-emotional factors seem to be more plausible sources of population differences in impulsivity (Quittner, Smith, Osberger, Mitchell, & Katz, 1994). If so, then CPTs done on deaf individuals but referenced to norms based on a hearing sample would tend to overdiagnose the impulsive forms of ADHD in many of those individuals. Recently, we confirmed this suggestion by comparing the performance of deaf and hearing college students with no known history of ADHD on the T.O.V.A. Our work is briefly summarized below.

T.O.V.A.

The T.O.V.A. is a 22.5 minute non-verbal vigilance task in which 648 target and non-target stimuli are randomly presented at a rate of about once every two seconds (see Figure 1). Response times to targets and accuracy for targets and non-targets are recorded.

The T.O.V.A. software computes several "variables" or measures of speed and accuracy based on the response times and error types. One set of variables, the *inattention measures*, determine how well the individual maintained attention to the targets. Another set of variables, the *impulsivity measures*, determine how sensitive the individual is to the distinction between relevant stimuli (targets) and irrelevant stimuli (non-targets) and how well the individual inhibits responses to the irrelevant stimuli. The T.O.V.A. software automatically compares an individual's scores against the norms for each of these inattention and impulsivity measures and reports what type of ADHD might be present.

Validity of the T.O.V.A. for Evaluating Deaf Adults

We wanted to determine whether the previously reported T.O.V.A. performance differences between deaf and hearing children hold for deaf adults with normal attentional abilities, and to further examine the validity of the T.O.V.A. for deaf adults. We selected 44 prelingually deaf and 38 hearing college students with no known history of ADHD. To confirm that our deaf and hearing groups were comparable in their ADHD-related behavioral patterns at the outset, we administered the Attention Deficit Scales for Adults (ADSA). To ensure linguistic and cultural validity, we developed a bilingual ASL-English version of the ADSA for use with our deaf participants (see Figure 2). The ADSA asks students to rate themselves on a 5-point scale of always to never on each of 54 questions about their behavior. Table 1 shows a sample of the ADSA questions for each of the nine subscales of the ADSA.

The ADSA results showed that our deaf and hearing samples had means and variances very similar to each other and to the ADSA normative sample for each of the nine subscales. These results suggest that our deaf and hearing groups had equivalent and normal attentional abilities and that the ADSA is a valid behavioral scale for the deaf adult population when care is taken to provide culturally and linguistically fair testing.

We administed the T.O.V.A. and the Test of Nonverbal Intelligence (C-TONI) to our participants. Briefly, our analyses and results were as follows:

Table 1.
Nine content subscales of the ADSA measure different types of ADHD-related behaviors (sample items in quotes).

Attention-Focus/Concentration: "I tend to daydream."
Interpersonal: "My intimate relationships have been short-lived."
Behavior-Disorganized Activity: "I jump from one task to another."
Coordination: "I feel clumsy and awkward."
Academic Theme: "I have trouble explaining my ideas to others."
Emotive: "I feel stressed by the demands and expectations of others."
Consistency/Long-Term: "I finish the home projects I start."
Childhood: "As a child I was described as clumsy."
Negative-Social: "I do not have much patience with people."

1. Deaf and hearing participants' scores on each T.O.V.A. variable were compared with Analyses of Covariance, using the C-TONI to remove the influence of individual differences in IQ on the T.O.V.A. scores. Deaf and hearing adults had equivalent T.O.V.A. scores on the inattention variables. However, compared to hearing adults, deaf adults showed significantly increased impulsivity response patterns on the T.O.V.A., namely, twice as many false identifications of non-targets, three times as many premature responses to targets and non-targets that had not yet been presented, faster but less accurate responses to targets, and decreased perceptual sensitivity.
2. A factor analysis of all of the T.O.V.A. variables was computed for deaf and hearing groups separately. For each group the first factor that emerged was an impulsivity factor. The second factor was an *inattention* factor. The factor structures for deaf and hearing participants were nearly identical.

The finding that deaf adults with apparently normal attentional abilities perform more impulsively on the T.O.V.A. than hearing adults is consistent with earlier findings of greater impulsivity in deaf children. These results strongly indicate that separate T.O.V.A. norms must be developed for the deaf population in order to avoid overdiagnosis of the impulsive forms of ADHD. Nevertheless, the finding that deaf and hearing participants produced an inattention and an impulsivity factor for the T.O.V.A. suggests that the T.O.V.A. measures the same underlying attentional processes in deaf and hearing people. Consequently, our results imply that the T.O.V.A. will have equivalent validity for a deaf and hearing population *once the T.O.V.A. is appropriately normed on a deaf reference sample*.

