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Improvement Resulting from Cognitive Training on Long Term Traumatic Brain Injury Patient

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Background and Purpose

The goal was to present a case study which illustrates what is typically seen clinically in providing cognitive rehabilitation in a mental health care setting; robust improvement in memory function followed by improvement in attention and executive reasoning function. Typically, pre and post neuropsychological evaluation reveals memory function improvement within the first three months while executive reasoning is seen within six to twelve months. Recent research documenting cognitive rehabilitation revealed mixed results which may be the result of not individualizing the program for each patient and/or not using neuropsychological evaluation for pre and post assessment. A literature review reveals that cognitively stimulating activities have been shown to independently slow late life decline, before death, offering protection against decline and possible helping to preserve cognitive function despite the presence of pathology. Cognitive therapy becomes a more efficacious method when there is more specificity of the training and improved functioning can be seen even if limited in time and duration [1-7].

Introduction

Recent research suggests the benefit of cognitive training for the dementia population [8,9]. At a private clinic as part of a therapeutic program we have been using cognitive training for individuals diagnosed with TBI (Traumatic Brain Injury) for almost fifteen years.

The following is a case study of a woman who came in for treatment at the age of 63 years in 2012. She was referred by her treating psychologist for neuropsychological evaluation to obtain a waiver for her language requirement to complete college study.

She sustained two MVA (motor vehicle accident) with the diagnosis of TBI; in May 1998 and in January of 2001. She was not diagnosed with TBI for an additional MVA in 1999. She had no prior significant medical history.

When evaluated in 1999 from the 1998 MVA she had a GAF (Global Assessment of Functioning) of 59; symptomatology of crying, increased desire for sleep, helplessness, extensive stress, emotional dyscontrol and with poor prognosis for recovery. She was diagnosed with an abnormal EEG in August of 2000 due to left temporal slowing attributed to the MVA of 1998. Neuropsychological evaluation in 2001 following the second MVA diagnosed significant deficits in working memory, sustained attention, right hemisphere lateralization, and more significant brain injury.

She had completed two years of college in 2001. When seen in 2012 she was on medical disability and in her last year of college study. She was unable to pass a Polish language class to meet her language requirement for graduation despite having spoken Polish as a child and receiving accommodations (and help for two additional hours after every class from her professor). In 2012 she had been attending college full time for three years. She attended school year round, taking two classes per semester. She spent arduous amounts of time completing papers, studying for exams as well as receiving accommodations (extra time for examination and a private room).

Method and Results

She was evaluated using neuropsychological testing in November of 2012. She participated in therapy from 2012 to 2013 and she was re-evaluated in August of 2013.

Evaluation in November of 2012 revealed a total score on the RBANS (Repeatable Battery for the Assessment of Neuropsychological Status) [10] that was within well below average limits at the 9th percentile. Her performance was primarily compromised by well below average/impaired immediate memory at 2nd percentile and well below average delayed memory at the 5th percentile. Visual memory on the BVMT-R (Brief Visuospatial Memory Test Revised) [11] revealed a total recall score within average limits at the 69th percentile and delayed recall was at the 88th percentile and within above average limits. Visual and verbal memory, recall and recognition testing on the Doors and People Test [12] revealed a total age scaled memory score within below average limits at the 10th percentile. There was a significant discrepancy between the visual and verbal memory at the 90th percentile; resulting from scoring within average limits for visual memory (50th percentile) compared to well below average verbal memory (1st percentile). Recall and recognition were not significantly discrepant and she had a total age scaled forgetting score at the 5th percentile within well below average limits.

Attention processes were within average limits (Trail making tasks A and B) [13,14] for cognitive speed, sequencing and cognitive flexibility while distractibility was within below average limits on the Stroop Color Word Test [15].

She received cognitive training as part of a therapeutic intervention two times per week for one hour for a total of 58 visits from 2012 to 2013. There was a carry-over program for her to work on at home with similar tasks to the ones that she was completing at our clinic. Her program was specifically designed based upon the neuropsychological testing to address specific deficits of working memory, verbal memory, retrieval memory, sequential processing, perseveration, cognitive flexibility deductive reasoning and concrete thinking.

