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Ila Parasnis is a professor in the Department of Research and Teacher Education at NTID.

The First Sign Language-Based Test for ADHD in Deaf and Hard-of-Hearing Adults

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

Attention Deficit Hyperactivity Disorder (ADHD) produces distractibility, impulsivity, and hyperactivity, which create an enormous challenge for individuals in traditional classrooms, multimedia learning environments, the workplace, and other settings.

ADHD has recently been recognized as a true syndrome in adults, with an estimated incidence of approximately 5% of the hearing adult population (Kessler et al., 2006). The incidence of ADHD in the deaf population has been estimated to range from approximately 5% for genetically deaf people to 38% for non-genetically deaf people (Kelly, Forney, Parker-Fisher, & Jones, 1993).

Accurate diagnosis and referral of individuals with ADHD are important to provide appropriate accommodations. Existing adult ADHD self-rating scales are intended for use with the hearing population and are typically administered in written English. The English language often poses a formidable challenge to deaf and hard-of-hearing adults, who have on average a fourth-grade reading level and who vary widely in their reading skills (Traxler, 2000). Given this fact and the estimated incidence of ADHD in the deaf and hard-of-hearing population, there is a critical need for psychologists and other professionals to have an ADHD assessment instrument that is linguistically accessible in sign language.

To fill this need, we translated the Attention Deficit Scales for Adults (ADSA; Triolo & Murphy, 1996) into sign language. The original ADSA is a written English-language ADHD self-rating instrument that has proven to be reliable and valid for assessing ADHD in hearing adults (McCann & Roy-Byrne, 2004). The new Attention Deficit Scales for Adults: Sign Language Version (ADSA-SLV; Parasnis, Berent, Samar, Triolo, & Murphy, 2008) is a computerized sign language version of the original ADSA administered through an interactive interface that presents translations of the test items in American Sign Language (ASL) and in English-based sign language. English-based sign language

typically uses ASL signs presented in English word order and incorporates certain grammatical aspects of both English and ASL in a conceptually accurate way. The ADSA-SLV produces a profile of scores across the following nine scales (see Triolo & Murphy, 1996) based on a client's combined responses to subsets of the 54 test items:

1. Attention-Focus/Concentration,
 2. Interpersonal,
 3. Behavior-Disorganized Activity,
 4. Coordination,
 5. Academic Theme,
 6. Emotive,
 7. Consistency/Long-Term,
 8. Childhood,
 - and 9. Negative-Social.
- In addition to scores for each scale, the ADSA client profile includes an internal consistency score based on pairs of items with nearly identical meaning and a total scale score.

ADSA-SLV Test Development

The production of the ADSA-SLV involved intense collaboration among experts in deaf education, sign language translation, media production, and programming at the National Technical Institute for the Deaf (NTID) at Rochester Institute of Technology (RIT).

Interface Description

Figure 1 (back cover) shows sample item screens in the ASL and the English-based sign language presentation modes. The interface provides several user-friendly options. Each item is captioned beneath the signer's window. Clients who have usable residual hearing may choose to view ADSA-SLV items with accompanying voice in the English-based sign language mode. The voice level is adjustable with an on-screen control. Clients may select items to answer in any order from the numbered pad to the right of the signer window. A pull-down menu appears in the upper right-hand corner that gives the examiner access to other screens and features, including screens for client registration, presentation of instructions, test item selection, review of responses, and test report as well as a lock/unlock security function and a change-client function. There is a graphically illustrated HELP function available from a pull-down menu in the upper left-hand corner.

On the Instruction screen, test instructions



Gerald P. Berent is a professor in the Department of Research and Teacher Education at NTID.

ADHD Test continued on page 3



John Albertini is a professor in the Department of Research and Teacher Education at NTID.

Utter the word *assessment* and the first things that come to many teachers' minds are achievement, No Child Left Behind, standardized tests, unfunded mandates, and accountability. With such associations paramount, we sometimes lose sight of the basic function of educational assessment, which is to document knowledge, skills, behaviors, attitudes, and beliefs. We know that valid and reliable assessments can promote effective instruction and research, suggest appropriate interventions, and lead to higher levels of student success.

That explains why researchers and practitioners get excited about the development of new assessment tools. They bring a promise of documenting behaviors and learning in new ways and with better results for specific groups. Such is the case with the assessment tools described in this issue of the NTID Research Bulletin.

