



## AOTA Critically Appraised Topics and Papers Series **Traumatic Brain Injury**

*\*A product of the American Occupational Therapy Association's  
Evidence-Based Literature Review Project*

### CRITICALLY APPRAISED PAPER (CAP)

#### *Focused Question*

**What is the evidence for the effect of interventions to address cognitive/perceptual functions (attention, memory, executive functions) on the occupational performance for persons with traumatic brain injury (TBI)?**

Wright, P., Rogers, N., Hall, C., Wilson, B., Evans, J., Emslie, H., & Bartram, C. (2001). Comparison of pocket-computer memory aids for people with brain injury. *Brain Injury, 15*, 787–800.

#### **PROBLEM STATEMENT (JUSTIFICATION OF THE NEED FOR THE STUDY)**

State the problem the authors are investigating in this study.

Conventional forms of memory support (e.g., lists) for people with brain injury may not be enough because of impaired planning skills and because the supports make heavy demands on memory. Electronic memory aids can reduce some of the memory load by sounding an alarm, inserting repeating entries, etc. Paging systems and pocket computers can be highly beneficial. Because persons with brain injury have different needs, it is important that the interface of a computer-based aid and the range of functions available be customized to suit individuals. It is timely to ascertain whether people with memory problems would be helped or hindered by using an on-screen keyboard versus a physical keyboard.

#### **RESEARCH OBJECTIVE(S)**

List study objectives.

Test whether an interface could be designed for memory aids on pocket computers, including an appointment diary and notebook that could be easily mastered by people with memory problems; compare people's attitudes to and use of pocket computer memory aids when essentially the same interface is made available on a handheld computer with a keyboard and on a palm-size computer with a touch-screen keyboard.

Describe how the research objectives address the focused question.

Occupational therapists use various types of memory aids to enhance occupational functioning of people with brain injury and other disorders characterized by memory deficits. This article purports to evaluate which of two types of computers is best and whether a custom-designed interface is useful.

**DESIGN TYPE:**

One group, repeated measures, counterbalanced design

**Level of Evidence:**

II

Limitations (appropriateness of study design):

Was the study design type appropriate for the knowledge level about this topic? *If no, explain.*

Yes

No

**SAMPLE SELECTION**

How were subjects selected to participate? Please describe.

NR

NR = Not reported.

**Inclusion Criteria**

NR

**Exclusion Criteria**

Visual or motor handicaps that would have precluded use of the computers; unwillingness to use the aid. Not excluded for previous or present use of any memory aid.

Sample Selection Biases: *If yes, explain.*

Volunteers/Referrals

Yes  volunteers

No

Attention

Yes

No

Others (list and explain):

### SAMPLE CHARACTERISTICS

$N = 12$  original + 12 (data-producing group further recruited after large dropout of 1<sup>st</sup> 12 participants); mean age = 34 years (range 22–54 years); mean duration since injury = 6 years (range 2–12 years). 4 had previously used NeuroPage.

% Dropouts

# (%) Male

# (%) Female

Ethnicity

Disease/disability diagnosis

Check appropriate group:

<20/study group <input checked="" type="checkbox"/>	20–50/study group	51–100/study group	101–149/study group	150–200/study group
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Sample Characteristics Bias: If no, explain.

If there is more than one study group, was there a similarity between the groups?

Yes

No

Were the reasons for the dropouts reported?

Yes  diverse, idiosyncratic personal reasons; new cohort of 12 participants recruited

No

**INTERVENTION(S)**—Included are only those interventions relevant to answering the evidence-based question.

The overall experiment lasted 22 weeks. At 1<sup>st</sup> visit, the researcher explained the purpose of the project; discussed the memory aids the person was currently using; demonstrated the functionality of both computers; administered tests of visual acuity, manual dexterity, and short-term memory; and left a memory diary for daily completion. Each participant kept a memory diary during the 1<sup>st</sup> week. 2<sup>nd</sup> week: researcher demonstrated the memory aids on one of the computers and loaned it to the patient. 3<sup>rd</sup> week: follow-up. 6<sup>th</sup> week: telephone interview. 10<sup>th</sup> week: reclaimed computer. 15<sup>th</sup> week: repeat of week 2. 16<sup>th</sup> week: repeat of week 3; 19<sup>th</sup> week: repeat of week 6.

