Assistive Technology Enhancement of Written Expression for Individuals with Neurodevelopmental Disorders [Poster]

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Purpose: AT Intervention Efficacy Study

The purpose of this project is to carry out an intensive training program in subjects with a broad range of neurodevelopmental disabilities to assess the efficacy of assistive technology (AT) intervention.

Assistive Technology and Neurodevelopmental Disorders

There is a lack of research efficacy concerning the use of assistive technology in individuals with cognitive deficits. Approximately 3% of the U.S. population has mental retardation with varied etiologies.

Computer Software (Don Johnston, Inc.)

CO:Writer® 4000

- Word prediction software.
- Reduces total number of keystrokes required
- Facilitates correct spelling
- Features auditory feedback
- Grammar and vocabulary support

Write:OutLoud®

- Talking word processor
- Also reads imported text
- Provides visual and auditory feedback

Procedures

Baseline Testing

IQ Testing (WASI or WISC - IV)
- Visual Motor Integration Test (VMI)
- Reading/Written Expression Battery: Mini-Battery of Achievement (MBA), Process Assessment of the Learner (PAL), Test of Written Language (TOWL-3)
- School Function Assessment (measures school participation and any AT applications implemented)
- Parent and Teacher Questionnaires
- Families and schools will receive summary of test findings and recommendations including the use of AT

Subjects are randomized into intensive intervention group or standard of care group. Subjects who are initially randomized to the control group are rolled over into the intervention group the following year.

- Re-evaluation post-control/pre-intervention, and post-intervention

Subjects

32 subjects enrolled to date

- 2 subjects disqualified to continue: 1 due to reading level lower than 1st grade, 1 due to cognitive level too high
- 17 randomized to intervention group, 13 to control group
- 10 subjects have completed 1 year of intervention
- 6 subjects have completed control year, rolled over to intervention group

Subjects include individuals with fragile X syndrome, sex chromosome abnormalities, Down syndrome, fetal alcohol syndrome and autism spectrum disorders.

Subject Demographics (N=32):

- Mean Age: 12.9 years
- Mean Verbal IQ: 78
- Mean Performance IQ: 74
- Mean Full Scale IQ: 76
- Mean Reading Level: 5th grade 1st month
- Mean Writing Level: 3rd grade 6th month

TOWL-3 Spontaneous Writing Task Example

Subjects are asked to write a story about a picture for 15 minutes

Boy with FS IQ 68, Learning Disability, ADHD:

Pre-intervention:

- 13 years 4 months, 7th grade, 58 words, SS 64

Post-intervention:

- 14 years 6 months, 8th grade, 72 words, SS 70

Preliminary Results

Group of 10 subjects who have completed 1 year of intervention using the software:

<table>
<thead>
<tr>
<th>Software</th>
<th>Group Mean (n=10)</th>
<th>Post-Intervention Group Mean (n=10)</th>
<th>Significance (Paired samples t-test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMI</td>
<td>72</td>
<td>68</td>
<td>.81</td>
</tr>
<tr>
<td>VMI: Visual Perception</td>
<td>85</td>
<td>81</td>
<td>.57</td>
</tr>
<tr>
<td>VMI: Motor Coordination</td>
<td>79</td>
<td>66</td>
<td>.39</td>
</tr>
<tr>
<td>MBA reading SS</td>
<td>70</td>
<td>61</td>
<td>.03*</td>
</tr>
<tr>
<td>MBA writing SS</td>
<td>51</td>
<td>53</td>
<td>.66</td>
</tr>
<tr>
<td>TOWL Story Quotient</td>
<td>76</td>
<td>83</td>
<td>.11</td>
</tr>
<tr>
<td>PAL Written: time to complete (sec)</td>
<td>69</td>
<td>60</td>
<td>.04*</td>
</tr>
</tbody>
</table>

Parent Survey

Parents are asked questions about their feelings/attitudes toward use of software and their child’s abilities both before and after the intervention year of the study.

Survey Questions

1. I am comfortable using the computer
2. I feel it is important to augment writing when it is difficult for children
3. I feel that good writing is an important part of learning
4. I understand how to use Co:Writer
5. I understand how to use Write:OutLoud
6. I think using software will help me teach writing
7. I think being taught how to best use the software will help with teaching writing
8. I would be likely to use the software on my own without additional intervention
9. My child writes better when he/she uses the computer
10. My child struggles with writing – effort/time
11. My child struggles with writing – effect/time
12. At this time I feel that my child’s writing is OK
13. At this time I feel that my child’s writing could be improved

Discussion

- Although we do not yet see a trend in improvement of writing quotient scores, some individuals have shown improvement in skills such as amount of generative language produced after a year of software use.
- Although the MBA reading level is significantly lower at time 2 thus far, we believe this is not a sign of loss of skills, but rather the demands of the standardized testing increasing with age

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