Teachers have long suspected that some deaf students in their classes had attention and hyperactivity problems but have been unable to document the existence of such problems. Similarly, researchers and teachers have needed to document the sign language abilities of their students in an efficient and cost-effective manner. These needs spurred the development of the ADSA-SLV and the ASL-SRT described in the following pages. We hope you will find these reports interesting and useful and that you will contact the authors, if you have questions or comments.

If you are curious about research being conducted on other topics, please visit our new website (<http://www.ntid.rit.edu/research/>) and try out the new search capabilities. As always, we welcome your comments and suggestions. Just click on the highlighted text, *suggest considerations*, on the research home page.

John A. Albertini

Editors

John Albertini
Gerald Berent
Gary Long
Robert Whitehead

Graphic Design

Alan Cutcliffe

NTID Research Bulletin

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96 Lomb Memorial Drive
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Fax: 585-475-7588, E-mail: edrequest@rit.edu

John Albertini, Chair
Department of Research and Teacher Education
jaancr@rit.edu

may be viewed in ASL and/or in English-based sign language, as the client wishes. The Registration screen allows identifying and demographic data to be entered for new clients and provides access to existing client records. Since client responses are continuously saved, tests may be interrupted and resumed at any time via access from the Registration screen. The Response Review screen allows clients to easily review and revise their test responses. The Report screen permits examiners to view and print summaries and graphs of test scores. Test security is ensured through the use of an examiner access code.



Vincent J. Samar is an associate professor in the Department of Research and Teacher Education at NTID.

Translation Process

In two comprehensive projects, the original 54 ADSA items were translated into ASL and into English-based sign language by deaf, hard-of-hearing, and hearing professionals working at NTID. Separate teams of ASL experts and experts in English-based sign language undertook in-depth analysis and discussion of each ADSA English item. This process was designed to yield translations into ASL and into English-based sign language that incorporated the nuances of meaning inherent in the original ADSA items. In the case of the English-based sign language version, the English of the original items was revised, where necessary, to conform to the principles of accurate English-based sign language.

After each team of experts achieved full agreement on the translation of each ADSA item, a native ASL signer produced an experimental videotaped version of each ADSA item in ASL, and an expert signer of English-based sign language produced an experimental videotaped version of each ADSA item in English-based sign language with voice. The teams monitored the production of their respective videotapes and provided immediate feedback to the signer on production accuracy. Items were re-recorded as necessary.

Back-Translation Process

In order to validate the accuracy and comprehensibility of the ADSA-SLV translations, two additional teams of experts back-translated the translated items. The English-based sign language version was reviewed without the voice component so that back-translations would be based on the signing, not the voicing, of items. The members of each team independently viewed the video recording of their assigned sign language version and produced their own English translations of the ADSA-SLV items. When there was consistency of translation for a given item and the back-translations accurately reflected the meaning of the original ADSA item, that item was approved for final production.

When there was inconsistency among back-translations, the team members reviewed the video-recorded signed item to determine the source of the inconsistency. If the team determined that there was a flaw in the original translation of an item, a revised translation was developed and agreed on, reviewed by the relevant expert signer, and approved for final production.

Studio Production

Final studio production of the ASL and English-based sign language versions of ADSA items was performed by TV production professionals. During the studio productions of the two versions of ADSA-SLV item sets, the expert signers (Patrick Graybill for the ASL items and Donna Gustina for the English-based sign language items) were provided with a video script and sign glosses. Subsequent to the production of the two ADSA-SLV item sets, the ADSA-SLV authors at NTID, with the assistance of digital media experts, carefully selected the best rendition of each item for inclusion in the ADSA-SLV.

Interface Evaluation

We designed a prototype interactive interface to deliver the ADSA-SLV test items. This prototype interface was evaluated through a formal usability study with several members of the Rochester Deaf community who varied in education, gender, age, and race/ethnicity. This usability study was conducted by an RIT information technology expert. The final interface design was revised based on the results of this usability study.

ADSA-SLV DVD

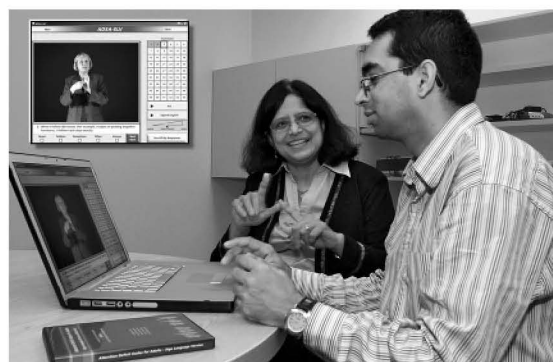
We produced a prototype DVD that included the interactive program for administering the test, the ADSA-SLV manual, the original ADSA manual (Triolo & Murphy, 1996), and installers for Flash player and Adobe Air for PC and Mac platforms, which are required to run the ADSA-SLV. This prototype DVD was evaluated by two Rochester area clinical psychologists who provided extensive feedback on the usability of this product. Their feedback was used to produce the final DVD product.