Training in weeks 2 and 15: Hands-on problem-based training followed by a manual with pictures of the various screens. In the 3<sup>rd</sup> and 16<sup>th</sup> weeks, participants were asked to demonstrate use of the computer to verify that they could use it. They had telephone numbers of the researchers for technical assistance.

Both computers had the following memory aids: appointment diary and notebook. These were linked so that from a diary entry, participants could link to a notebook page containing details about the situation of the diary entry. An alarm could be set for any diary entry and/or an entry could be repeated daily by ticking boxes on the screen.

*Add groups if necessary*

Condition 1: Computer aid with physical keyboard

Brief Description	Hewlett Packard (HP) 360 LX with 8 MB RAM and screen resolution of 640 x 240 pixels, occupying 154 x 62 cm in landscape orientation. Text was entered via the keyboard, but all interactions were made by tapping the screen with the pen provided.
Setting	Home/community
Who Delivered?	Self
Frequency?	Daily use of computer
Duration?	2 months treatment

Condition 2: Computer aid with on-screen keyboard

Brief Description	Casio E10 with 8 MB RAM and screen resolution of 240 x 320 pixels, occupying 80 x 60 cm in portrait orientation. Text was entered and all interactions were made by tapping the screen with the pen provided.
Setting	Home/community
Who Delivered?	Self
Frequency?	Daily
Duration?	2 months

Group 3 Condition 3: Baseline/Washout Period

Brief Description	Time between two experimental conditions
Setting	
Who Delivered?	
Frequency?	
Duration?	1 month

Intervention Biases: *Explain, if needed.*

Contamination

Yes

No  counterbalanced design with 1-month washout period.

Co-intervention

Yes

No  probably not; all > 2 years postinjury

Timing

Yes

No  probably not. Although 22 weeks is a long time, all participants were in chronic stage of recovery and unlikely to recover function. Some could have lost interest during the long period.

Site

Yes

No

Use of different therapists to provide intervention Not reported regarding training.

Yes

No  self-administered

**MEASURES AND OUTCOMES**—Included are measures relevant to answering the focused question.

Psychometric measures administered at the 15<sup>th</sup> week, but not of interest to this review.

Name of measure:

Satisfaction

Outcome(s) measured (what was measured?):

Attitude toward ease of use of computers; on a 1–10 point scale

Is the measure reliable (as reported in article)?

Yes

No

NR

Is the measure valid (as reported in article)?

Yes

No

NR

How frequently was the measure used for each group in the study?

Once per condition

Name of measure:

Use of the computer

Outcome(s) measured (what was measured?):

Demonstrate ability to retrieve information known to be stored on the computer to verify ability to use the features of the computer. Time-stamped computer log file of entries made.

Is the measure reliable (as reported in article)?

Yes

No

NR

Is the measure valid (as reported in article)?

Yes

No

NR

How frequently was the measure used for each group in the study?

Once per condition

Name of measure:

Record of instances

Outcome(s) measured (what was measured?):

Record of instances when person felt they would have used the computer if they had it and whether they managed successfully without it

Is the measure reliable (as reported in article)?

Yes

No

NR  probably not—asking persons with memory deficits to keep a log

Is the measure valid (as reported in article)?

Yes

No

NR

How frequently was the measure used for each group in the study?

Ad lib during the 4 weeks between using a computer

Measurement Biases

Were the evaluators blinded to treatment status? *If no, explain.*

Yes

No  probably not—not reported.

Recall or memory bias *If yes, explain.*

Yes  possibly because the interview was repeated after the use of each computer; however, the counterbalanced order would have controlled for this

No

Others (list and explain):

Limitations (appropriateness of outcomes and measures) *If no, explain.*

Did the measures adequately measure the outcome(s)?

