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Assistive Technology Enhancement of Written Expression for Individuals with Neurodevelopmental Disorders

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AT Enhancement of Written Expression for Individuals with Neurodevelopmental Disorders

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AT Enhancement of Written Expression for Individuals with Neurodevelopmental Disorders

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Question 1a:
Do you know what AT is?

a) Yes
b) No
c) I think so, but I'm not positive

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Question 1b:
Do you know what AT is?

a) Yes
b) No
c) I think so, but I'm not positive

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Question 2a:
Which of the following would be considered AT?

a) modified pencil grip
b) computer / software
c) block chair
d) visual timer
e) all of the above

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Question 2b:
Which of the following would be considered AT?

a) modified pencil grip
b) computer / software
c) block chair
d) visual timer
e) all of the above

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Answer:
Which of the following would be considered AT?

a) modified pencil grip
b) computer / software
c) block chair
d) visual timer
e) all of the above

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AT 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 intellectual disabilities with varied etiologies.
- In our work with many types of neurodevelopmental disorders we have seen anecdotal improvements with use of AT (Hagerman, 1999a, 1999b, 1999c; Scharfenaker, O'Connor, Stackhouse, & Noble, 2002).

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Some New Evidence / Research

- Effectiveness of Reading and Mathematics Software Products: Findings from the First Student Cohort (Report to Congress)
  - U.S. Department of Education, 3/2007
  - http://ies.ed.gov/ncee/pdf/20074005.pdf

- The State of Research and Practice in Augmentative and Alternative Communication for Children with Developmental / Intellectual Disabilities.
  - Wilkinson & Hennig, 2007, MRDD Research Reviews, 13:58-69.

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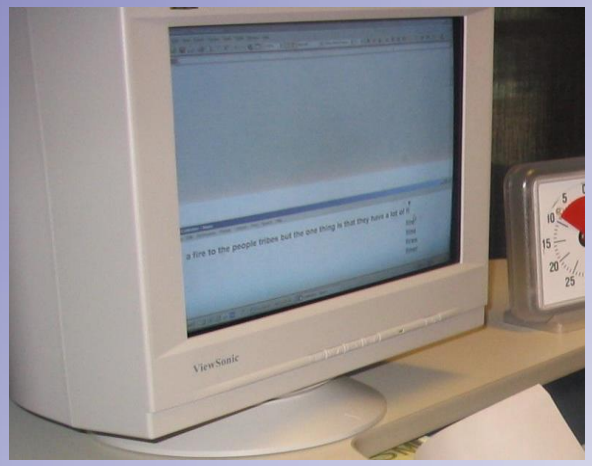
AT Intervention Efficacy Study

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

- Software from Don Johnston Inc. www.donjohnston.com

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Purpose:
AT Intervention Efficacy Study

To carry out an intensive training program for subjects with a broad range of neurodevelopmental disabilities to assess the efficacy of AT intervention for the group as a whole

We will also evaluate whether some etiological groups (defined by differing cognitive phenotypes) will obtain greater benefits from this assistive technology than others

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Subjects

- Our subjects include individuals with Neurodevelopmental disorders including: fragile X syndrome, sex chromosomal abnormalities, Down syndrome, fetal alcohol syndrome and autism spectrum disorders.
- We are enrolling both males and females ages 8 to 20.
- Control subjects matched on diagnosis, age and IQ
- Subjects are randomized into intensive intervention group and standard of care (control) group. Those subjects initially placed in control group will be offered intensive treatment the following year.

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Enrollment to Date

- Total Subjects to Date: N=32
  - 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
- 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

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Enrollment by Diagnoses

- Fragile X Syndrome: N=6
- Fragile X Premutation: N=1
- Autism/ASD: N=15
- Down Syndrome: N=4
- Tourette Syndrome: N=2
- XXYY Syndrome N=1
- Mental Retardation: N=1
- Learning Disorder: N=2

- Total Enrollment: N=32

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Procedures

- Baseline
  - IQ Testing
  - Visual Motor Integration Testing (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 / Surveys
  - Families and schools will receive summary of test findings and recommendations including the use of AT
- Reevaluation at 1 year

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Intensive Intervention

- **Direct treatment / training of student at M.I.N.D. clinic and home on use of software**
  - Introductory trainings
  - Follow up treatment sessions
- **Treatment Plan School/ Educational Staff**
  - Introductory trainings for teachers
  - Consultations regarding use of software for specific lesson plans / units

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Sample Intervention…

- 12 year old boy with FXS
- Great memory for faces and names.
- Enjoys singing and playing music.
- He dictated his sentence to the therapist about a preferred / motivating topic.