Reliability and Validity

Although the ADSA has been shown to be among the most reliable and valid ADHD adult rating scales (McCann & Roy-Byrne, 2004), studies of the reliability and validity of the ADSA-SLV have not yet been undertaken in a representative sample of deaf and hard-of-hearing adults. Nevertheless, results from a study by Parasnis, Samar, and Berent (2003) offer preliminary

support for the basic reliability and validity of the ADSA-SLV. Parasnis et al. compared the ADSA subscale scores of 44 deaf and hard-of-hearing college students who used a pilot ASL version of the ADSA with the ADSA subscale scores of 38 hearing college students who used the standard printed version of the ADSA. All participants were selected based on a negative history of ADHD or other neurological disorders. Parasnis et al. found that the deaf and hard-of-hearing participants and the hearing participants had comparable means and standard deviations on each of the nine ADSA scales. Statistical analyses confirmed that there were no significant differences between deaf and hard-of-hearing participants and hearing participants on any of the ADSA scales. These results indicate that deaf and hearing groups perform equivalently

Project leader, Ila Parasnis, and research assistant, Amardeep Sekhri, demonstrate the ADSA-SLV. The insert shows the test interface with Donna Gustina on the screen.



The ADSA-SLV will soon be available for purchase. Please contact Marketing/Communications at 585-475-6906 for further details.

when each group is administered the ADSA in their most accessible language (i.e., ASL for deaf and hard-of-hearing ASL users and printed English for hearing English users). These initial results support the premise of the ADSA-SLV that careful translations of the ADSA into ASL and into English-based sign language should help restore the reliability and validity of the ADSA for deaf and hard-of-hearing people who use one or both of these forms of sign language. Further studies that directly assess the reliability and validity of the ADSA-SLV will be necessary to fully support this claim and to quantify the actual reliability and validity of the ADSA-SLV for deaf and hard-of-hearing people.

Conclusion

The ADSA-SLV is the first linguistically accessible ADHD assessment instrument designed for the deaf and hard-of-hearing adult population (age 17 and above). The interactive interface, the option to view instructions and items in ASL or in English-based sign language at will, the optional voicing, and the English captions provide a test that fully meets the communication needs of the heterogeneous deaf and hard-of-hearing population. This interactive design is expected to increase the validity of the ADHD assessment in this population

and holds the promise for using this design with other English language-based paper and pencil tests in the future.

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Peter C. Hauser is an assistant professor in the Department of Research and Teacher Education at NTID.

Web-Based Measure of American Sign Language Competency

By Peter C. Hauser

There are few American Sign Language (ASL) competency tests in existence and none are available for researchers and practitioners to purchase. However, there is a significant need for such a tool. For example, many claims are made about the effects of sign language on learning and cognition without any actual measures of sign language competency. Also, deaf students with Individualized Education Programs (IEPs) could benefit from such a test, as those IEPs often track ASL development. Peter C. Hauser from the Deaf Studies Laboratory (DSL) in the Department of Research and Teacher Education (NTID) has been working to develop a reliable, valid, and brief measure of ASL competency with his partner laboratories at the University of

Rochester—the Sign Language Research Center directed by Ted Supalla and the Brain and Vision Laboratory directed by Daphne Bavelier. This project is an effort of the Science of Learning Center on Visual Language and Visual Learning (VL2) and is partially funded by the National Science Foundation (SLC-SBE-0541953) and the National Institute of Health (NCDICD RO1 DC004418-06A1).

This ASL competency measure, the *ASL Sentence Reproduction Test (ASL-SRT)*, was first developed as a non-web-based test (the *ASL-SRT-beta version*) before the web version was developed (the *ASL-SRT-web version*). The psychometric analyses of the beta version's reliability and validity have been published in the proceedings of the 9th Theoretical Issues in Sign Language

Web-based Measure continued on page 6

Figure 1.
The *ASL-SRT* is presented on the web via a remote server, and participants' responses are captured and sent to the server for scoring.