In general, our work underscores the need to carefully evaluate the validity of existing assessment instruments and test norms when developing a protocol to evaluate deaf individuals for ADHD. Even a multifaceted protocol for ADHD evaluation will not succeed in minimizing misdiagnosis of ADHD in deaf individuals if the component procedures and tests are not individually designed to avoid cultural and language biases, and norms which are developmentally appropriate for the deaf population must be used.

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Sporn, M.B., (1999). *The use of the Test of Variables of Attention to predict attention and behavior problems in deaf adults.* Unpublished doctoral dissertation project, Gallaudet University, Washington, DC.

Project Access: A Partnership of Success

Ken Nash is an associate professor in the Department of Research at NTID. He is the Director of Project Access.

T. Alan Hurwitz is Dean at NTID.

[Project Access is an American-Hungarian strategy to bring Hungarian deaf pupils into the age of Information Technology (IT) and to create the first-ever IT curriculum for deaf students in Central and Eastern Europe. Hungarian educators, working with US colleagues, are creating an industry-oriented curriculum that is adapted to the learning style of deaf students. Eight Hungarian schools, linked to the Internet, have created their own Web sites, and have participated in ongoing workshops conducted by Hungarian and American specialists in IT and deaf education. Project Access was funded with $500,000 from the Open Society Institute (OSI), with matching time and commitment by a broad range of US and Hungarian educational institutions, IT companies, and the Hungarian-American Chamber of Commerce. Below is the text of a speech delivered by T. Alan Hurwitz, Dean of NTID, at the Project Access Conference, Hungarian Academy of Sciences, November 17, 2000. See ***www.rit.edu/access*** *for more information on Project Access.]*

We are here to celebrate the success of Project Access—what has been accomplished and what will be accomplished on behalf of deaf students in Hungary. Project Access began on January 15, 1999.

• In February, 1999 the heads of all eight schools for the deaf braved the Rochester winter to meet their US partners. A joint plan of operation was developed. Commitments were finalized.

• In April, 1999, a delegation of US educators visited the eight Hungarian schools. The schools had little equipment, no IT curriculum, and few trained staff. Internet connection was not feasible. There was no contact with the IT industry. The Ministry of Education had given the schools for the deaf its lowest priority: the schools for the deaf could expect assistance in the year 2002, or later. Prospects were not good. So, in April, equipment priorities were determined, an international IT advisory committee was established, and the process of selecting teachers to be trained in the US began.

• On July 6, 1999, at about midnight, 24 tired Hungarian teachers landed in Toronto, and after a 2 a.m. visit to Niagara Falls, rolled onto the RIT campus. Instruction was bilingual—thanks to the assistance of the Rochester Hungarian Club and several Hungarian teachers of English who kept things flowing. The Hungarian team spent their days in the classroom and their nights on the computer—by their own choice. The Hungarian delegation was the most motivated group we have ever worked with. Many began with little or no IT skills. The Internet was foreign territory. Browsers were unknown. For better or worse, they had never experienced a "systems failure." Their progress was absolutely remarkable; I give my compliments to the headmasters who selected the Hungarian teachers, to each of the teachers, to the NTID and RSD [Rochester School for the Deaf] instructors, and the team of interpreters. The training program was a great success. Each participant received a certificate from RIT nominating them as a "Soros Fellow." Senior representatives from the Open Society Institute took time from their busy schedules to attend the "graduation."

• By October, 2000, each school had built its own IT lab. The teachers did most of the work themselves. The labs were equipped with the latest computers, scanners, a digital camera, software and numerous other items. Each lab reflected the needs of the

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featured site in Lightspan's StudyWeb® as one of the best educational resources on the Web. StudyWeb® is one of the Internet's premier sites for educational resources for students and teachers. Each site in StudyWeb® includes a detailed review describing its editorial and visual merits. If you are unfamiliar with StudyWeb®, check it out at *www.studyweb.com*.

Jerry Berent presented "English for deaf students: Assessing and addressing learners' grammar development" at the first-ever conference on Teaching English to Deaf and Hard-of-Hearing Students at Secondary and Tertiary Level of Education held at Charles University in Prague, Czech Republic, November 1-3, 2000.

