SWAAAC Evidence-Based Practice

Text To Speech for Students with Disabilities

The following is a collection of peer-reviewed journal articles addressing the effects and the use of Text-To-Speech (TTS) to support reading comprehension 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.*

Common Themes in the Research

-The Read Aloud/TTS accommodation improves the reading scores for students with disabilities. Zero - small gains were found for students without disabilities.

- There were multiple concerns regarding the integrity of assessment constructs with the application of TTS accommodations.

Accommodating Remedial Readers in the General Education Setting: Is Listening While Reading Sufficient to Improve Factual and Inferential Comprehension?

- Ara J. Schmitt, Andrea D. Hale, Elizabeth McCallum, Brittany Mauck

Abstract: Word reading accommodations are commonly applied in the general education setting in an attempt to improve student comprehension and learning of curriculum content. This study examined the effects of listening-while-reading (LWR) and silent reading (SR) using text-to-speech assistive technology on the comprehension of 25 middle-school remedial readers. Participants were provide three grade-level passages, each with 10 comprehension questions (5 factual, 5 inferential) after SR and also after LWR using the assistive technology. Conditions were counterbalanced across participants. No significant differences were found between LWR and SR total, factual, or inferential comprehension, even after controlling for participant reading ability. Discussion focuses on implications of these findings for reading comprehension theory and school psychologists, study limitations, and directions for future inquiry. (Schmitt, Hale, McCallum, & Mauck, 2011)

Assistive Software Tools for Secondary-Level Students With Literacy Difficulties

- Alissa A. Lange, Martin McPhillips, Gerry Mulhern, Judith Wylie

Abstract: The present study assessed the compensatory effectiveness of four assistive software tools (speech synthesis, spellchecker, homophone tool, and dictionary) on literacy. Secondary- level students (*N* = 93) with reading difficulties

completed computer-based tests of literacy skills. Training on their respective software followed for those assigned to the Assistive Software and the Microsoft Word Control groups. Posttests revealed an improvement for the Assistive Software group on reading comprehension, homophone error detection, spelling error detection, and word meanings. The Microsoft Word Control group also improved on spelling error detection and word meanings, but performed worse on homophone error detection. A Full Control group showed no significant improvements on any of the measures. Overall, results indicate a significant assistive value of the four software tools (from the software package Read & Write Gold, 2002) across several domains of literacy. (Lange, McPhillips, Mulhern, & Wylie, 2006)

Can Text To Speech Software Improve Reading Outcomes of Struggling Readers? ATIA 2016 Presentation
-Kiriko Takahashi, Kelly Roberts
This is a PowerPoint presentation that was delivered at the 2016 ATIA conference. It outlines a 3 year Steppingstones research grant that investigated the application of TTS and its impact on reading measures. (Takahashi & Roberts, 2016)

Does Text To Speech Use Improve Reading skills of High School Students?
-Kelly Roberts, Kiriko Takahashi, Hye Jin Park, Robert Stodden
This is a PowerPoint presentation that was delivered at the 2013 CSUN conference.
The purpose of this study was to determine the effectiveness of the use of Text-To-Speech (TTS) software as an intervention for improving *unaided* reading skills and academic performance of 9th grade struggling readers.
There was a significant positive effect of the TTS intervention upon vocabulary and reading comprehension, after statistically controlling for students' baseline performance on the measures. (Roberts, Takahashi, Park, & Stodden, 2013)

