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Attention Development Training for People with Traumatic Brain Injury

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***Abstract:** The objective of the study is to examine the effectiveness of Attention Development Training among People with Traumatic Brain Injury. A sample of 90 People with Mild Traumatic Brain Injury were chosen by purposive sampling from Neurological Departments. Post-Concussion Syndrome questionnaire and Attention scale scale was administered. The research was conducted in four phases: (1) Baseline assessment (2) Pre-test (3) Attention Development Training and (4) Post-test. To find out the effectiveness in Attention before and after the Attention Development Training, paired "t" test was computed. The findings revealed that Attention Development Training among People with Mild Traumatic Brain Injury significantly improved Focused, Sustained, Selective and Divided Attention.*

I. INTRODUCTION

Mild brain injury is any disruption of brain function, as evidenced by loss of consciousness, loss of memory of events before or during the trauma, or a change in mental state. Patients experiencing post-traumatic amnesia for more than 24 hours, loss of consciousness not more than 30 minutes will be classified under Mild Traumatic Brain Injury. Post-concussion syndrome is a set of signs which continue for weeks, months, or years after a concussion, which is a mild form of Traumatic Brain Injury. The symptoms includes persistent headache, difficulty in concentration and behavioural, such as irritability. Attention, a behavioural and thinking process of selectively focusing on a distinct aspect of information, which may be subjective or objective, while neglecting other perceivable information. It is processed by the mind in clear and vivid form out of seem several simultaneous objects or sequence of thought. Localisation, concentration of consciousness are of its essence. Brain injury affect attention and concentration abilities, resulting in work related problems, study and everyday living. People with Traumatic Brain injury will not immediately recognize their ability to concentrate and will not exhibit any physical signs of the existing problem. People who have sustained a traumatic brain injury or other type of brain disorder are easily distracted, have trouble keeping track of what is said or done, have difficulty doing more than one task at a time, experience information overload and slow at taking in and comprehending any of the information. People with Traumatic Brain Injury will not immediately recognize their ability to concentrate is any different, and there are no physical signs to suggest a problem exists. They often mistake problems with attention as a lack of intelligence or motivation. Attention Development Training is a client centered program for attention deficits among people with Traumatic Brain injury which address issues related to various dimensions of attention such as Focused, Sustained, Selective and Divided.

II. REVIEW OF LITERATURE

Kim et al., (2009) aimed to delineate the cerebral attentional network in patients with traumatic brain injury and assess for variations in this network in response to intervention. Chen et al., (2011) confirmed that training of goal-directed attention regulation and control over neural processing for individuals with brain injury.

Larson et al., (2011) evaluated the practicability of applying virtual reality and robotics to improve attention in patients with severe traumatic brain injury in the early stages of recovery.

Fernandez et al., (2012) examined the impact of cognitive training for acquired brain injured. Program's clinical usefulness was shown with 100% of patients with improved performance in trained functions. Schmitter et al., (2015) quantified that employing complete pre-attentive visual search skills during rehabilitation helps to lessen high mental work load situations, thereby enabling improved rehabilitation process. Robertson Kayela et al., (2017)

Emphasised on capitalizing on intact focused attention abilities by allocating attention during cognitively demanding tasks may help to reduce mental workload and improve rehabilitation effectiveness. Patil Maitreyi et al., (2017) suggested that cognitive and functional outcomes improve significantly with committed and dedicated inpatient rehabilitation in Acquired Brain Injury patients, which is sustainable over a period.

III. METHODOLOGY

A. *Objectives Of The Study*

To find out the effectiveness of Attention Development Training in improve Attention among People with Mild Traumatic Brain Injury.

B. *Hypothsis*

People with Mild Traumatic Brain Injury would not significantly differ in Attention - Focused, Selective, Sustained and Divided after the Attention Development Training.

C. *Methodology*

1) *Sample:* Sample comprised of 90 People with Mild Traumatic Brain Injury treated as out patients were chosen randomly from neurological departments from various Private Hospitals in Chennai city. Prior approval from the hospital and informed consent was obtained from the chosen sample who agreed to participate in the study. Confidentiality was maintained.
2) *Inclusion criteria:* People with Mild Traumatic Brain injury who have undergone concussion type of Brain Injury, aged above 18 years and below 56 years, Men and Women, School educated, Non-graduates and Graduates, belonging to Low, Middle and High Income Group with a Duration of Post Injury ranging from 01 - 03 months, 03 - 06 months, 06 - 09 months were chosen for the study.
3) *Exclusion criteria:* People with Severe Traumatic Brain injury who have undergone Contusion, Coup-Contrecoup, Diffuse Axonal, Penetration, aged below 18 years and above 56 years, Transgender, both Uneducated and Illiterates with a Duration of post injury over 9 months were not chosen for the study.