With **Bill Clymer** (Educational Resources), he presented "A Web-based resource for teaching English to deaf students" at the New York State Association of Educators of the Deaf convention in Saratoga Springs, NY, November 8-10, 2000.

At the April, 2000, Project Access Advisory Board meeting in Budapest, Egon Toth (right), principal of the Budapest School for the Deaf, presents Dr. Harold Mowl (left) with a Soros Plaque for him to carry back to the Rochester School for the Deaf (RSD). Staff at RSD provided a great deal of expertise, time and support to Project Access. Also shown in the photo is Dr. Alan Hurwitz, Dean at the National Technical Institute for the Deaf.

This picture was downloaded from Project Access' website.

students in that school.

• By October, 2000, each school was linked to the outside world through the Internet. For the first time, Hungarian deaf students were connected beyond their school, their town, and their country. The cost of connection time in Hungary is the highest in Europe, but the schools sacrificed so that they could introduce their students to the benefits of information technology.

• By October, 2000, each school had created its own Web site. These sites were linked to the Project Access site in Rochester and to numerous databases worldwide. For the first time, Hungarian deaf education had a presence in cyberspace. Yahoo could find them.

• In May, 2000, an international committee selected Project Access as a finalist for the Stockholm Challenge. The Stockholm Challenge is sponsored by the city of Stockholm, the EU, and numerous companies. It is an international competition for IT projects that focuses on the benefits and changes that IT can bring to communities. There were more than 500 entries from around the world. Project Access was one of the few from Hungary, and the only one that involved two countries. Five Hungarian representatives attended the Challenge—they learned, but they also shared with the world—and brought home recognition, respect and connections.

• For the past year, the Hungarian educators have been adapting teaching programs, creating applications, and focusing their energies on the instructional process. Teams have developed 18 new, unique applications to teach deaf children.

• Over the past year numerous exchanges have occurred. For example, Elissa Olsen, an NTID faculty member, spent six weeks in Hungary. Elissa has many years of experience with IBM. Her presence in Hungary was an example to Hungarian deaf students. Her presence speaks to the long-term goal of Project Access—bringing Hungarian deaf citizens into the "civil society." Key to that goal is full participation in the workforce.

• Project Access has involved more than 175 different people—each contributing his or her own expertise, and in turn, learning even more. It is a real partnership. Hungary now has a team of deaf educators who are also skilled in IT. Local capacity has been established. And plans are underway to maintain the activities once OSI funding ends. Hungary is emerging as model for Europe.

• All this was done in such a short time.

• All this was done **on time and within budget**.

It is a remarkable achievement. I compliment all the partners:

1. each of the eight Hungarian schools for the deaf (Szeget, Debrecen, Koposvar, Eger, Vacs, Sopron, Budapest Hard of Hearing, and the Budapest School for the Deaf),
2. the Association of Hungarian Schools for the Deaf,
3. Rochester School for the Deaf,
4. NTID,
5. the international advisory committee, the Von Neumann (Computer) Society and the American Chamber of Commerce of Hungary,
6. the Rochester Hungarian Association, and
7. the Open Society Institute, specifically the Network Scholarship Program.

This team of partners has created a true model for Central and Eastern Europe, one which can be emulated even at home. We have learned much from our participation. A special thanks to the NTID team.

In December, **Marc Marschark** gave an invited address on "Effects of bilingual education on language and cognitive development" at an international conference on bilingual education of deaf students, in Warsaw, Poland. A longer version of his presentation will be published in the journal of the Polish Speech and Hearing Association, *Audiofonologia*. In a ceremony prior to the meeting, Marschark was made an Honorary Lifetime Member of the Association "for research in the field of communication skills and development of deaf and hearing persons."

Marschark also recent published an article, "Intellectual and emotional functioning in college students following mild traumatic brain injury in childhood and adolescence," in the *Journal of Head Trauma Rehabilitation, 15*, 1227-1245.

Ken Nash has just received the Dr. Török Béla Commemorative Medal from the Dr. Török Béla School, Kindergarten and Student's Home in Budapest, for assistance to the school for hard-of-hearing children through Project Access.

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Students at the Budapest Hard of Hearing School enjoy their new computer lab. The photo was taken during the Project Access Advisory Board Meeting in April, 2000. At this time, each school participating in the project was presented with a plaque for their computer labs, designed by Egon Toth, principal of the Budapest School for the Deaf (George Soros is on the plaque, with a brief statement regarding the dedication of the labs). For information on Project Access, see the article on p.6 of this issue.

