

SWAAAC Evidence-Based Practice

Speech to Text for Students with Disabilities



The following is a collection of peer-reviewed journal articles addressing the effects and the use of Speech-To-Text (STT) to support written language production for students with disabilities. The intent of this document is to provide some foundational information for the implementation of evidence-based practice. Please contact the SWAAAC office if you would like to add an article to this resource.

**This document contains a variety of resources including, but not limited to peer-reviewed journal articles, magazine articles, academic papers, and conference proceedings. It is the responsibility of the reader to evaluate the sources and use their best judgment with regard to EBP applications.*

Summary of the Research:

- Essays dictated using Speech Recognition were better than hand written essays.
- When comparing spoken vs. written narratives of students with language learning disorders, written summaries were shorter and had more errors than spoken versions.
- Speech Recognition increased length and decreased errors of narratives produced by the students identified as less fluent writers.
- In a study investigating Automatic Speech Recognition (ASR) as a computer access method, the researchers found users with the best performance were those with the best error correction strategies.
- One study examined ASR vs. Word Processing and found improved fluency and length with ASR but decreased accuracy.

Assistive Technology: Empowering Students with Learning Disabilities

- Karen E. Forgrave

Abstract: Recent advances in the field of technology are not being employed as widely in schools as some experts argue they should be (Edyburn 2000). Unfortunately, many teachers, special educators, and administrators do not realize how new technology can benefit their students. My purpose in this article is to demonstrate some of the possibilities that technological innovations hold for middle and high school students with learning disabilities in reading and writing. I will focus on reading and writing because many students with learning disabilities have problems in these areas, despite the fact that they have average to above average intelligence. Reading problems vary, but most students with learning disabilities display slow and effortful word decoding skills (Lundberg 1995). These lower-level decoding problems lead to poor comprehension of textbooks and course reading materials, an area of particular concern in the middle and high school years. The academic performance of students with learning disabilities can also be hindered by their writing difficulties. Many have problems with basic skills, such as spelling and grammar, as well as higher level skills, such as the

planning, organization, and revision of a piece of work (Graham et al. 1998). Mechanical difficulties, including difficulty with handwriting, also contribute to the fact that children with learning disabilities produce less written work and work that is lower in quality than their typically achieving peers (Lewis 1998). The good news is that certain mainstream computer programs are now in use in regular classrooms to support the literacy efforts of students with learning disabilities (Edyburn 2000). Word processing programs with spelling checkers facilitate writing for students with learning disabilities by compensating for some of the students' difficulties with the writing process. New assistive technology enables students to complete tasks more efficiently and independently and results in improved performance on a variety of reading and writing tasks, which in turn leads to greater academic success. Lewis (1998) describes assistive technology as having two purposes: to build on individual strengths, and to compensate for their disabilities to enable them to better perform a given task. In the following sections, I will focus on three areas that have promise for students in the middle and upper grades; namely, speech synthesis programs, organizational software, and voice recognition software. I will review recent studies in each area and examine the advantages and limitations of these technological applications. In addition, I will outline considerations for the successful adoption of assistive technology by teachers and school district personnel and make suggestions for future research. (Forgrave, 2002)

Dictation and Speech Recognition Technology as Test Accommodations

- Charles A. Macarthur and Albert R. Cavalier

Abstract: This study addressed the feasibility and validity of dictation using speech recognition software and dictation to a scribe as accommodations for tests involving extended writing. On the issue of feasibility, high school students with and without learning disabilities (LD) learned to use speech recognition software with acceptable accuracy. Total word errors with speech recognition were under 10%, and there were few unreadable words. On the issue of writing quality, for students with LD, essays dictated using speech recognition were better than handwritten essays, and essays dictated to a scribe were even better. No differences in quality were found for students without LD. The results provide support for the validity of dictation as a test accommodation. (Macarthur & Cavalier, 2004)

General Language Performance Measures in Spoken and Written Narrative and Expository Discourse of School-Age Children With Language Learning Disabilities

