

## Evidence-Based Practice in AAC: Developing CATs (Critically Appraised Topics)

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### Example of a Critically Appraised Topic (CAT) Two-Switch Step Auditory Scanning versus Automatic Auditory Scanning

Note: The format for this Critically Appraised Topic was adapted from:

Schlosser, R.W., Wendt, O., & Blischak, D.M. (manuscript in preparation). *Effects of augmentative and alternative communication on natural speech production in autism: II. Developing a critically appraised topic.*

#### CAT: Two-Switch Auditory Scanning for a Child with Cerebral Palsy and Cortical Vision Impairments

##### Title

- This CAT is related to treatment/intervention
- T.W. is an eight-year old child who is diagnosed with spastic cerebral palsy and cortical vision impairments. Although T.W. has a few single words and two-word combinations, his communication skills are not appropriate to meet his everyday communication needs and most utterances are difficult to understand. T.W. needs a dynamic screen device for communicating within his home and school environment but due to cortical vision impairments and significant physical difficulties, he needs to use auditory scanning and switch(es) to access his device. His SLP wants to know if scanning should be taught using a single switch with automatic scanning or two-switch scanning with step scanning.

##### Reviewer

- Amy Finch, Ph.D.

##### Date

- The search was completed November 2006
- Proposed re-evaluation: November 2008

##### Search

###### Database Searches

- Cochrane Library: (all): keywords “cerebral palsy and scanning access”, “two switch scanning access”
  - LeBlanc, M., & Barker, M. (1981). *A Comparative Study of Control and Display Design Principles Which Affect Efficient Use of Communication Aids by the Severely Physically Disabled (Final Report)*. Washington D.C.: U.S. Department of Education (G008100458).
- CINAHL (2000 onward): keywords “two switch auditory scanning”, “two switch scanning”, “auditory scanning”, “access to augmentative-alternative communication” “cerebral palsy and access”
  - Jones, J. & Stewart, H. (2004) A description of how three occupational therapists train children in using the scanning access technique. *Australian-Occupational-Therapy* 51(3): 155-65.
- ERIC (- all): keywords “single switch scanning”, “cerebral palsy and scanning”
  - Ottenbacher, K. & Angelo, J. (1994). *Comparing Scanning Modes for Youths with Cerebral Palsy (Final Report)* Washington D.C.: U.S. Department of Education (ED408782)
  - Light, J. (1993). Teaching Automatic Linear Scanning for Computer Access: A Case Study of a Preschooler with Severe Physical and Communication Disabilities. *Journal of Special Education Technology*, 12, 125-134.
- PubMed: (all) “scanning access for augmentative communication”, “cerebral palsy and scanning”
  - Treviranus, J. & Tannock, R. (1987). A scanning computer access system for children with severe physical disabilities. *The American Journal of Occupational Therapy*, 41, 733-738.
  - Angelo, J. (1992). Comparison of three computer scanning modes as an interface method for persons with cerebral palsy. *The American Journal of Occupational Therapy*, 46, 217-222.

## Web searches

- Ponder, G. & Ortega, R. (2004) *Unusual access methods*. Retrieved on October 30, 2006 from <http://www.csun.edu/cod/conf/2004/proceedings/143.htm>.
- Burkhart, L. (2004). *Two switches to success: Access for children with severe multiple challenges*. Retrieved on October 20, 2006 from <http://www.csun.edu/cod/conf/2004/proceedings/62.htm>.

## Hand Searches

- Augmentative-Alternative Communication
  - Leshner, G., Moulton, B., & Higginbotham (1998). Techniques for augmenting scanning communication. *Augmentative and Alternative Communication*, 14, 81-101.
  - Petersen, K., Reichle, J., & Johnston, S. (2000). Examining preschoolers' performance in linear and row-column scanning techniques. *Augmentative and Alternative Communication*, 16, 27-36.
  - Ratcliff, A. (1994). Comparison of relative demands implicated in direct selection and scanning: Considerations from normal children. *Augmentative and Alternative Communication*, 10, 67-74.
- ASHA Convention Abstracts (2000 onward)
  - Bardach, L. (2005). 1 switch? 2 switch? old switch,? new switch?: Alternative Access to SGDs. *American Speech-Language-Hearing Association National Convention*. Retrieved on November 1, 2006 from [http://convention.asha.org/2005/handouts/293\\_Bardach\\_Lisa\\_073146\\_111505091603.ppt](http://convention.asha.org/2005/handouts/293_Bardach_Lisa_073146_111505091603.ppt)
  - Lasker, J., Ball, L., Bardach, L., Fox, L., Fried-Oken, M.. (2004). AAC III: Grand rounds in AAC assessment: Case Studies. *American Speech-Language Hearing Association National Convention*. Retrieved on November 1, 2006 from [http://convention.asha.org/2004/handouts/handout\\_186135.pdf](http://convention.asha.org/2004/handouts/handout_186135.pdf).
  - Begley, E. (2004). Computer-assisted scanning: What to do when Johnny can't point. *American Speech-Language Hearing Association National Convention*. Retrieved on November 1, 2006 from [http://convention.asha.org/2004/handouts/handout\\_185150.ppt](http://convention.asha.org/2004/handouts/handout_185150.ppt).
- Books
  - Beukelman, D. & Mirenda, P. (2005). *Augmentative & alternative communication: Supporting children & adults with complex communication needs* (3<sup>rd</sup> Edition). Baltimore: Paul H Brookes Publishing Co.
  - Lloyd, L, Fuller, D., & Arvidson, H. (1997). *Augmentative and alternative communication: A handbook of principles and practices*. Boston: Allyn and Bacon.