D. *Instruments*

1) *Post-Concussion Syndrome Questionnaire :* Vasantha Prabha and Sarah Manickaraj (2015) was administered on the patients to test the severity of Traumatic Brain injury. Based on this tool, only People with Mild Traumatic Brain Injury were considered for the study. The questionnaire proved to be rationalised after including the main factors affecting People with Mild Traumatic Brain Injury. Though initially the tool was developed with 15 items, later 05 items were removed because of the ambiguity of the statements in reliability analysis. The Cronbach alpha value is 0.77. The test-retest score is 0.81.
2) *Scoring*: The 10 item self-report questionnaire that measures the severity of common Post-concussion symptoms on a 4 point Likert scale ranging from 1 to 4 (1 – strongly disagree, 2 – Disagree, 3 – Agree, 4 – strongly agree) was calculated by adding all items. High score (30 - 40) denotes severity of post concussive symptoms and low score below 30 reflects mild symptoms of Post-concussion encountered by the people with mild Brain injury, based on which patients were chosen for the present study.
3) *Attention scale*: The scale was developed with four dimensions namely Focused, Sustained, Selective and Divisional Attention components in order to measure level of Attention in people with Mild Brain injury. This scale was developed with 26 constructs initially, later it was reduced to 20 items, with 5 constructs under each dimension. The Cronbach alpha value is 0.71. The test-retest score is 0.78.
4) *Scoring:* This scale comprises of 20 constructs, with 5 constructs under each dimension. A, 4 point Likert scale ranging from 1 to 4 (1 – strongly disagree, 2 – Disagree, 3 – Agree, 4 – strongly agree) was calculated by adding all items. Higher the score (15 - 20) indicates low attention in that particular dimension. Lower score (below 15) indicates high attention.

5) Purpose of Testing: To determine to the affected domain of Attention to what degree, the patient will be asked questions to measure cognitive functions for attention, learning, recall, language and viso spatial abilities. The tests are compared to the tests of others of similar age and education. The patient and people familiar with the patient will be interviewed about the patient's emotional state and day to day routine. They will also be asked about possible alcohol or drug abuse, Brain trauma and other causes for attention deficit. Family members or close friends can provide valuable information about changes in the patient's behavior and personality.

E. *Procedure*

1) *Phase I - Baseline Assessment*: The base line assessment was conducted using Post-Concussion Syndrome Questionnaire and Cognitive Disability Scale. This screening tool helps in diagnosing the prevalence of cognitive deficits among People with Traumatic Brain Injury.

2) *Phase II – Pre–Test:* In pre-test, the data was collected in two sessions. The sample were instructed carefully about the tests and doubts were clarified whenever necessary. The answers were recorded for the tests on a separate printed answer sheet and the booklet was collected. It took approximately three months to collect the data from People with Mild Brain injury.
3) *Phase III – Attention Development Training:* People with Mild Traumatic Brain Injury were given specially devised Attention development Training to improve Attention, in an out-patient Neurobehavioral Rehabilitation Centre for a period of four months lasting for about 18 hours session.
4) *Phase IV – Post-Test:* Following the Attention Development Training, the Post-Test was conducted to the sample after a gap of 30 days. Attention scale was administered again as these constituted Post-Test Scores, to study the impact of Attention Development Training and to measure whether there would be any significant difference in their Attention.
5) *Attention Development Training:* Attention Development Training comprises of games which were administered to People with Mild Traumatic Brain Injury to improve their Attention. This Training is carried out through a board game which consists of 16 levels under each variable. The levels are based on progressive method. This game is played on a specially designed rectangular shaped board which contains six colors (red, green, yellow, blue, orange and purple). 16 levels of game sheets containing various brain stimulating puzzles are were used to play this game. It was designed to develop skills in visual discrimination, pattern awareness, sorting, classifying, sequencing, number sense and letter recognition.

Concentration Games			
Rucksacks	Mouse	Lines	Dominoes
Tree	Swimming pool	Drawings	School items
Bears	Jigsaw	Flags	Shapes
Bunnys	Clown	Crayons	Child walking

6) *Statistical Analysis:* Paired t-test was used to find out impact of Attention Development Training among People with Mild Traumatic Brain Injury in this study.