Does Use of Text-to-Speech and Related Read-Aloud Tools Improve Reading Comprehension for Students With Reading Disabilities? A Meta-Analysis
-Sarah G. Wood, MS, Jerad H. Moxley, PhD, Elizabeth L. Tighe, PhD, Richard K. Wagner, PhD
Abstract: Text-to-speech and related read-aloud tools are being widely implemented in an attempt to assist students' readingcomprehension skills. Read-aloud software, including text-to-speech, is used to translate written text into spoken text,enabling one to listen to written text while reading along. It is not clear how effective text-to-speech is at improving reading comprehension. This study addresses this gap in the research by conducting a meta-analysis on the effects of text-to-speech technology and related read-aloud tools on reading comprehension for students with reading difficulties. Random effects models yielded an average weighted effect size of (d = .35, with a 95% confidence interval of .14 to .56, p < .01). Moderator effects of study design were found to explain some of the variance. Taken together, this suggests that text-to-speech technologies may assist students with reading comprehension. However, more studies are needed to further explore the moderating variables of text-to-speech and read-aloud tools' effectiveness for improving reading comprehension. Implications and recommendations for future research are discussed. (Wood, MS, Moxley, PhD, Tighe, PhD, & Wagner, PhD, 2018)

Effects of text-to-speech software use on the reading proficiency of high school struggling readers
-Hye Jin Park, Kiriko Takahashi, Kelly D. Roberts & Danielle Delise
Abstract: The literature highlights the benefits of text-to-speech (TTS) software when used as an assistive technology facilitating struggling readers' access to print. However, the effects of TTS software use, upon students' unassisted reading proficiency, have remained relatively unexplored. The researchers utilized an experimental design to investigate whether 9th grade struggling readers who use TTS software to read course materials demonstrate significant improvements in unassisted reading performance. A total of 164 students of 30 teachers in Hawaii participated in the study. Analyses of covariance results indicated that the TTS intervention had a significant, positive effect on student reading vocabulary and reading comprehension after 10 weeks of TTS software use (average 582 minutes). There are several limitations to the study; however, the current study opens up for discussions and need for further studies investigating TTS software as a viable reading intervention for adolescent struggling readers. (Park, Roberts, PhD, Takahashi, PhD, & Delise, MA, 2017)

Effects of Text-to-Speech Software on the Reading Rate and Comprehension Skills of High School Students with Specific Learning Disabilities.

-Moorman, A., Boon, R.T., Keller-Bell, Y., Stagliano, C. & Jeffs, T.

Abstract: The purpose of this study was to examine the effects of a text-to-speech software program known as "Read Please" on the reading rate and reading comprehension accuracy of two high school students with specific learning disabilities (SLD) in reading. A single-subject A-B-A-B "withdrawal" research design (Alberto & Troutman, 2009) was used to evaluate the effects of the software on the students reading rate accuracy and comprehension skills. The participants were taught to utilize the features of the "Read Please" software that reads the text aloud to the participants and upon completion of the reading passage, the experimenter collected measures on the students' reading rate and percent of comprehension questions answered accurately. Measurements were collected throughout the study on the dependent variables of reading rate and reading comprehension accuracy. Results of this study indicated that the use of the "Read Please" software increased the reading rate and improved students reading comprehension for both participants. Limitations of the study, implications for practice for both general and special education teachers at the high school level, and future research questions are discussed. (Moorman, Boon, Keller-Bell, Stagliano, & Jeffs, 2010)

Reading Rate and Comprehension as a Function of Computerized Versus Traditional Presentation Mode: A Preliminary Study

- Sherry Mee Bell, R. Steve McCallum and Christy A. Sorrell

Abstract: Using a counterbalanced, randomized treatment design, 12 elementary school-aged children read under two conditions: (a) independent, silent reading; and (b) computer-assisted reading, via Kurzweil 3000. A repeated-measures multivariate analysis of variance (MANOVA) revealed no significant difference in the composite mean for comprehension and reading rate scores based on presentation strategy. Computerized text presentation (via auditory and visual means) proved no more effective than traditional reading instruction for teacher-nominated weak readers in improving reading rate and comprehension. However, a trend was noted for slower readers to show increased reading rate as a function of computer-assisted reading, with the opposite result for faster readers. Overall, results indicate that for students reading material at their instructional level, computer-assisted reading did not improve comprehension. Future research should continue to focus on the role of technology as an aid to reading instruction. (Sorrell, Bell, & McCallum, 2007)

Supported eText: Effects of Text-to-Speech on Access and Achievement for High School Students with Disabilities