*Citations (included only studies that had training studies and that used individuals with disabilities; used expert opinion if enough information provided on reasoning of why procedure should be used)*

- *Relevant Narrative Reviews (only included sections)*
  - *No narrative reviews identified*
- *Relevant Systematic Reviews (to locate individual appraised studies)*
  - *No systematic reviews identified*
- *Relevant Studies (Suggestive evidence):*
  - LeBlanc, M., & Barker, M. (1981). *A Comparative Study of Control and Display Design Principles Which Affect Efficient Use of Communication Aids by the Severely Physically Disabled (Final Report)*. Washington D.C.: U.S. Department of Education (G008100458)
- *Relevant Studies (Inconclusive evidence):*
  - Ottenbacher, K. & Angelo, J. (1994). *Comparing Scanning Modes for Youths with Cerebral Palsy (Final Report)* Washington D.C.: U.S. Department of Education (ED408782)
  - Angelo, J. (1992). Comparison of three computer scanning modes as an interface method for persons with cerebral palsy. *The American Journal of Occupational Therapy*, 46, 217-222.
- *Expert Opinion:*
  - Burkhart, L. (2004). Two switches to success: Access for children with severe multiple challenges. Retrieved on October 20, 2006 from <http://www.csun.edu/cod/conf/2004/proceedings/62.htm>.
  - Ponder, G. & Ortega, R. (2004) *Unusual access methods*. Retrieved on October 30, 2006 from <http://www.csun.edu/cod/conf/2004/proceedings/143.htm>.
  - Beukelman, D. & Mirenda, P. (2005). *Augmentative & alternative communication: Supporting children & adults with complex communication needs* (3<sup>rd</sup> Edition). Baltimore: Paul H Brookes Publishing Co.

- Lloyd, L, Fuller, D., & Arvidson, H. (1997). *Augmentative and alternative communication: A handbook of principles and practices*. Boston: Allyn and Bacon.

*Summary and Appraisal of Studies*

Study; AAC	Subjects	Results	Appraisal
LeBlanc & Barker (1982)	6 children with athetoid cerebral palsy	Compared: row/column directed scan (two switches); row/column auto scan (one switch); row auto scan (one switch); and column auto scan (one switch); No significant differences among systems for scan time; row/column auto scan resulted in significantly more errors than any of the other three systems; individuals could learn to use 2 switches with fewer errors than two of the systems and with equal or faster time	<u>Suggestive</u> : Repeated measures design with 6 subjects; subjects and methods well described but no blinding used; treatment fidelity maintained through use of computer program and consistent procedures throughout (although adjustment of rate of scanning for 3 subjects on different days); intention to treat met; non-standardized outcome measures used and appeared to be valid and reliable; p-values reported and confidence interval and effect size calculable
Angelo (1992)	6 subjects with 3 presenting spastic CP and 3 with athetoid CP; ages 18 to 20 years of age	Assessed step, automatic and inverse scanning using single switch access No difference between mode and CP but slower speed of scanning resulted in more accurate responses Visual inspection of data: Spastic cerebral palsy group had more post-hit errors when using auto mode Athetoid and Mixed cerebral palsy group showed more post- hit errors in auto mode; no differences between inverse and step Mistimings common errors for pre-hits and post-hit errors	<u>Inconclusive</u> : indicated single subject design but grouped data for statistical analysis; subjects not described well; treatment fidelity maintained through use of computer program and consistent procedures throughout; intention to treat met; p-values stated for statistical analysis; neither confidence interval or effect size stated or calculable
Light (1993)	1 subject with severe spastic quadriplegia with athetosis; age 4 -11	Purpose was to document a cognitive developmentally-based instructional protocol to teach automatic linear scanning for computer access; Multiple baseline probes; Child learned to use automatic linear scanning using the instructional procedure	<u>Suggestive</u> : provides evidence for a way of developing an instructional technique for teaching scanning; could be used for teaching any of the scanning techniques Single subject but subject younger than current subject; subject characteristics and procedures well described; treatment fidelity maintained through use of computer program but no observational data on the instructions by the researcher; non-standardized outcome measures valid and reliable; intention to treat met