This picture was downloaded from Project Access' website.

IMPLICATIONS OF NTID RESEARCH

FOR DEAF AND HARD-OF-HEARING PEOPLE • NTID RESEARCH BULLETIN

Vol.6 No.1 Winter 2001

In 1993, the National Technical Institute for the Deaf established the Center for Research, Teaching and Learning. A primary mission of the Center is to "foster advances in teaching and learning that enhance the academic, professional, social and personal lives of people who are deaf or hard of hearing." Among its other functions, the Center both conducts research relevant to that goal and supports research conducted by colleagues from across NTID.

As part of our collaborative efforts, the Center regularly undertakes the collection and dissemination of relevant research findings from across NTID. Included for each publication is a description of the implications of the research findings the author thinks will be most relevant for NTID's audiences.

DeFilippo, C., Dagel, D., Foster, S., McKee, B., Barefoot, S., Crandall, K., & Gustafson, M. (1999). Designing a learning community for young deaf adults: Can we improve program completion rates? In M. Kolvitz (Ed.), *Empowerment through partnerships: PEPNet '98 Conference Proceedings* (pp. 182-190). Knoxville, TN: PEPNet.

A learning community based on a model of linked courses was implemented for 14 freshmen with low reading and writing test scores compared to other entering students at a college for students who are deaf or hard of hearing. Instructors collaborated on curricular objectives and discussed student progress weekly. A deaf student teaching assistant and intensive career and personal counseling were provided. Compared to a control group, the experimental group more often attended class and submitted homework on time, was perceived as putting in more effort, and completed more courses. Students appeared to benefit from the clustered learning environment and intensive monitoring of their progress.

Implications:

Participation in a learning community is known to increase retention of students in colleges for normal-hearing students. It enhances feelings of connection to the academic environment that can result in more time spent on learning. The outcome is greater academic success, which engenders greater persistence and, ultimately, completion of the program. This study suggests that the benefits reported for normal-hearing college students can be achieved at the post-secondary level for students who are deaf or hard-of-hearing. The current effort, with three linked courses and regular faculty consultation, represented a modest "cost" to the students and the faculty.

Fischer, S. (2000). More than just handwaving: The relationship between sign language and linguistic theory. In K. Emmorey & H. Lane (Eds.), *The signs of language revisited: An anthology to honor Ursula Bellugi and Edward Klima* (pp. 195-213). Mahwah, NJ: Lawrence Erlbaum Associates.

This paper discusses the contributions of the study of sign language to linguistics. Linguistics has both guided sign language researchers in ways of approaching data and given us tools to analyze those data. At the same time, the study of sign language can contribute to our understanding of language in general. It can also provide

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The *NTID Research Bulletin* is published three times a year during the academic year by the Center for Research, Teaching and Learning, National Technical Institute for the Deaf, a college of Rochester Institute of Technology. It is available without charge. Contact the Editorial Office for back issues, changes of address, or to subscribe to the *NTID Research Bulletin*.

Opinions expressed in the *NTID Research Bulletin* do not reflect those of NTID or RIT. Your comments, questions, and requests for information are welcome.

evidence for aspects of linguistic theory that spoken language cannot.

Implications:

In schools for hearing children, there are so-called "language arts" courses that teach children the standard language of the community to which some of the children may not have been adequately exposed. Even in many so-called bi-bi programs for deaf children, there are not equivalent language arts courses in ASL. Such courses are missing in the vast majority of schools for the deaf, as well as in mainstreamed settings. The result is probably greater variation in the language than is found in spoken English.

Foster, S. (in press). Examining the fit between deafness and disability. In F. Rusch, P. Devlieger, and D. Pfeiffer (Eds.), *Disability at the crossroads: Emerging definitions, concepts, and communities*. Ann Arbor, MI: University of Michigan Press.

At a time when the disability community is defining itself as having a culture and calling for a celebration of differences rather than exclusive focus on conformity and inclusion, why is it that people who consider themselves culturally Deaf often distance themselves from the disability movement? If deafness is not a disability, should deaf persons be entitled to SSI payments, special schools, and the protection of laws such as the Americans with Disabilities Act? What are the implications for educational policy and practice? In this chapter, these and other questions are tied to questions of "disability as difference" and the place of deafness in the growing field of disability studies, and form a starting place for dialogue by scholars and members of both groups.