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Co-Writer Example:

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CO:Writer and Write:OutLoud Working Together:

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Expected Outcomes

- We expect that the subjects who receive the intensive intervention will show significant gains in educational participation in written expression (including handwritten and computer generated written tasks), versus those subjects in the standard of care group.
- We expect that the caregiver and teacher questionnaires may show that the two groups show differences in the use of written language for educational use at the end of the intervention or standard of care period.
- We expect that the use of AT may help improve the educational participation and writing skills of individuals with differing levels of cognitive functioning and also those with neurodevelopmental disorders of differing etiology.

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Preliminary Descriptive Findings

- Some individual cases have demonstrated an increase in the number of words typed within a 15 minute session when “writing about a picture”
  - One subject’s baseline was 0 words and at close of study typed 10 words
- Number of handwritten words also slightly increased
  - One subject’s baseline was 133 words and at the close of the study he wrote 254 words.
  - May indicate that overall process of writing is improving via access to the software

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Preliminary Descriptive Findings

- Some individual cases have demonstrated a decrease in the amount of time it takes to type a sentence.
  - One subject decreased time by a full minute
  - Handwriting time remained the same
    - May indicate continued struggle with graphomotor skills necessary for handwriting / penmanship

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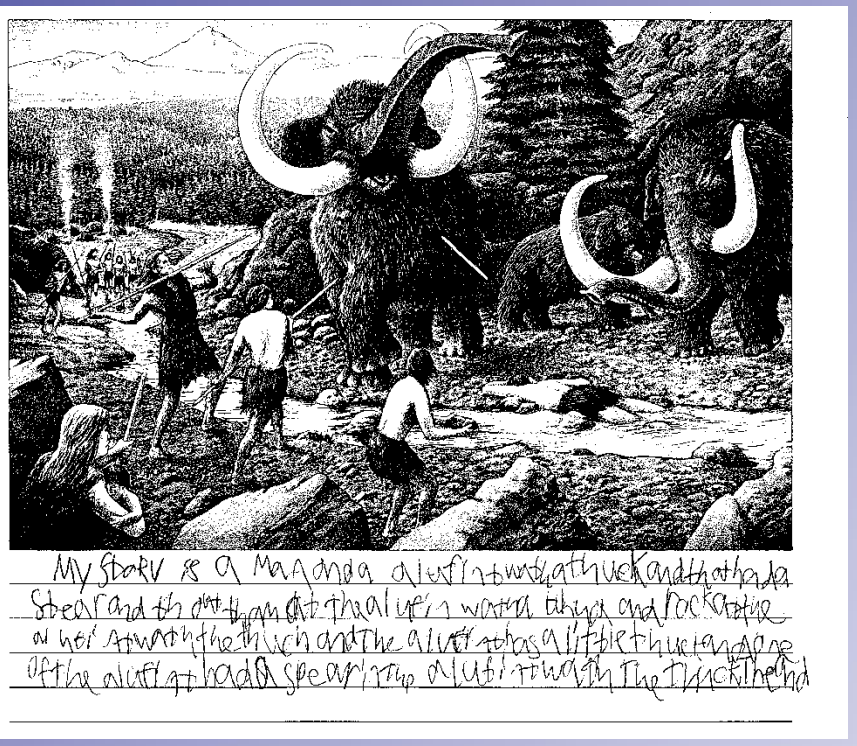
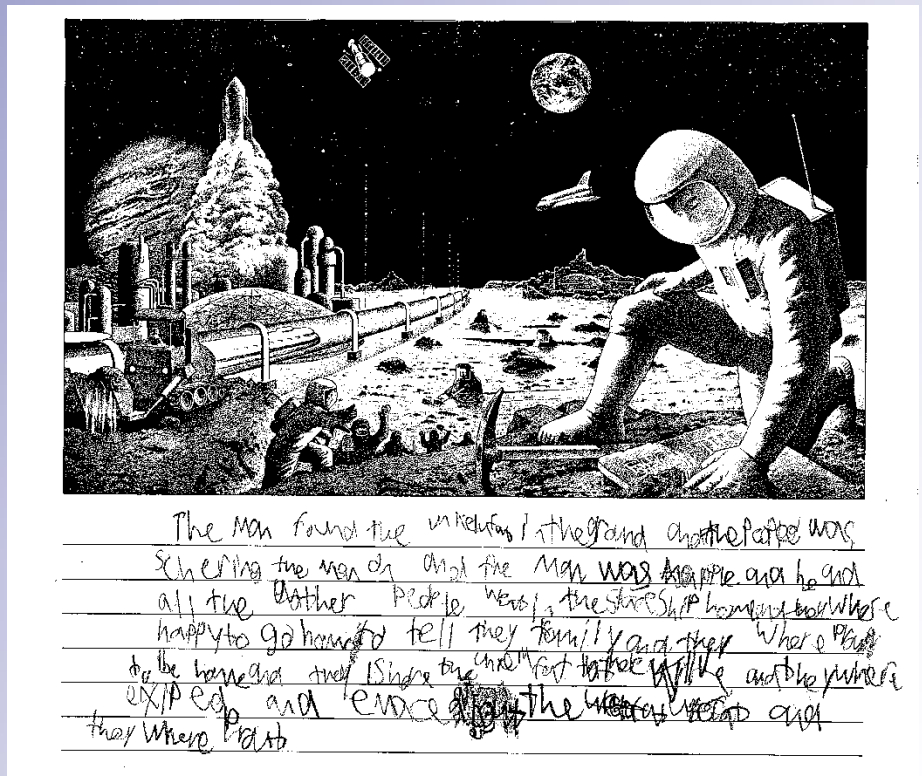
TOWL-3 Spontaneous Writing Task