Table 1 – shows Pre and Post Assessment Scores

Sl. No.	Dimensions	Attention Development Training	n	Mean	$\bar{d}$	SD	t-value
1.	Focus Attention	Before	90	15.12	89	2.32	26.14**
		After	90	9.32	89	2.15	
2.	Selective Attention	Before	90	15.42	89	2.34	27.17**
		After	90	9.39	89	1.66	
3.	Sustained Attention	Before	90	15.24	89	2.45	20.96**
		After	90	8.99	89	1.42	
4.	Divided Attention	Before	90	15.92	89	2.46	14.15**
		After	90	10.93	89	2.47	

Significant at 0.01 level

IV. RESULTS

Table – 1, shows that pre-test and post test scores of focus, sustained, selective and Divisional Attention in attention. The pre-test and post-test mean score of Focus Attention is 15.12 and 9.32 respectively and the t-value is 26.14. The pre-test and post-test mean score of Sustained Attention is 15.42 and 9.39 respectively and the t-value is 27.17. The pre-test and post-test mean score of Selective Attention is 15.24 and 8.99 respectively and the t-value is 20.96. The pre-test and post-test mean score of Divisional Attention is 15.92 and 10.93 respectively and the t-value is 14.15. It indicates that pre-test and post test scores are significant at 0.01 level. Hence the hypothesis "People with Mild Traumatic Brain Injury would not significantly differ in Attention - Focused, Selective, Sustained and Divided after the Attention Development Training" is rejected.

V. DISCUSSION

A. Attention Development Training has increased Attention among people with Traumatic Brain Injury.

Kim et al., (2008) performed cognitive training, after which the TBI patients showed an improved performance of attention tasks accompanied by changes in attentional network activation; the activity of the frontal lobe reduced, yet activation of the anterior cingulate cortices and precuneus improved. These findings demonstrate the plasticity and training induced redistribution of the visuo spatial attentional network in TBI patients. Chen et al., (2011) studied on training of goal-directed attention regulation over neural processing for individuals with brain injury. The author identified neural mechanisms that underlie improvements in attention and executive control with rehabilitation training. Intensive training enhanced modulatory control of neural processing of perceptual information in patients with acquired brain injuries. Larson et al., (2011) evaluated the feasibility of applying virtual reality and robotics technology to improve attention in patients with severe traumatic brain injury (TBI) in the early stages of recovery. It enhances comparing and differentiation abilities, their accuracy and concentration in observation and teaches them methods and disciplines of observation through playing relative games of size, weight comparing and quantity value matching. Observations of behaviour during the intervention were recorded. It is proposed that attention exercises using virtual environments are well-tolerated and engaging and that they could be beneficial for in patients with severe TBI. Fernández et al., (2012) examined the impact of cognitive training for acquired brain injured. Their functions were assessed with a pre- and post-treatment design, using the Mini-Mental State Examination, Wechsler Memory Scale and Trail Making Test (Parts A and B). The program's clinical effectiveness was established, with 100% of patients showed improved performance in skilled functions.

A common problem associated with brain injury is difficulty with the ability to focus on attention or concentration. Since attention skills are considered a “building block” of higher level skills (such as memory and reasoning), people with attention or concentration problems often show signs of other cognitive problems as well. A person with TBI may be unable to focus, pay attention or attend to more than one thing at a time. Attention development Training played a significant role in reducing attention deficits. Their problems like distraction or trouble keeping track of what is being said or done or information overload or difficulty doing more than one task at a time where reduced to a greater extent after this Training.

These games trained logical thinking and reasoning skills, including tasks of distinguishing missing objects, matching coloured shapes, recognizing objects by orientations, determining sequencing patterns, matching objects by sizes and directions, matching and drawing mirror images, and categorizing things of People with Traumatic Brain injury. These activities strengthens association and reasoning abilities by applying their real life experiences through playing relative games of determining required items, distinguishing unusual items from pictures, matching scenes and rearranging pictures in logical order. It also trained them under comprehension, operation and eye and hand coordination abilities through handcrafting, drawing and colouring pictures, and playing games by following text and pictorial instructions using different tools.

After this Training the mental processes enabled People with Mild Brain injury to be alert and to selectively focus on information from the environment or from the contents of their thinking. “Attention” is a complex thinking skill that has many different parts which showed significant improvement after this Training. Difficulties in attention and difficulty to concentrate on a specific task for a prolonged period of time were considerably reduced.

VI. CONLCUSION

Attention Development Training improved focused, sustained, selective and divided Attention among People with Mild Traumatic Brain Injury. The study has implications for Rehabilitation therapist and Counsellors in identifying problems encountered by People with Mild Traumatic Brain Injury to help them cope better and prevent more serious complications.

VII. SUGGESTIONS

A. Areas of active investigation inattention include source of sensory cue, signals that promote attention, the effects of these sensory cues and signals on sensory neurons can be studied.
B. People with moderate Traumatic Brain Injury with concentration problems can be chosen for further research.
C. The size of the sample may be increased.
D. People with Mild Traumatic Brain Injury with cognitive deficits in rural and semi urban areas can be researched.
E. Follow up study after the post test, to assess the confusion, fatigue and their overall mental health can be conducted.