Implications:

Deaf Culture and Disability Culture are on a collision course. In what ways are they similar? On what points do they differ? Are their goals compatible or in conflict? These and other questions must be addressed if both groups are to succeed in addressing their various philosophical and political agendas.

If you would like to obtain information in an area beyond what you see listed, you can write to the first author of closely related papers, c/o NTID. If you are unable to obtain one of the publications on this sheet from your local library, you may send this form to: Educational Technology Resource Room, National Technical Institute for the Deaf, 52 Lomb Memorial Drive, Rochester, NY 14623-5604.

___ *DeFilippo, C., Dagel, D., Foster, S. McKee, B., Barefoot, S., Crandall, K., & Gustafson, M. Designing a learning community for young deaf adults: Can we improve program completion rates?*
___ *Fischer, S. More than just handwaving: The relationship between sign language and linguistic theory.*
___ *Foster, S. Examining the fit between deafness and disability.*

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NTID Research Accomplishments, FY2000

Center for Research, Teaching and Learning · National Technical Institute for the Deaf · Rochester Institute of Technology

Vol.6 No.1 Winter 2001

Dear Reader,
Summarized below are last year's Programmatic Research and Institutional Research activities undertaken by NTID's Department of Research (DOR), and a quick glimpse at plans for the current year.

DOR's priority areas for Programmatic Research are Language and Literacy, Teaching and Learning, Sociocultural Influences, Career Development, and Technology Integration. DOR's research activities under Institutional Research respond to the key performance "indicators" established for NTID by the federal government.

DOR's mission is anchored in service to NTID/RIT and the broader field of deafness. We would enjoy hearing from you about existing needs and emerging ideas that could help shape future Programmatic and Institutional Research activities.

If you have such feedback to share, don't hesitate to contact:

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Sincerely,
Jeffrey Porter, PhD
Interim Director, Center for Research, Teaching and Learning

Language and Literacy

The Department has undertaken projects to describe and analyze English and American Sign Language in order to better understand the use and processing of these languages in educational, social and employment settings. These projects have sought to determine the challenges these languages pose for students, faculty, and staff and to find ways of optimizing the use of these languages for teaching, learning, and curriculum development. In terms of English, this research is seeking to enhance literacy through research on both spoken and written forms of communication and their relationship to access and success. Seventeen projects were undertaken in this area, and the following are some key outcomes:

• Deaf students have command of certain types of relative clauses (English sentence structures), but limited knowledge of other types.
• Speech production during simultaneous communication may be slowed, but, in general, the parameters of intelligibility are not distorted.
• For those needing a specialized vocabulary, a comprehensive glossary of mathematical and scientific signs was updated.
• The development of high literacy skills in deaf students is related to early recognition of literacy accomplishments by parents and teachers.
• Writing is a useful tool for students learning science even if they do not have a complete command of English.

Teaching and Learning

Research projects in this area have described and analyzed the learning behaviors and cognitive abilities of deaf students in order to find effective ways to optimize their skills. The Department also has investigated teaching strategies that are most effective with deaf individuals in order to effect positive educational reform in secondary and postsecondary programs. Thirteen projects were undertaken in this area, and the following are some key outcomes:

• When solving math problems, deaf students have trouble generalizing a successful strategy from one problem to another.
• When reading, students with a good knowledge of English and experience with reading are better able to apply sophisticated strategies to aid their comprehension of challenging texts.
• Investigations of visual processing markers indicate that it may be possible to diagnose dyslexia in deaf readers.
• In mainstream settings, instructional practices that enhance learning for deaf students enhance learning for hearing students as well.
• An instructor's willingness to modify practice is a key factor in a successful mainstream experience.
• In NTID classrooms, students' perception of communication ease and teaching effectiveness are only generally related to instructors' sign communication proficiency.
• In distance learning situations, deaf students generally behave as do hearing students except that they express greater motivation to learn and greater concern about communication and isolation.