- Subjects are asked to write a story about a picture for 15 minutes.
- Boy with FSIQ 68, Learning Disability, ADHD:

Pre-intervention:

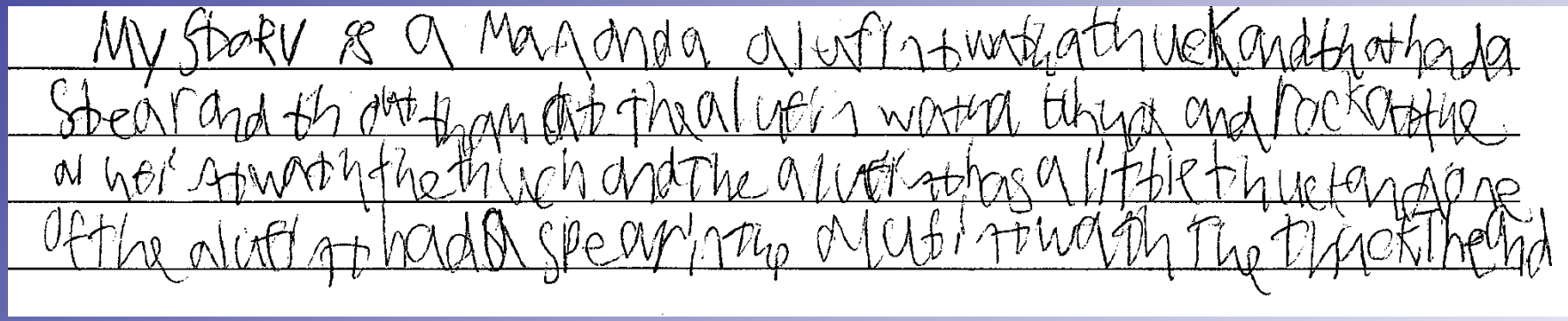


Post-intervention

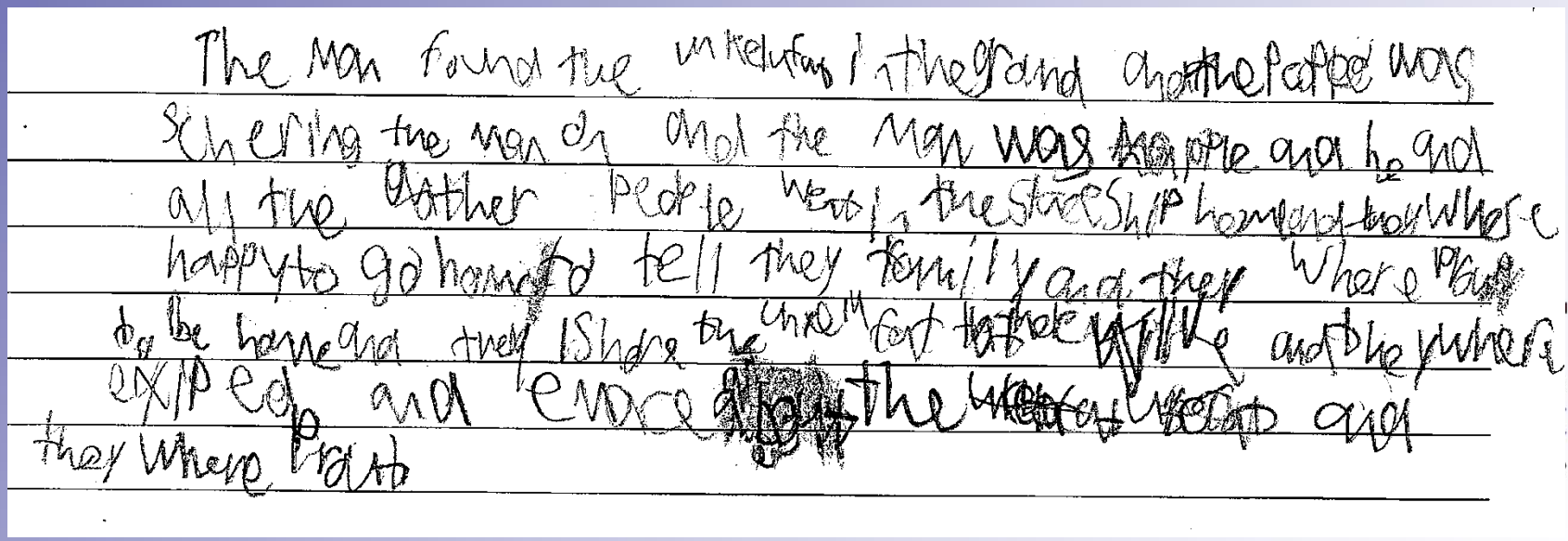


TOWL-3 Spontaneous Writing Task

Pre-intervention: 13 years 4 months, 7th grade, 58 words, score = 64:



Post-intervention: 14 years 6 months, 8th grade, 72 words, score = 70:



Computer Assessment

Pre-intervention: 13 years 4 months, 7th grade, 40 words

This is a story because it was a cave men can be a good drawer and they have a spear and they can eat food and they have a fire and they have a club log they have a basket.

Post-intervention: 14 years 6 months, 8th grade, 42 words

The man has a spear and the 1man is eating the one man is using a bat and the other one man is sitting by the fire and the other one woman is holding the bag with stuff and they were happy.

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Results

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

	Pre-intervention Group Mean (n=10)	Post-intervention Group Mean (n=10)	Significance (Paired samples t-test)
VMI	72	68	.81
VMI: Visual Perception	85	81	.57
VMI: Motor Coordination	79	66	.39
MBA reading SS	70	61	.03
MBA writing SS	51	53	.66
TOWL Story Quotient	76	83	.11
PAL Written: amount of time to complete (sec)	69	60	.04

Despite lack of statistical significance, qualitative findings indicate that individual cases have made improvements in written expression as measured by the TOWL.

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Parent Survey

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 me 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 – legibility
11. **My child struggles with writing – effort/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

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Parent Survey Results

Wilcoxin Signed Ranks Test

	Significance (two-tailed)
4. I understand how to use Co:Writer	p=.01
5. I understand how to use Write:OutLoud	p=.01
11. My child struggles with writing – effort/time	p=.03

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AT Intervention Challenges

- One big challenge of this study has been the implementation of the use of the software in the school setting.

  Why do you think this might this be?