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She had her last therapy session in August of 2013 and was re-evaluated one week later. Re-evaluation is typically completed to make necessary changes in the therapeutic program.

Re-evaluation was completed at the same time of day as the previous evaluation. Re-evaluation in August of 2013 resulted in a significantly improvedtotal score on the RBANS (Repeatable Battery for the Assessment of Neuropsychological Status) that was within average limits at the 66th percentile. Immediate memory improved to high average scoring at the 73rd percentile and delayed memory to high average scoring at the 75th percentile. Visual memory on the BVMT-R (Brief Visuospatial Memory Test Revised) declined for her total recall score although remaining within average limits at the 42nd percentile and delayed recall was declined although within high average limits at the 79th percentile. Visual and verbal memory, recall and recognition testing on the Doors and People Test revealed an improved total age scaled memory score within average limits at the 25th percentile. The discrepancy between visual and verbal memory was decreased in significance between the 75 and 90th based upon improved verbal memory to below average limits at the 10th percentile (visual memory remained the same). Recall and recognition were not significantly discrepant and her total age scaled forgetting score improved to high average limitsat the 75th percentile.

Attention processes remained within average limits (Trail making tasks A and B) for cognitive speed, sequencing and cognitive flexibility and distractibility remained within below average limits (although slightly improved) on the Stroop Color Word Test (although slightly improved) (Tables 1-4).

Indices	November 2012 T Score	2012 %	August 2013 T Score	2013 %
Total Scale Index	80	9th	106	66th
Immediate Memory Index	69	2nd	109	73rd
Delayed Memory Index	75	5th	110	75th

Table 1: Results of the RBANS: This is a measure of general brain functioning used for dementia for repeated assessment, scoring is in the form of standard scores.

Indices	November 2012 T Score	2012 %	August 2013 T Score	2013 %
Total Recall	55	69th	48	42nd
Delayed Recall	62	88th	58	79th

Table 2: Results of the Brief Visuospatial Memory Test-Revised: This is a measure of visual memory functioning that incorporates the use of spatial material under conditions of immediate and delayed recall. Scores are compared to normative data for her specific age range, presented in T score formulation.

Indices	November 2012 T Score	2012 %	August 2013 T Score	2013 %
Total Age Scaled Score	6	10th	9	25th
Visual-Verbal Discrepancy Age Scaled Score	14	90th	12	75-90th
Recall-Recognition Discrepancy Age Scaled Score	11	50-75th	9	50-75th
Visual Memory Age Scaled Score	10	50th	10	50th
Verbal Memory Age Scaled Score	3	1st	6	10th
Overall Forgetting Age Scaled Score	5	5th	12	75th

Table 3: Results of the Doors and People Test: This is a measure of visual and verbal recall and recognition as well as immediate and delayed learning. Scores are compared to normative data for her specific age range, presented in scaled score formulation.

Indices	November 2012 T Score	August 2013 T Score		
Stroop Interference Score	34	38		
Indices	**November 2012 Time Score**	**2012 SD**	**August 2013 Time Score**	**2013 SD**
Trail Making Part A Time	41	0.44↑	32	0.32↓
Trail Making Part B Time	95	0.36↑	90	0.23↑

Table 4: Attention Testing: Results of the Stroop and Trail Making Tests A and B: The Stroop is a measure of divided attention (distractibility) and the Trail Making Tests are measures of sequential processing, cognitive speed and flexibility. Scoring for the Stroop is a T score for the interference task (using normative data for age) and the Trail Making Tests are represented by a standard deviation score for the time taken to complete the task (below the mean is a higher score for less time) based upon normative data for age. She had no errors for the trail making tasks for 2012 or 2103 performance.

Conclusions

Cognitive training within the context of a therapy program provided positive improvement in memory function, specifically verbal memory. There was slight decline on a visual memory task however scoring remained within average limits. Attention testing while improved in terms of raw scoring remained within average limits and did not show robust improvement. Re-evaluation test findings suggest what is clinically known; that memory function is easier to rehabilitate and that frontal or executive reasoning deficits take longer to produce changes seen on neuropsychological evaluation. There was improvement in life functioning, as a result of the therapy the patient managed to complete her college degree and she is going on for her master's degree. She was happy and well-adjusted at the last meeting in August of 2014.

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