

OBJECTIVES

An increasing amount of **assistive technology** (AT) interventions exist for adolescents and adults with **learning disabilities** (LD). The aims of this review were to:

1. survey **both quantitative and qualitative** research, to determine
 - whether interventions are effective
 - how they affect lived experience
2. formally assess the **quality** of available studies

METHODS

Literature search:

1. PubMed queries
2. Google Scholar (2 methods)
3. ERIC
4. Citations of related reviews
5. Recent articles of related journals

We located:

- 32 quantitative intervention studies
- 11 qualitative studies
- 5 survey studies

Almost all conducted in educational settings.

Quality assessment:

- Using a modified Downs-Black checklist (Justice et al., 2008)
- 2 independent raters (BP, KRG)
- Intraclass correlation coefficient for average rating scores = 0.874
- Consensus ratings were produced

REFERENCES

Justice, L. M., Nye, C., Schwarz, J., McGinty, A., & Rivera, A. (2008). Methodological quality of intervention research in speech-language pathology: Analysis of 10 years of group-design studies. *Evidence-Based Communication Assessment and Intervention*, 2, 46–59.

INTERVENTION STUDIES

We sorted intervention studies by **topic**:

1. Text-to-speech systems 10 publications
2. Speech-to-text systems 6 publications
3. Word processing 5 publications
4. Multimedia & hypertext 4 publications
5. Smart pens 4 publications
6. Other computer-based 3 publications

We performed **meta-analyses by topic group** where possible (reasonable study quality scores, comparable outcomes...)

QUALITATIVE STUDIES

Qualitative studies were also sorted by **topic** (listed from **general to specific**):

1. AT as one component of accommodations: 4 publications
2. Perspectives about AT: 1 publication
3. Technological course supports: 4 publications
4. Specific assistive supports: 2 publications

We created a **qualitative summary**. Some points:

- Students did not necessarily like or use institution-provided AT
- Regular AT users often set up their AT using their own resources
- Customization is very important
- Negative emotions connected to:
 - Technical difficulties
 - Insufficient support
 - AT use perceived as stigmatizing
- Non-self-reported and self-reported data similar → asking AT users often easiest!

FUNDING AND CONFLICT OF INTEREST STATEMENT

This research was supported by the University of Iowa Presidential Graduate Research Fellowship awarded to Bogi Perelmutter and by NIH grant R01DC011742-02 awarded to Karla K. McGregor. We acknowledge the help of Renee Perelmutter, Amanda Van Horne and Hardin Library Interlibrary Loan. The authors report no financial or other conflicts of interest.

META-ANALYSES OF INTERVENTION STUDIES

Text-to-speech: Reading comprehension as outcome variable. Small overall effect ($g = 0.445, p = 0.06$) that further diminishes if the outlier is excluded. Some evidence that interactions obscure the effect: higher initial reading skills lead to more negative outcomes. AT can be distracting!

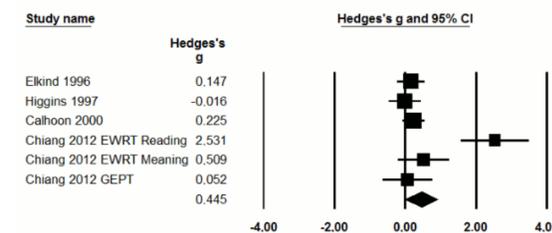


Figure 1: Forest plot for text-to-speech systems

Speech-to-text: Generally positive results, but outcome variables too different for meta-analysis despite similar hardware & design across studies

Multimedia & hypertext: Effects tended to be positive, but both large confidence intervals in many studies and considerable differences in intervention design → we opted not to do a meta-analysis

SURVEY STUDIES

Limited conclusions due to:

- Small amount of studies despite ease of access (through disability services)
- Only 2 studies w. quantitative evaluation
- Data from different countries
- Data not cumulative, distinct topics:
 - Different technology use profile from ADHD / TD
 - AT use related to more hopeful outlook

Word processing: Error rate change as outcome variable (negative is better).

Large effect ($g = -1.626, p = 0.002$)

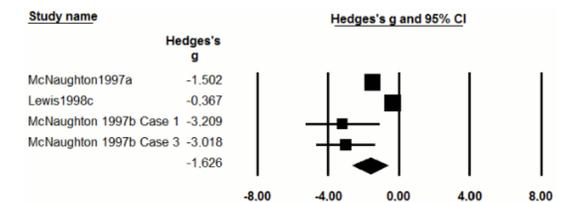


Figure 2: Forest plot for word processing systems

Smart pens: Reading comprehension as outcome variable. Small, but significant positive effect ($g = 0.449, p = 0.029$)

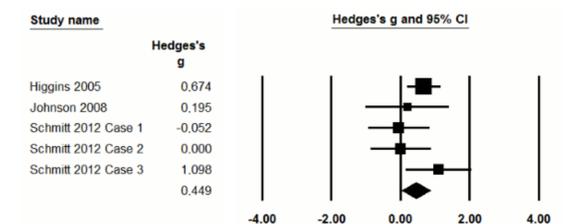


Figure 3: Forest plot for smart pen interventions

CONCLUSION

Convergent results from both quantitative and qualitative data: AT supports **can be effective, but they need to be customized** to the person. Some forms of AT **can be unhelpful or harmful** for some participants. Word processor interventions like spell and grammar checking were most effective. Methods varied considerably; in the future it would be important to use **comparable designs and similar outcome variables** across studies. Study quality was comparable to research on other interventions (Justice et al., 2008).

CONTACT INFORMATION

All authors Word Learning Laboratory, U Iowa
Web <http://clas.uiowa.edu/comsci/research/word-learning-lab>
Email bogi-takacs@uiowa.edu