Ottenbacher & Angelo (1994)	22 subjects between 12 and 20 years of age (M = 17)  Spastic CP (n = 18) Athetoid (n = 2) Mixed (n = 4)	Assessed automatic, inverse and step using single switch; assessed slow and fast speed; ANOVA for grouped data to compare accuracy of scanning mode and groups; significant difference between mode and CP with slower speed resulting in more accurate responses for all subjects; Spastic cerebral palsy had significantly more post-hits in auto mode Athetoid cerebral palsy showed no significant differences Mixed had significantly more post-hits for auto mode	<u>Inconclusive</u> : researchers indicated single subject design but then grouped data for analyses; limited numbers in the mixed and athetoid groups; no details regarding subject description or how subjects selected; treatment fidelity maintained through use of computer program; intention to treat met; p-values reported but confidence interval and effect size not reported or calculable
Burkhart (2004)	Expert opinion		<u>Suggestive</u> : Two-switch scanning considered when child has difficulty timing activation
Ponder & Ortega (2004)	Expert opinion		<u>Suggestive</u> : Two-switch row-column scanning eliminates exact timing required by single switch scanning; scanning is driven by client; load is divided between motor groups; lessens likelihood of increased tone and spasticity due to anticipation of responding within a timed situation
Beukelman & Mirenda (2005)	Expert opinion		<u>Suggestive</u> : Step scanning often used by (a) individuals who have severe motor control (b) cognitive restrictions or (c) beginning users; may be fatiguing for complex AAC applications due to repeated, frequent switch activations. Choice of cursor control technique for scanning influenced by individual's motor control; skill accuracy requirements of cursor control techniques for step scanning: wait = low; activate = medium; hold = low; release = low; wait = medium; reactivate = medium; fatigue = high
Lloyd, Fuller, & Arvidson (1997)	Expert opinion		<u>Suggestive</u> : Individual has direct control of speed of selection; high number of switch activation required, which can be fatiguing

### *Applicability*

- The n of the study that actually investigated two-switch scanning was 6 thus generality may be compromised.
- All subjects in above mentioned study had athetoid cerebral palsy whereas T.W. has spastic cerebral palsy.
- All subjects in above mentioned study had good visual skills whereas T.W. has cortical vision impairments.
- No studies discussed individuals who needed auditory scanning.
- Expert opinion mentioned timing issue and indicated that two switch scanning should be considered when timing is difficult and lessens likelihood of increased tone and spasticity.
- Expert opinion indicated that two switch scanning may be used in auditory or visual scanning modes.

### *Conclusions*

Taken together, the research is inconclusive since only one study investigated the use of two-switch scanning and this study used only subjects who presented athetoid cerebral palsy. The research did imply that individuals with spastic cerebral palsy had difficulty with post-hits which could be inferred to be due to mistimings. The limited research and expert opinion suggested that:

- Individuals can learn to use two-switch scanning with fewer errors than two of the other types of scanning and with equal or faster time
- Two-switch scanning should be considered when child has difficulty of timing activation.
- Two-switch scanning may reduce increased tone and spasticity related to anticipating an upcoming switch hit that must occur within a specified time.
- Two-switch scanning is driven by the client.
- Two-switch scanning allows the movement load to be divided between two motor groups which may reduce repetitive use injuries.
- Two-switch scanning may be cause more fatigue because of the number of switch hits required.

## Example of a Critically Appraised Topic (CAT): Teaching Reading to Individuals with Developmental Disabilities

Note: The format for this Critically Appraised Topic was adapted from:

Schlosser, R.W., Wendt, O., & Blischak, D.M. (manuscript in preparation). *Effects of augmentative and alternative communication on natural speech production in autism: II. Developing a critically appraised topic.*

### CAT: Teaching Reading to Adults with Developmental Disabilities

- This CAT is related to treatment/intervention
- S.C. is a 50 year old woman with developmental disabilities. She has been seen in a University Clinic for several semesters for work on articulation and language. However, she has recently expressed an interest in improving her ability to read and write. Part of her interest in these literacy skills is that she wants to be able to read children's books to her young neighborhood children and her niece. Several semesters of work on phonological and phonemic awareness activities had yielded little change in functional ability. Assessment of her reading skills using the Qualitative Reading Inventory-3 found silent reading comprehension at the pre-primer level, word identification at the primer and first grade level and listening comprehension at the first and second grade level. Her single word receptive language skills are between the 6-0 and 7-0 level. What intervention strategies are used with the best results to teach adults with developmental disabilities to read?