-Margo Vreeburg Izzo, Amanda Yurick, and Bianca McArrell

Abstract: Students with disabilities often lack the skills required to access the general education curriculum and achieve success in school and postschool environments. Evidence suggests that using assistive technologies such as digital texts and translational supports enhances outcomes for these students (Anderson-Inman & Horney, 2007). The purpose of the current study was to examine the effects of a text-to-speech screen reader program on the academic achievement of high school students with disabilities in an online transition curriculum emphasizing information literacy. The text-to-speech support was introduced and withdrawn in a reversal design across 10 curriculum units. Findings suggest that the text-to-speech support increased unit quiz and reading comprehension performance with large effect sizes. Implications for practice and future research are discussed. (Vreeburg Izzo, Yurick, & McArrell, 2009)

The Compensatory Effect of Text-to-Speech Technology on Reading Comprehension and Reading Rate in Swedish Schoolchildren With Reading Disability: The Moderating Effect of Inattention and Hyperactivity Symptoms Differs by Grade Groups

-Sofia Gruner, Per Ostberg, Martina Hedenius

Abstract: The purpose of this study was (i) to investigate if the compensatory effect of text-to-speech (TTS) technology on reading comprehension and reading rate in schoolchildren with reading disability is influenced by problems with inattention and hyperactivity and (ii) to examine whether a potentially moderating effect of such symptoms differ between grade groups. Participants (N ¼ 49) were randomized into one of the two experimental conditions: Group A listened to a text with TTS, and Group B read the text themselves. The conditions were then switched. Inattention and

hyperactivity symptoms were assessed with the Strengths and Difficulties Questionnaire (SDQ). Statistical analyses were performed both on the whole group and within-grade groups (Grades 3–5 and 6–9). Using TTS technology had a positive effect on reading rate for both grade groups, and this effect was not influenced by attention-deficit/hyperactivity disorder (ADHD) symptoms. As for reading comprehension, the two groups differed both with respect to the amount of improvement seen in the TTS condition and with respect to the moderating effect of ADHD symptoms. Reading with TTS improved reading comprehension significantly in the younger group, whereas no effect on reading comprehension was found in the older group. A higher score on the SDQ ADHD Scale was associated with less improvement in reading comprehension in the younger group and with greater improvement in reading comprehension in the older group. The results indicate that symptoms of inattention and hyperactivity, as well as the child's grade level, are factors that should be taken into account when planning and introducing TTS technology. (Gruner, Ostberg, & Hedenius, 2018)

The Effect of Embedded Text-To-Speech and Vocabulary E-Book Scaffolds on the Comprehension of Students with Reading Disabilities
- Dr. Michelle Gonzalez
Abstract: Limited research exists concerning the effect of interactive electronic texts or eBooks on the reading comprehension of students with reading disabilities. The purpose of this study was to determine if there was a significant difference in oral retelling and comprehension performance on multiple-choice questions when 17 students with reading disabilities in third (n = 10) and fourth (n = 7) grade read eBooks under three different book formats. Participants read text presented in 3 formats with varying levels of built-in scaffolds including text-to-speech and vocabulary supports. Results of a Friedman's Test revealed a significant effect of the different book formats on comprehension measured by oral retelling, but not for comprehension measured by multiple-choice questions. (Gonzalez, 2014)

The Efficacy of Assistive Technology on Reading Comprehension for Postsecondary Students with Learning Disabilities
- Kim K. Floyd and Sharon L. Judge
Abstract: Despite the large increase of students with learning disabilities (LD) entering postsecondary institutions and the legislative emphasis on providing students with disabilities equal access to education, we have yet to develop comprehensive planning of accommodations for postsecondary students with LD in regard to assistive technology (AT). The purpose of this study was to provide empirical insight related to using AT to support reading comprehension in postsecondary students with LD. Participants were six postsecondary students with LD. A multiple baseline across participants design was employed to examine the effects of AT, specifically the ClassMate Reader, on reading comprehension. The data were analyzed to discern participant performance with and without the device, social fidelity, and acceptability. (Floyd & Judge, 2012)

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