Individualized Neuro-cognitive rehabilitation can reverse cognitive and memory impairment irrespective of etiology: Prospective pilot study

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P6.189 - AAN, Washington, DC, April 2015

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INTRODUCTION

Memory is the building block of intelligence. Without a memory of the past, we cannot operate in the present or think about the future. In well published literature , complex cognitive function depends on the ability to learn and retain in short term memory (STM) through acoustic repetition, visual, and semantic memory. The transition of making new memory from STM to long term memory (LTM) is by genetic coding through stages of memory, encoding , storage, and retrieval. The principle encoding system in LTM appears to be semantic coding (by meaning/logic) and visual. LTM involve changes in protein synthesis, gene regulation, and in many cases, structural modifications. LTM involves changes in the structure of neurons including growth of new processes and synapses in the different parts of the brain. Assisted computerized cognitive brain training (CCBT) is capable of the repetitive brain stimulation of visual, auditory, semantic, and procedural memory.

CCBT is designed to rehabilitate cognitively impaired patients via an individualized program of specific cognitive training and practice. Physical and occupational therapy has been effective in patients after a stroke but not much has been published in cognitive rehabilitation of TBI, hypoxia, dementia, and stroke. TBI frequently results in memory impairment causing significant disabilities in daily life and cognitive rehabilitation should be a target of focus. Brain remediation and plasticity has led to novel insights in remediation-oriented approaches for the rehabilitation of memory deficits.

MATERIAL AND METHODS

In 12 months, we diagnosed 71 patients with neuro-cognitive deficits due to various etiologies by psychometric battery Weschler Memory Scale IV and Neuro-cognitive assessment battery. The patients were offered a customized cognitive rehabilitation based upon their specific cognitive impairment in primary 6 modalities . Auditory memory (AM I), Visual Memory (VMI), Immediate auditory memory recall (IMI), Delayed memory recall (DMRI), Executive function, and Visual Working memory (VWMI).

Method Cont..

The program consisted of 20 sessions– sixty minutes twice a week. After the completion of the program, each patient was administered the same WMS-IV test. Test results indicate patient's performance as Index Scores: Auditory Memory (AMI), Visual Memory (VMI), Immediate Memory (IMI), and Delayed Memory (DMI). Scores are also expressed as percentiles. A score of 100 is considered average (50 percentile). The scores for the patients were compared with initial and final tests. The average period of time the test from the TBI in mTBI group was 12.8 months.

Symptoms at Present	Number
Age	21-78Years
M: F	7:6
TBI	8
CVA	3
Dementia	1
Hypoxic/ischemic injury	1

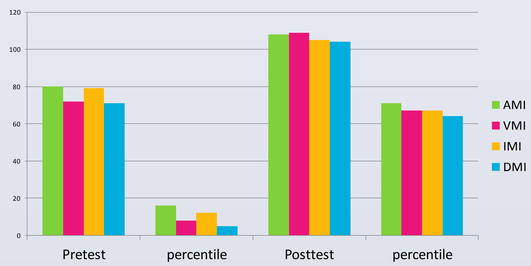
The mean score for auditory, visual, visual working, immediate recall, and delayed recall memories were 85, 75, 76, 81 and 75 respectively that are in the bottom 25th percentile for all modalities. Visual memory and the delayed recall memory (11th percentiles) are the most affected cognitive functions followed by the working visual memory (13th percentile). Auditory memory (22th percentile) was the least affected cognitive modality.

The limitation of the CCBT is ecological bias. We tried to limit this by providing natural ecological brain stimulation by a different task module.

Result:

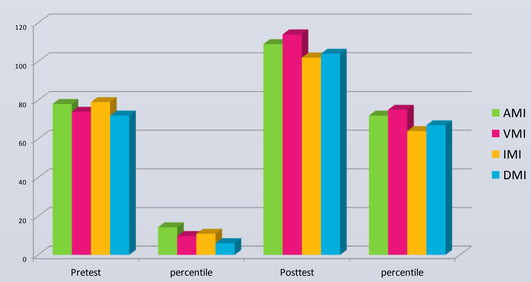
13 patients (7M, 6F) have completed the program (mean age 47 years). The etiologies were mild TBI, dementia, hypoxia,, and CVA. The average initial index scores were 80, 72, 79 and 71 for AMI, VMI, IMI and DMI respectively. The average percentile ranks were 16, 8, 12 and 5 for these groups. After cognitive rehabilitation (average 3.6 months) the WMS scores were 108, 109, 105 and 104 (71, 67, 67 and 64 percentile) for AMI, VMI, IMI and DMI respectively. This represents an average of 31 points (57 percentile points) improvement in memory scores overall.

Pre & Post rehab Cognitive test in all Group



The T score Pre and post test P value 0.0011 and ANOVA pre and post treatment group P value 0.0001 present significant changes in cognitive improvement in all modality.

Pre & Post Cognitive test in TBI Group



In the mTBI group, the T score Pre and post test (P value 0.0011) and ANOVA pre and post treatment (P value 0.0001) are significant changes in cognitive improvement in all modalities. The improvement averages 10.2 to 69.5 percentile.

Results Cont..

Cognitive impairment persists in majority (75%) of patients even a year after mTBI from the point prevalence in our study presented as poster #P7.185.

CONCLUSIONS

Tailored supervised intensive neuro-cognitive rehabilitation, though CCBT specifically designed for individual provides significant reversal of cognitive deficit in adult patients with cognitive impairment, regardless of the etiology. In our studies on average we have seen 57 percentile improvement of cognitive function with ANOVA P value 0.001 regardless of etiology, and almost 70th percentile improvement in the TBI group.

In a parallel study presented as poster # P7.185 we have learned in both TBI and hypoxia, visual and delayed memories were the worst affected while the auditory memory was preserved. Dementia affected all modalities equally. Delayed recall was the most impaired in every etiology.

A majority of MTBI patients continue to suffer from occult cognitive impairment long after the initial injury. Impairment of Visual memory and delayed recall (V-DIP) is the significant pattern seen in patients with mTBI can be rehabilited through the CCBT. Further research is recommended to validate these findings with a larger Acquired Brain Injury population and to investigate transfer to improvement in occupational performance that supports daily living skills and ultimately gainful quality of life.

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