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Question 3a:
Why is it difficult to implement the use of Co:Writer and Write:OutLoud in schools?

a) no computers available
b) computers are available but cannot run the software
c) lack of teacher/administrator buy-in
d) lack of efficacy research, therefore school $ is not spent on AT applications
e) all of the above

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Question 3b:
Why is it difficult to implement the use of Co:Writer and Write:OutLoud in schools?

a) no computers available
b) computers are available but cannot run the software
c) lack of teacher/administrator buy-in
d) lack of efficacy research, therefore school $ is not spent on AT applications
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Answer:
Why is it difficult to implement the use of Co:Writer and Write:OutLoud in schools?

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AT Intervention Challenges

- Coordinating AT visits with teachers, staff, principles, school district IT support
- Family comfort and knowledge about general computer use
- Students refusing to use software at home
- Lack of continuity between home and school for flow of tasks/work applicable to the software

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Teacher Comments

- “I was so thrilled to see a program that was so user friendly and made such sense for those with writing and speaking barriers. The kids know what they want to say...it's just getting it communicated that keeps them frustrated...For some of our guys, it would be useful if they can approximate the first few letters…”
  - Excerpts from a Junior High School, SH SDC teacher following her initial training and introduction to the software

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Parent Comments

"I see much benefit to the CO:Writer and Write:OutLoud programs. With training for teachers and parents - this can be a great aide in the classroom and home environment. It provides many benefits as we have witnessed through our daughter, including extending the depth and amount of writing taking place. Allowing for corrections, audio feedback, and the comfort of using the computer - which I feel is the greatest impact as we know computers are the tool of the future and opens doors otherwise unavailable to all children!"

» Parent of 6th grade girl diagnosed with FXS

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Parent Comments

- “It was difficult to get him to use it at home because there was no buy in from the school so it was very hard to carry over. I also feel that had he been exposed to this software when he was younger, in Junior High, it would have been a no-brainer, but in High School it is very difficult to coordinate things with all the various teachers etc.”
    - Parent of High School Senior (now a GRADUATE!!)

Parent's Perspective:

- This parent does not have experience using the computer.
- Multiple home visits and phone conferences were needed in order to get the parent familiarized with the software.

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Initial Reaction:

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Current Perspective:

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Future Directions:

Question 4a: How should we prioritize future research regarding the use of AT with people who have cognitive disabilities?

a) research about computers / software
b) research about simple devices that can be implemented easily
c) research about use of high-tech devices
d) research development: making new devices that don't exist yet
e) all of the above

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Future Directions:

Question 4b: How should we prioritize future research regarding the use of AT with people who have cognitive disabilities?

a) research about computers / software
b) research about simple devices that can be implemented easily
c) research about use of high-tech devices
d) research development: making new devices that don't exist yet
e) all of the above

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Publication Outcome

- PROSPER MAGAZINE, September 2005 p54-56
- www.prospermag.com

M.I.N.D.ful Learning on Trial
New Software Could Be the Key
By Georgette Jeppesen

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Publication Outcome

- The Fragile X Foundation Quarterly, A Journal For Families and Professionals
- Issue 27, June 2007
- “Therapy in Action: Assistive Technology and the IEP”
- www.nfxf.org
  - Kerrie Lemons Chitwood, MA CCC-SLP
  - Laura Greiss Hess, MS OTR/L

The National **Fragile X** Foundation

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Dissemination

- Randi Hagerman, National and International lectures - ongoing
- U.C.Davis, MIND U.C.E.D.D – AT Consortium Collaboration (Ongoing)
- U.C.Davis MIND Institute Summer Institute – August, 2007
- Fragile X Society India – January, 2007
- NFXF Chicago Chapter – October, 2006
- NFXF International Conference – July, 2006
- Dubai Autism Clinic – Ist International Conference and Clinic on Neurodevelopmental Disorders, March 2005
- XXYY Syndrome Conference at the MIND Institute. Treatments in XXYY Syndrome", Monday, July 18, 2005
- Eldorado County Office of Education, Back to School Inservice Training, August 2005
- MIND Institute Psychiatry Resident Training
- RERC Poster Sessions

Paper Submitted, May, 2007: "Assistive Technology Use by Individuals with Fragile X Syndrome: A Review

Journal of Intellectual Disability Research (JIDR)

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  - Vivien Narcissa

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