



**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)?**

Levine, B., Robertson, I. H., Clare, L., Carter, G., Hong, J., Wilson, B. A., et al. (2000). Rehabilitation of executive functioning: An experimental-clinical validation of Goal Management Training. *Journal of the International Neuropsychological Society*, 6, 299–312.

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

State the problem the authors are investigating in this study.

Maintaining intentions in goal-directed behavior (goal management) is considered an executive function. Deficits in this function are associated with negative occupational (work) outcomes. In spite of the impact of goal neglect on patients' day-to-day lives, there are few theoretically grounded, experimentally validated rehabilitation protocols for this problem. Goal Management Training (GMT) is a theoretically derived, structured, interactive, manual-based rehabilitation protocol tested in this research.

**RESEARCH OBJECTIVE(S)**

List study objectives.

To determine the effectiveness of GMT for persons with traumatic brain injury (TBI) to the frontal lobes.

Describe how the research objectives address the focused question.

The research tests a particular protocol to remediate the executive function of goal management.

**DESIGN TYPE:**

Randomized controlled trial

**Level of Evidence:**

I

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.

**Inclusion Criteria**

Documented brain injury; hospitalized initially; impaired on a test reminiscent of the unstructured, real-life situations targeted by the GMT

**Exclusion Criteria**

Serious medical conditions or death; psychiatric illness; substance abuse; refusal to participate; loss of contact over the 3 to 4 years of the ongoing primary study on posttraumatic amnesia.

Sample Selection Biases: *If yes, explain.*

Volunteers/Referrals

Yes

No  94 consecutive admissions prior to application of exclusion criteria

Attention

Yes

No

Others (list and explain):

Possibly; \$50 paid after the 2<sup>nd</sup> (last) session

**SAMPLE CHARACTERISTICS**

*N* = 30; mean age = 29.9 years; mean years of education = 12.8; mean Glasgow Coma Scale score = 10.7; years since injury = 3.75

% Dropouts

# (%) Male

# (%) Female

Ethnicity

Disease/disability diagnosis

NR = Not reported.

Check appropriate group:

<20/study group <input checked="" type="checkbox"/>	20–50/study group <input type="checkbox"/>	51–100/study group <input type="checkbox"/>	101–149/study group <input type="checkbox"/>	150–200/study group <input type="checkbox"/>
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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  except for days of posttraumatic amnesia; treatment group = 17.9, control group = 14.6 (NS difference)

No

Were the reasons for the dropouts reported?

Yes

No

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

Add groups if necessary

Group 1 Treatment: Goal Management training (GMT)

Brief Description	<p>5 stages of GMT:</p> <p>Orienting (participants are trained to assess the current state of affairs and direct awareness toward relevant goals)</p> <p>Goals are selected</p> <p>Goals are partitioned into subgoals</p> <p>Goals and subgoals are encoded and retained</p> <p>Monitoring (outcome of action is compared with the goal state). If there is a mismatch, the entire process is repeated.</p> <p>Trainer used a memorized script to give examples of goal management and the consequences of poor goal management; participants' own experiences were discussed; participants used a workbook that included the script and paper-and-pencil exercises; and training concluded with a real-life activity (setting up an answering machine) that required partitioning into subgoals before performing correctly.</p>
Setting	Laboratory
Who Delivered?	Research assistant trainer
Frequency?	Once
Duration?	1 hour

Group 2 Control: Motor Skills Training (MST)

Brief Description	Training of procedural processes unrelated to goal management: reading and tracing mirror-reversed text and designs.
Setting	Laboratory
Who Delivered?	Research assistant trainer
Frequency?	Once
Duration?	1 hour

Biases: *Explain, if needed.*

Contamination

Yes  versions of the measurement tasks were used in the training

No

Co-intervention

Yes

No

Timing

Yes

No

Site

Yes

No

Use of different therapists to provide intervention

Yes

No  same therapist

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

Name of measure:

Everyday paper-and-pencil tasks

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

1. Three tasks, all of which involved keeping goals in mind, analyzing subgoals, and monitoring: 1. Proofreading—Using a list of 3 simple proofreading instructions, participants marked specified words in a paragraph using specific symbols in 60 s. Scores from two paragraphs were averaged together. Scores consisted of time spent reading the instructions, time to complete task, and number of errors.
2. Room layout—A 5 x 5 grid representing columns and rows of a seating scheme for a meeting. In each of 25 cells, a letter A to E indicated an employee from one of five companies. Participants had to answer five questions of ascending difficulty using the grid. Scores consisted of time to answer the questions and number of correct answers.
3. 3. Grouping—A sheet with two columns each listing 23 individuals' age and sex (e.g., 25 M). The participant was to follow remembered instructions (written instruction studied for 60 s) for classifying these individuals. Scores consisted of time spent reading the instructions, time to complete task, and number of errors.

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?

Twice; before and after the training

Measurement Biases

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

Yes

No

NR

Recall or memory bias *If yes, explain.*

Yes

No  stimuli of the test tasks were different from pretraining to posttraining evaluation, although the tasks and instructions remained the same

Others (list and explain):

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

Did the measures adequately measure the outcome(s)?

Yes

No

## RESULTS

List results of outcomes relevant to answering the focused question

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

Include effect size if reported NR, but calculated from data supplied

*Hypothesis tested:* The participants receiving GMT would show greater improvement on the posttraining tasks (relative to the pretraining tasks) than the participants receiving MST.

*Accuracy:* There was a significant difference between the GMT group and the MST group on the proofreading task ( $F_{1,28} = 6.43, P < .05, r = .43$ ) after treatment; however, the effect was due to more errors made by the MST group pre-post while the GMT group did not change. On the grouping task, the GMT group performed significantly better ( $F_{1,28} = 5.56, P < .05, r = .41$ ) than the MST group, who made more errors. In the room layout task, both groups improved, but there was no significant difference between the groups.

*Speed:* The GMT group slowed significantly on the proofreading task (reflecting increased care and attention) from pretest to posttest ( $t_{(14)} = 3.74, P < .05, r = .71$ ) as compared to the MST group, which did not slow significantly ( $t_{(14)} = 1.14, NS, r = .29$ ). Both groups reduced their time on the posttraining grouping and room layout tasks, but not significantly.

*Effects of MST:* MST participants improved significantly on procedural learning measures: Their time to do the tasks reduced significantly ( $t_{(14)} = -4.40, P < .01, r = .76$ ) and they made significantly fewer errors ( $t_{(14)} = -3.27, P < .01, r = .66$ ) compared to pretesting.

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

Yes

No

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.

The authors concluded that GMT was associated with improved performance on paper-and-pencil tasks that correspond to everyday situations known to be problematic for people who have sustained a TBI. These effects were significant in spite of the relatively brief intervention.

This reviewer concludes that task-specific training offered even several years posttrauma can be effective in restoring the ability of the person to do very similar tasks, but the ability to generalize to other tasks was not adequately tested to allow a conclusion regarding this.

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  the authors concluded that GMT training was effective; however, the results showed that one difference (proofreading) between groups was because of deterioration of the control group with no change in the treatment group; there was no difference between groups on another task (room layout). Only on grouping did the GMT group outperform the control group in accuracy. Regarding speed, only on one task (proofreading) did the GMT group show significant difference between pre- and posttesting compared to the MST group.

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

Yes

No

## IMPLICATIONS FOR OCCUPATIONAL THERAPY

Task-specific training was again shown to cause some improvement in the particular tasks featured in the training in persons who had moderate brain injury of years standing. However, whether the training can be generalized to non-practiced occupational tasks requires study.

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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