Sociocultural Influences

This category has included research on such topics as interpersonal skills, leadership, decision making, cultural identity, and the ability of an individual to assess and adapt to new social settings, learn the culture of a work environment, and participate in team or group activities. Often these skills are developed through observing and interacting with peers, and deaf students may have limited experience in this area. For example, some deaf students in mainstream environments may not enjoy regular, comfortable communication with hearing peers. Projects in this area have sought to describe ways in which the personal, social and cultural development of deaf persons is enhanced or thwarted in order to facilitate growth in these areas. Four projects were undertaken in this area, and the following are some key outcomes:

• Minority faculty and staff at NTID perceive a need to provide role models for students and that need is greater than current resources allow.
• They perceive a need to increase the comfort level of minority students on campus.

Career Development

The primary goal of NTID is to prepare deaf persons for successful careers in a variety of technical fields. Understanding how deaf persons select careers and their success or difficulty in finding and sustaining employment and mobility in their chosen field are important research foci. Additionally, deaf

professionals must be able to quickly adapt, grow, and learn new skills in the future if they want to remain viable in their careers. The Department has described the career development of deaf persons, particularly those who have technical skills and work primarily in the "hearing" settings of business and industry. Two projects were undertaken in this area, and the following are some key outcomes:

• A study of deaf supervisors suggests that support and mentoring by family members, friends, and professional associates is a key factor in the professional success of deaf persons.

• A study of attitudes regarding deaf people and occupations in Sweden indicates that, as in the US, the ability to communicate in the dominant language of the society continues to be a primary concern.

Technology Integration

While technology is, of course, woven into each of the priority areas described above, recent and projected advances in technology may have significant impact on the lives of deaf persons in both positive and negative ways. This trend, coupled with RIT's leadership as a technical institute, warrants the focus on this area of study. The Department has examined ways to apply the range of technologies as vehicles for enhancing student outcomes, both regarding access of deaf persons to education and employment and success in these areas of endeavor. Four projects were undertaken in this area, and the following are some key outcomes:

• Evaluation of a real-time, speech-to-print transcription system indicates that the system helped college students recall lecture information and that the system was unobtrusive to the extent that instructors sometimes forgot about it.

• Preliminary evaluation of new speech recognition technology for the same purpose indicates promising levels of accuracy and utility.

Institutional Research

The Department of Research is committed to addressing Institute concerns related to the success of deaf postsecondary students. In fiscal year 2000, all Department researchers are involved in four "Research Strands" associated with such issues as admissions, placement, diversity, retention and alumni success and employment. Outcomes of this activity were presented to the community in four major reports: NTID Admissions and Placement Research Strand, FY 2000 Report; Student Satisfaction with their Educational Experiences at Rochester Institute of Technology; Research Strand on Diversity and Minority Issues, Final Report June 20, 2000; and Alumni Satisfaction with Education and Employment Achievement 1999-2000. Five projects were undertaken in this area, and the following are some key outcomes:

• Research in the area of retention lead to the identification of appropriate measures of student satisfaction and the finding that the satisfaction levels of NTID students compare favorably with those of other RIT students and with a national sample.

• Graduates report a high level of satisfaction with their NTID education, job content and co-workers.

• Students and parents displayed high levels of satisfaction with the First Year Experience program.

• Current criteria for placement of students in developmental courses appear to be valid.

Research Plans, FY2001

Many research projects from FY2000 will be continued into FY 2001 and new projects in each of the research priority areas will be initialized. Under **Language and Literacy**, the investigation of eye gaze of deaf people when attending to simultaneous communication and comparative investigations of the structure of American Sign Language will continue. New projects will include the coding of deaf students' spoken English, documentation of students' communication preferences, and an investigation of the word knowledge of deaf students. Under **Teaching and Learning**, new projects will investigate the processing of sign language by students and interpreters, the interpreting process itself, and the effective use of sign communication in direct instruction. A model of inclusive instruction will be developed and evaluated and Web-based problem solving resources and English teaching resources will be developed. Investigations of attention deficit disorder among deaf students and deaf students' study habits will continue. Under **Sociocultural Influences**, new studies of social relationships in mainstream settings and the use of a High Awareness monitoring system will be begun. Under **Career Development**, new investigations of job status and job mobility will be undertaken; and under **Technology Integration**, the use of interactive media, the world wide web, and distance learning with deaf students will be investigated. Under **Institutional Research**, new aspects of admission, retention, diversity and career placement will be investigated.

Conclusion

The research at NTID continues to provide accurate baseline information for students, parents, teachers, researchers, and other professionals. In order to effect change in assumptions, practice and outcomes, researchers suggest implications of the research findings and ways the findings may be applied. We hope this leads to useful dialogue between researchers and practitioners.