#### Reviewer

- Julie Scherz, Ph.D.

#### Date

- The search was completed September 2006
- Proposed re-evaluation: September 2008

#### Search

##### Database Searches

- Cochrane Library: (all): keywords "sight words and disabilities"
  - No relevant articles found
- CINAHL (2000 onward): keywords "sight words and disabilities", "reading", "reading and disabilities"
  - No relevant articles found
- First Search (- all): keywords "sight word research and disabilities"
  - Browder, D.M., & Yan, P.X. (1998). A meta-analysis and review of sight word research and its implications for teaching functional reading to individuals with moderate and severe disabilities. *Journal of Special Education, 30* (3), 130-154.
- Hand Searches
  - Exceptional Children (2006)
    - Browder, D., Wakeman, Shawnee, Spooner, F., Ahlgrim-Delzell, L., & Algozzine, B. (2006). Research on reading instruction for individuals with significant cognitive disabilities. *Exceptional Children, 72*, 392-408.

#### Citations (include only those that are relevant)

- *Relevant Systematic Review:*
  - Browder, D.M., & Yan, P.X. (1998). A meta-analysis and review of sight word research and its implications for teaching functional reading to individuals with moderate and severe disabilities. *Journal of Special Education, 30* (3), 130-154.
  - Browder, D., Wakeman, Shawnee, Spooner, F., Ahlgrim-Delzell, L., & Algozzine, B. (2006). Research on reading instruction for individuals with significant cognitive disabilities. *Exceptional Children, 72*, 392-408.

*Summary and Appraisal of Studies*

Study	Subjects	Results	Appraisal
Browder & Yan (1998)	<p>48 studies included in a meta-analysis; all but 2 used single subject design.</p> <p>A total of 269 individuals participated in the research. Most (63%) were school-aged; 17% were adults.</p>	<p>All studies focused on teaching sight words. Overall, sight word instruction seemed to be highly effective for individuals with disabilities. Postresponse prompting (feedback; repetition of a corrected response) appeared to be more effective than preresponse prompting (time delays; stimulus prompting). Use of real materials or activities produced better outcomes. Most studies failed to include measures of response generalization. Using a larger number of words in a set (5-10) produced better responses.</p>	<p><u>Suggestive</u>: Only a small percentage of participants in these studies were adults; the overall percentage of nonoverlapping data (PND) used to determine effect size for single subject research was high (above 90%); most studies reported one-to-one rather than small group instruction by a teacher/researcher; often students who are learning sight words have no other reading skills (e.g., phonetic analysis skills or ability to name separate letters); 4 studies measured comprehension by functional use of sight words (e.g., preparing recipes, reading product warning labels).</p>
Browder, Wakeman, Spooner, Ahlgrim-Delzell, & Algozzine (2006)	<p>88 studies used single subject design 56 studies out of 88 met all criteria for single subject designs and</p> <p>Only 2 of the 40 group design studies met all criteria</p>	<p>38 of the 56 single subject studies used sight word instruction using massed trial training (e.g., flash card drill) Fluency measures focused on error rate Insufficient studies found that focused on phonics or phonemic awareness</p> <p>Wider range of procedures used in group studies producing no single type of intervention with five or more studies to support it with the exception of teaching sight words using massed trial instruction</p>	<p><u>Suggestive</u>: Most studies meeting criteria described subjects with moderate mental retardation with a few studies using subjects with severe mental retardation; majority of subjects were elementary-aged students with only 4% being adults; majority of studies occurred within a research setting or self-contained classroom; majority of studies used massed trial training format using flash cards; procedural integrity was better in single subject designs than in group studies; percentage of nonoverlapping data (PND) used to determine effect size for single subject research; effect size for sight word vocabulary was 85%</p>

### *Applicability*

- The n of the studies reviewed was 1, 123 with most subjects within the elementary age level (n = 301). Only 4% were adults (n = 50) which would be similar to S.C.
- Majority (55%) of participants presented moderate mental retardation which is similar to the functioning level of S.C.

### *Conclusions*

Taken together, these comprehensive reviews suggest that it is *plausible* that:

- Teaching sight word vocabulary using massed trial training is the most typical strategy
- Other strategies used with massed trials are time delays and systematic prompting with both time delays and systematic prompting faded over time
- Further research is needed regarding the applicability of reading comprehension, fluency, phonics and phonemic awareness with this population.