Yes  the usage by computer tally

No  the interview and the log relied on patient memory in a group with memory deficits

## RESULTS

List results of outcomes relevant to answering the focused question

Include statistical significance where appropriate ( $p < 0.05$ )

Include effect size if reported

I calculated effect sizes when data was reported.

All participants could use the computers and 83% found them helpful. Amount of use varied widely.

Qualitative data (questionnaires and interviews): The diary was considered more useful than the notebook by 10 out of 12 people (mean scores of 7.6 [out of possible 10] vs. 4.8 (sign test,  $p < 0.05$ )). Nine versus two people rated the Casio higher than the HP (sign test,  $p < 0.07$ ). 7/12 people kept 1-week log of when they might use a computer during the month they did not have one and only 3 people recorded forgetting things they would have entered into a diary, indicating that 25% benefited from the electronic memory aids; however, this measure was found to be unreliable.

Performance data (computer logs of actual use): 3 total entries/day, with 1 new entry/day. On average, more diary and notebook entries were made with the Casio than the HP, but wide variation. People who were high users of one machine tended to be high users of the other. Correlations between computers for total entries ( $r = 0.82$ ,  $P < 0.01$ ); for new entries ( $r = .71$ ,  $p < 0.01$ ).

High use subgroup used HP more to make entries than Casio ( $t_{(4)} = 2.48, p < 0.07, r = .77$ ). Low users made twice as many with the Casio than the HP ( $t_{(6)} = 4.97, p < 0.01, r = .89$ ).

The only statistically reliable difference between the pocket computers was the greater use of alarms for diary entries when using the HP ( $t_{(11)} = 2.38, p < 0.04, r = .58$ ).

Was this study adequately powered (large enough to show a difference)? *If no, explain.*

Yes

No  too few subjects. The effect sizes were large, indicating the likelihood of reaching statistical significance in those measures that did not if there were a greater number of subjects.

Were appropriate analytic methods used? *If no, explain.*

Yes

No

Were statistics appropriately reported (in written or table format)? *If no, explain.*

Yes

No

## CONCLUSIONS

State the authors' conclusions that are applicable to answering the evidence-based question.

This study established that people with memory impairments resulting from brain injury can use purpose-designed computer-based memory aids, comprising an appointment diary, notebooks, and links between them. The design solution is to present people with an unambiguous set of choices and then rely on their problem-solving skills rather than expecting them to remember procedures. The data strongly suggest that different pocket computers suit different participants. A memory aid that performs a safety-net role of alerting the user to critical events can be very valuable even if that role is not required often. There is a need to distinguish ability to use from willingness to use a handheld computer memory prosthetic aid.

Were the conclusions appropriate for the study design (level of evidence)? *If no, explain.*

Yes

No

Were the conclusions appropriate for the statistical results? *If no, explain.*

Yes

No

Were the conclusions appropriate given the study limitation and biases? *If no, explain.*

Yes

No

### **IMPLICATIONS FOR OCCUPATIONAL THERAPY**

This section provides guidance about clinical practice, program development, and other implications of the study findings as they relate to the focused question.

This study provides evidence that memory aids (diary, notebook, and links between) on a handheld computer that has a custom-designed interface to allow patients with brain injury to use the system by ticking off choices (problem-solving skills) rather than memory can be useful for some persons with brain injury. Although all participants were able to use the computers after training, only 83% (10/12) found them useful, indicating that personal preferences affect choice of memory prosthetic appropriate for particular patients. There was no measure of effectiveness of the memory aids on occupational performance (medications, keeping appointments, etc.), which should be studied.

This work is based on the evidence-based literature review completed by Catherine Trombly, ScD, OTR/L, FAOTA.

CAP Worksheet adapted from: Critical Review Form – Quantitative Studies ©Law, M., Stewart, D., Pollack, N., Letts, L., Bosch, J., & Westmorland, M., 1998, McMaster University. Used with permission.

For more information about the Evidence-Based Literature Review Project, contact the American Occupational Therapy Association, 301-652-6611, x 2052.



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