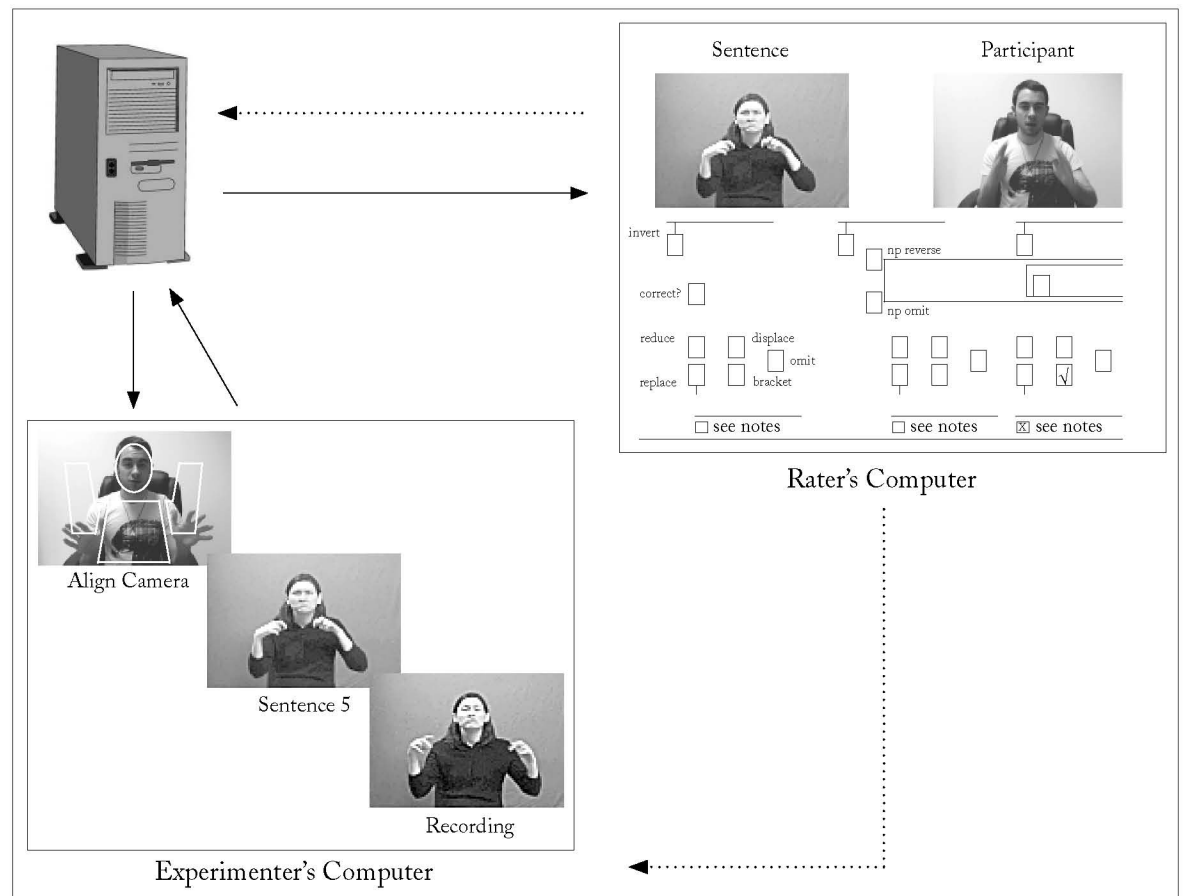


Figure 2.
ASL-SRT examples with
English translations of an
easy sentence (top) and a
difficult sentence (bottom).

Easy Sentence:
“The motorcycle spun
and hit a tree.”

Web-based Measure continued from page 5

Research conference (Hauser, Paludnevičienė, Supalla, & Bavelier, 2008). The web version was recently developed after recognition of the challenges of maintaining the beta version’s standardized administration at remote laboratories. Use of the web now makes it possible for researchers



to administer the ASL-SRT on-site, to store video captures on a remote server, and later to have trained raters at a remote location (DSL) score the responses (see Figure 1).

clips of a native signer signing sentences of increasing length and complexity (see Figure 2). After viewing each sentence, the participant has to sign back the sentence. Participants receive a point for each sentence correctly reproduced and zero points for sentences with any errors of omission, commission, etc. The ASL-SRT takes approximately 15 minutes to administer

and 15 minutes to score, making it a time-efficient measure of ASL competency. The ASL-SRT measures three types of ASL skill: receptive, processing, and expressive. The total correct

Difficult Sentence:
“Two dogs walking
by noticed each other,
started growling, then
jumped into a fight while
people rushed in to pull
them apart.”



