Mini Review

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ACTA PSYCHOPATHOLOGICA
ISSN 2469-6676

2017
Vol. 3 No. 2: 9

DOI: 10.4172/2469-6676.100081

The Benefits of Neurocognitive Training in a Diagnosed Dementia Population, an Ongoing Study since 2011

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Received: February 14, 2017; **Accepted:** March 24, 2017; **Published:** April 03, 2017

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Citation: Garges DM, Fisher BC. The Benefits of Neurocognitive Training in a Diagnosed Dementia Population, an Ongoing Study since 2011. Acta Psychopathol. 2017, 3:2.

Introduction

Patients have been receiving neurocognitive training as part of their treatment at an outpatient mental health facility for the past ten years and findings are the result of an on-going study completed over the past six years. The program consists of neuropsychological assessment, a specific battery of tests to evaluate for dementia, consisting of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS), Memory Assessment System (MAS), Doors and People Test, and Brief Visuospatial Memory Test-Revised (BVMT-R). Based upon the individual evaluation, a specific treatment plan is created. The plan is patient specific. Evaluation is completed, using the same testing at the same time of day, following a general of range three to six months of treatment to ascertain changes and efficacy of the program. Re-evaluation occurred when the treating therapist thought there was sufficient improvement to change the program or at the wish of the patient. All patients were initially administered a memory battery of tests consisting of the RBANS, MAS, Doors and People and the BVMT-R.

Neurocognitive intervention has been gaining credence in recent research, along with the modifiable risk factors and exercise as an intervention to address dementia decline. There are commercial programs that have shown to have efficacy and large scale studies have been conducted revealing the benefit of cognitive training and stimulation [1,2]. Cognitive training intervention and cognitive enhancement have been found to have positive effects, as well as impacting cognitive decline in the aged population [3,4]. When cognitive training was compared to physical training, improvement was distinct revealing improved executive function with cognitive training and [5] improved memory with physical training [6]. Only modest support was shown for the potential of videogame training to improve cognitive function in healthy older adults and another study revealed only specific effects. The transfer of training to real life improvement was seen as offering mixed results [7]. Finally, another study revealed that an active lifestyle was more effective than the effect of short term training interventions as impacting cognitive change over time in a dementia risk group.

Method

Adults were referred by their primary care physician or neurologist for assessment of memory difficulties and diagnosed with dementia (age 51-90 years, n=51). The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS), Memory Assessment System (MAS), Doors and People Test, and Brief Visuospatial Memory Test-Revised (BVMT-R) were utilized to measure memory functioning pre and post treatment. On average, a total of 3 to 6 months elapsed between pre and post testing.

Educational level ranged from high school to graduate degrees. All patients were diagnosed with dementia by neuropsychological evaluation; diagnosis was primarily multifactorial, predominated by cardiovascular dementia; 0.03% was diagnosed with early onset Alzheimer's dementia and 0.06% with dementia secondary to traumatic brain injury.

The RBANS has been used extensively for critical care and in research with patients diagnosed with cognitive deficits or dementia [8,9]. The Doors and People is an accepted memory test for visual and verbal retrieval and recognition [10]. The BVMT-R has been used in the aged population as a measure of visual memory [11].

The neurocognitive training is presented during the course of a therapy session providing treatment of emotional issues, addressing modifiable risk factors and on-going daily life. Patients are seen twice per week and encouraged to play the games during the course of their week in the home setting with a carryover home program. Each patient is assigned a different protocol based upon neuropsychological evaluation and the diagnosis of specific

memory types (short term, working, visual, verbal, recognition versus retrieval) as well as the impact of executive reasoning deficits (selective attention, cognitive rigidity, integration, poor sequential processing). There are over 200 games and activities to choose from, some have been created and some are utilizing available published games. During the course of therapy, the use of the game is altered; timing may be added, increasing the items to remember, changing the pattern of recall for working memory, to cite a few examples. As the individual improves, there are increased levels of the activities. For example, there is a Geoboard that involves the use of patterns created with different colored rubber bands matching a picture presented in black and white or color that provides increasing complexity. The person copies the design and then has to recall it from memory. The task involves the use of planning, memory processes and visual perceptual analysis.

Results

Areas of short-term, delayed, visual, verbal, and overall memory evaluated improved following treatment. Paired samples t-tests revealed significant differences between pre and post treatment scores on the RBANS for delayed memory (p=0.011) consisting of verbal and visual retrieval as well as a verbal delayed recognition task **(Tables 1-6)**. Significant differences were seen on the MAS for short term memory (p=0.049) consisting of a verbal and visual memory task. Significant findings were present on the Doors and People Test for verbal memory (p=0.043) consisting of a verbal recall (retrieval) and recognition task; retrieval (p=0.012) for verbal and visual stimuli and the overall age score (p=0.012) comprised of all four subtests measuring visual and verbal retrieval and recognition. The first learning trial of the BVMT-R trial one (p=0.021) was significantly improved, representing initial learning.

Table 1: Effect of cognitive training on delayed memory performance.

		Pre-testing	Post-testing
RBANS Delayed Memory	Mean ± SD	81.39 22.84	89.07 23.78

Table 2: Effect of cognitive training on short-term memory performance.

		Pre-testing	Post-testing
MAS Short-Term Memory	Mean ± SD	76.0 7.07	82.5 6.36

Table 3: Effect of cognitive training on verbal memory performance.

		Pre-Testing	Post-Testing
Doors and People Verbal Memory	Mean ± SD	7.12 3.50	8.38 3.72

Table 4: Effect of cognitive training on memory recall.

		Pre-testing	Post-testing
Doors and People Recall	Mean ± SD	6.87 3.05	8.38 3.67

Table 5: Effect of cognitive training on overall memory performance.

		Pre-testing	Post-testing
Doors and People Overall Age	Mean ± SD	7.22 3.53	9.18 3.62

Table 6: Effect of cognitive training on visual memory performance.

		Pre-testing	Post-testing
BVMT-R Trial One	Mean ± SD	39.82 14.68	45.72 13.65

Conclusion

Findings indicate that memory function can be improved by neurocognitive training using a specifically designed, individualized program of activities to improve memory function. Improvement can be seen following as short a duration of time as three months and ranging to six months or greater of treatment. The individualized therapeutic program appears to be effective in augmenting memory functioning in a clinical outpatient population. Findings have been documented at this facility shown in abstracts presented at area conferences since 2012 by this facility [12-20].

Limitations of the Study

There is no patient control group given that this was completed in an outpatient setting with the goal of treating dementia and memory deficits. There is always the risk of a practice effect given the familiarity with the measure however in testing individuals with memory difficulties this becomes less of an issue. Six months has been the general known rule for practice effects no longer being considered as a variable which is specifically noted in various test manuals. On the RBANS there was a largely absent practice effect after one year, mean re-test scores increased by 5 points for the index scores excluding language which was 2 points after 39 weeks. Depending upon the form, there was a gain of 2 to 4 raw score points for the BVMT-R after 56 days in healthy participants [21]. On the Doors and People Test there was no change in the brain injured group over time [22]. Testing typically was six months or greater.

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