VIII. IMPLICATIONS

A. Improves focus, attend to more than one thing at the same time in daily activities of People with Traumatic Brain Injury.

B. Affects the ability to learn and remember information which once was a troublesome task.
C. Deregulates information overload, slow at taking in and making sense of information.
D. Improves their concentration on a specific task and sustain attention for a prolonged time period.
E. Enables them to respond to multiple tasks at the same time or give two or more responses at the same time.
F. Rehabilitates normal human attention by improvising in speed on mental tracking.

IX. LIMITATIONS OF THE STUDY

A. Attention only in relation to focus, sustained, selective and divisional is studied.
B. People with Mild Traumatic Brain Injury with attention problems were chosen for the study.
C. The sample size of the study is restricted to 90.
D. The geographical location of the present study is confined to Chennai City.
E. Follow up study after the post-test to assess the effectiveness of Attention Development Training is not conducted.

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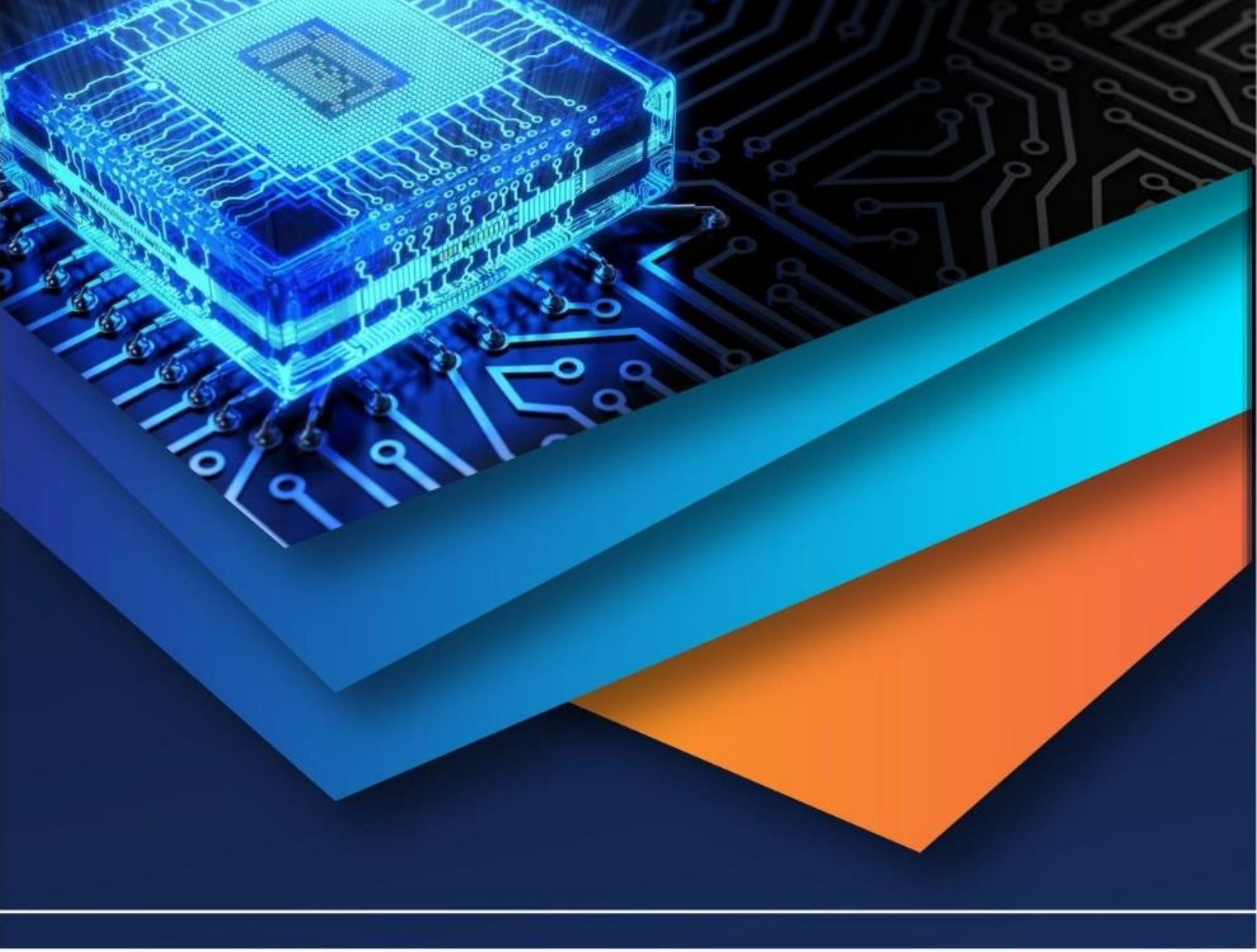

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