The ASL-SRT was developed using a new paradigm for assessing ASL competency. It is modeled after the *Speaking Grammar Subtest* of the *Test of Adolescent and Adult Language*, 3rd Edition (TOAL3; Hammill, Brown, Larsen, & Wiederholt, 1994). The ASL-SRT requires participants to watch computer-displayed video

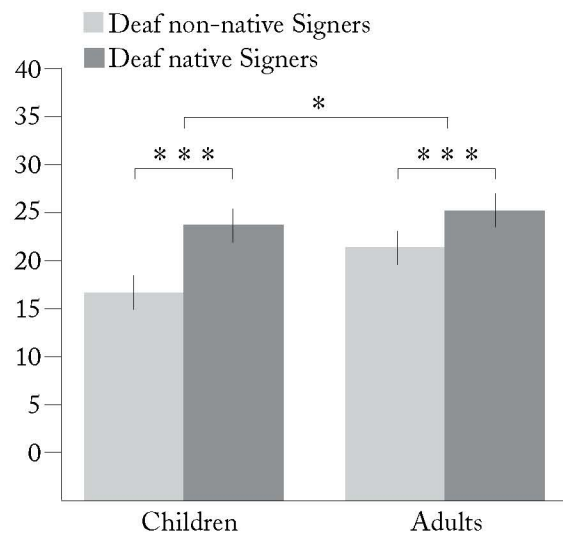
ASL-SRT score represents an individual’s overall ASL competency, as difficulties in any of the three skills would have an impact on the total correct reproduction score.

Preliminary analyses of the ASL-SRT-beta version, using a sample of 99 participants (hearing/deaf, native signers/non-native signers,

children/adults), provided support that this test is reliable. Specifically, high inter-rater reliability, $R = .83$, $p < .01$, was found along with high internal consistency with alpha coefficients of .87 - .88. To determine if the ASL-SRT is a valid measure of ASL competency, the researchers tested whether the ASL-SRT can differentiate between native and non-native signers as well as between children's and adults' competency. A 2x2 ANOVA with native fluency (native vs. non-native) and developmental age (children vs. adults) as independent variables was computed using the total scores of the deaf participants on the ASL-SRT-beta version. The results of the analysis revealed a main effect of native fluency, $F(1, 63) = 11.33$, $p = .001$, and developmental age, $F(1, 63) = 5.10$, $p < .05$, and no interaction effect (see Figure 3). These results support the psychometric soundness of the ASL-SRT as a true measure of ASL competency.

The 39 sentences on the ASL-SRT-beta have been analyzed quantitatively and qualitatively using

Figure 3.
Deaf adult and child
native and non-native
signers' ASL-SRT total
correct reproduction scores.



data from a larger sample of participants. These linguistic and psychometric analyses were conducted to reduce the number of test sentences, to set the sentences in order of difficulty, and to develop a refined rating protocol that takes into consideration natural variations and specific errors. The ASL-SRT-web version, which has 20 sentences, provides not

only the total correct score but also the frequencies of different types of unique errors. Data are currently being collected to test reliability and validity, including the predictive validity of the unique error scores in determining ASL competency and concurrent validity of the test with other sign language measures. Ultimately, the goal is to make the ASL-SRT-web version available to researchers and practitioners once its psychometric soundness is documented.

The creation of a psychometrically sound measure of visual language competency is transformative because it will enable researchers across the country to measure this effect and ask questions about language and cognition that otherwise could not be asked. The ASL-SRT-web version is currently being used in several VL2 studies investigating bilingualism and the impact of visual language acquisition on cognitive development and reading achievement, as well as in other studies in the DSL and its partner laboratories. A German Sign Language version of this test is being developed, and there are plans to create an Israeli Sign Language version. Many deaf individuals use a visual language for learning; however, deaf educators and administrators are not able to rely on evidence-based methods of visual language instruction, as there has been very little empirical research on the relationship between sign language competency and learning. While this will have clear implications for deaf education in North America and abroad, what we learn about visual learning and human cognition most likely will broaden our understanding of the human capacity to learn.

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Figure 1.
Sample screens from the Attention Deficit Scales for Adults – Sign Language Version (ADSA-SLV)
See article starting on p.1.



Patrick Graybill signing a test item in ASL



Donna Gustina signing a test item in English-based sign language