- Cheryl M. Scott & Jennifer Windsor

Abstract: Language performance in naturalistic contexts can be characterized by general measures of productivity, fluency, lexical diversity, and grammatical complexity and accuracy. The use of such measures as indices of language impairment in older children is open to questions of method and interpretation. The study evaluated the extent to which 10 general language performance measures (GLMP) differentiated school-age children with language learning disabilities (LLD) from chronological-age (CA) and language-age (LA) peers. Children produced both spoken and written summaries of two educational videotapes that provides models of either narrative or expository (informational) discourse. Productivity measures, including total T-units, total words, and words per minute were significantly lower for children with LLD than for CA children. Fluency (percent T-units with mazes) and lexical diversity (number of different words) measures were similar for all children. Grammatical complexity as measured by words per T-unit was significantly for LLD children. However, there was no difference among groups for clauses per T-unit. The only measure that distinguished children with LLD from both CA and LA peers was the extent of grammatical error. Effects of discourse genre and modality were consistent across groups. Compared to narrative, expository summaries were shorter, less fluent (spoken versions), more complex (words per T-unit), and more error prone. Written summaries were shorter and had more errors than spoken versions. For many LLD and LA children, expository writing was exceedingly difficult. Implications for accounts of language impairment in older children are discussed. (Scott & Windsor, 2000)

Speech Recognition for Students With Disabilities in Writing

- Teresa J. Gardner

Abstract: The role of technology in education is ever increasing. This article looks at students with disabilities and the problem of writing independently. Speech recognition technology offers an option, or solution, for students who have physical and/or learning disabilities and for students who cannot access and use computer keyboards or switches.

Classroom use of the speech recognition software program packaged within most personal computers is suggested. (Gardner, 2008)

Speech Recognition Technology and Students With Writing Difficulties: Improving Fluency

- Thomas Quinlan

Abstract: The present study investigated the effects of speech recognition technology (SR) and advance planning on children's writing processes. Fluent and less fluent writers, ages 11 to 14, composed 4 narratives, via handwriting and SR, both with and without advance planning. Less fluent children's handwritten narratives were significantly inferior to those of fluent children in terms of length, quality, and surface errors. For less fluent writers, SR (a) significantly increased the length and (b) decreased the surface errors of narratives. Although narrative length related positively to holistic quality, SR did not significantly improve quality. Advance planning helped children to compose more fully developed stories. For children with writing difficulties, advance planning and SR may each independently support text generation. (Quinlan, 2004)

Usage, performance, and satisfaction outcomes for experienced users of automatic speech recognition

- Dr. Heidi Horstmann Koester

Abstract: This paper presents a variety of outcomes data from 24 experienced users of automatic speech recognition (ASR) as a means of computer access. To assess usage and satisfaction, we conducted an in-person survey interview. For those participants who had a choice of computer input methods, 48% reported using ASR for 25% or less of their computer tasks, while 37% used ASR for more than half of their computer tasks. Users' overall satisfaction with ASR was somewhat above neutral (averaging 63 out of 100), and the most important role for ASR was as a means of reducing upper-limb pain and fatigue. To measure user performance, we asked users to perform a series of word processing and operating system tasks with their ASR systems. For 18 of these users, performance without speech was also measured. The time for nontext tasks was significantly slower with speech ($p < 0.05$). The average rate for entering text was no different with or without speech. Text entry rate with speech varied widely, from 3 to 32 words per minute, as did recognition accuracy, from 72% to 94%. Users who had the best performance tended to be those who employed the best correction strategies while using ASR. (Koester, 2004)

Using Speech Recognition Software to Increase Writing Fluency for Individuals with Physical Disabilities

- Jennifer Tumlin Garrett, Kathryn Wolff Heller, Linda P. Fowler, Paul A. Alberto, Laura D. Fredrick, Colleen M. O'Rourke

Abstract: Students with physical disabilities often have difficulty with writing fluency, despite the use of various strategies, adaptations, and assistive technology (AT). One possible intervention is the use of speech recognition software, although there is little research on its impact on students with physical disabilities. This study used an alternating treatments design to compare the use of speech recognition software to word processing on first draft writing with students with physical disabilities. Areas examined were fluency, accuracy, type of word errors, recall of intended meaning, and length. The results of this study indicated that fluency and length were greater for all participants with speech recognition compared to word processing, but accuracy was lower using speech recognition. (Garrett, et al., 2011)

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