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Cognitive rehabilitation in hemiplegia

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Abstract
Objective: It is the proposed generic aim of this investigation "Cognitive Rehabilitation in Hemiplegia". Post stroke
Method: A total of 30 patients with hemiplegia post stroke with mildly to moderately impaired cognitive functions that belongs to age group of 45-65 years. The gender distribution was found 17 males and 13 females out of total 30 stroke patients. The entire population randomly assigned for the intervention and will not put emphasis of diagnostic specifies like level of severity and comorbidity. The subjects for the research for selective on a set of inclusion and exclusion criteria.
The subjects will be grouped into pre and post-test experimental group. Interventions were administered five times per week for 8 weeks using by (Cognitive rehabilitation therapy CRT) Outcomes were evaluated using the Montreal cognitive assessment (Moca) and Barthel Index scale (BI).
Result: After 8 weeks treatment of cognitive rehabilitation therapy (CRT) showed higher improvement in most of cognitive assessments for hemiplegic. The pre-test & post-test of Montreal cognitive assessment scale Barthel index test was showing statistically highly significant.
Conclusion: We achieved maximum level of cognitive functioning in population with hemiplegia post stroke only. As they are regulated and taken to regular occupational therapy intervention protocol session consisting of Cognitive rehabilitation therapy CRT are showed effective in improving the cognitive function of patients with mild to moderate hemiplegia due to stroke.

Keywords: Barthel index, moca, sub-acute stroke, hemiplegia, cognitive rehabilitation

Introduction
Stroke is one of the leading cause of hemiplegia and disability in India. The estimated adjusted prevalence rate of stroke range, 84-262/100,000 in rural and 334-424/100,000 in urban areas. The government is focusing on early diagnosis, management, infrastructure, public awareness and capacity building at different levels of health care for all the non-communicable diseases including stroke. An organized effort from both the government and the private sector is needed to tackle the stroke epidemic in India. Neuro hemiplegic patients after stroke usually present cognitive deficits that cause dependencies in their daily living. These deficits mainly affect the performance of some of their daily activities. For that reason, hemiplegic patients need long-term processes for their cognitive rehabilitation. Considering that classical techniques are focused on acting as guides and are dependent on help from therapists, significant efforts are being made to improve current methodologies and to use e-Health and Web-based architectures to implement information and communication technology (ICT) systems that achieve reliable, personalized, and home-based platforms to increase efficiency and level of attractiveness for patients and career. Hemiplegia is said to be a paralysis of the muscles of the lower face, arm, and leg on one side of the body. The most common cause of hemiplegia is stroke, which damages the corticospinal tracts in one hemisphere of the brain. The corticospinal tracts extend from the lower spinal cord to the cerebral cortex. They decussate, or cross, in the brainstem; therefore, damage to the right cerebral hemisphere results in paralysis of the left side of the body. Damage to the left hemisphere of a right-handed person may also result in aphasia. Other causes of hemiplegia include trauma, such as spinal cord injury; brain tumours; and brain infections. Hemiplegia is treated by addressing the underlying cause and focusing more on the various complications with are essentially treated by therapy to recover motor function. In particular, motor

function in a hemiparetic limb may be improved with, Occupational therapy, physical therapy, and with mirror therapy. Attention - Tsaousides and Gordon describes attention as a "complex mental activity that refers to how an individual receives and begins to process internal and external stimuli." Attention deficits are more commonly encountered in persons with severe hemiplegia post stroke, and may include difficulties in sustained attention/concentration, delayed reaction time, distractibility, decreased processing speed, and impaired dual or multitasking (e.g., walking and talking).

Attention can be improved significantly with a specific skill training after acquired brain injury. Attention process training (APT) is a direct attention training program, intended to be restorative, has been designed to improve visual and auditory attention. APT targets five components of attention: Focused attention, sustained attention, selective attention, alternating attention, and divided attention. The training program consists of tasks with a hierarchical progression of increasing attention demands, graduating from simple to complex distracters.

Memory

Memory impairment is one of the most common cognitive impairments after stroke. It is frequently the first function to be notably impaired and one of the last function to be regained in the recovery process.

Cognitive rehabilitation therapy interventions aim either to restore or compensate the memory deficits. Restorative approaches for memory intervention include the word list, paragraph listening, visual imagery, and mnemonic strategies. And in their review, reported that memory remediation treatments like memory drills, computer-assisted cognitive rehabilitation are not much helpful for TBI persons for long-term memory. Though, computer-assisted strategies have been found to be useful to improve overall general cognitive functioning, attention, memory, and executive skills as a whole.

There is strong evidence supporting the use of external memory aids in compensating the memory impairments in TBI persons. Compensatory strategy training, including internalized strategy training (e.g., visual imagery) and external memory compensations (e.g., memory notebooks, AT tools), is found to be effective in mild memory impairments after stroke. A memory notebook usually includes section of orientation (injury related information), memory log, calendar, to-do lists, transportation (maps, public transportation schedule, and taxi phone numbers), a feelings log, names, etc. AT tools encompass portable electronic devices, personal computers, personal digital assistants, voice recorders, pagers, etc.

Computer assisted training is useful for improving general cognitive functioning. It has been found to have several benefits such as allowing flexibility in retraining procedures, programs that can be customized for individuals, and finally it reduces the direct time a therapist needs to be with a patient. Several studies have shown computer-assisted strategies to improve attention, memory, and executive skills.

Visuospatial perception

Visuospatial perception changes such as unilateral neglect, impairments of body scheme, and constructional skills are common in severe hemiplegic persons. Agnosia and apraxia are not uncommon. When such deficits combine with cognitive impairments, they have a significant impact in rehabilitation participation and ADL along with posing as a safety concern. Using visuospatial cues to direct attention to the areas of residual vision, in vision restoration therapy (VRT), some improvement in vision in persons with visual field defect has been documented. It has the potential to enhance neural plasticity and ultimately increase conscious visual perception. Similarly, showed that VRT improves visual functions in persons with central nervous system disorders. Used spatial scanning with optokinetic stimulation in patients with the hemineglect disorder, but it failed to show any additional benefit in their performance. A study by Cicerone *et al*. has found visual scanning training, isolated microcomputer exercises, and electronic technologies to be useful. Likewise, prism adaptation has also been found to be useful in gaze abnormalities. Non confrontive, behavioral therapy approaches have been reportedly beneficial in anosognosia. Anosognosia (impaired self-awareness or denial) is a very common and serious consequence of brain injury.

Language and Communication

Communication is very complex and involves processing of both verbal and nonverbal information. Language and communication disorder in the hemiplegia can be categorized into four main groups: Apraxia, aphasia, dysarthria, and cognitive communication disorder. Apraxia is the inability to carry out a motor act despite intact motor and sensory pathways. An apraxia in brain injured persons has been found of three types: ideomotor, ideational, and constructional apraxia. The type of speech and language impairment is dependent on the extent and location of the brain injury. Broca's aphasia (26.49%) is the most common type, followed by anomic aphasia (19.6%), and transcortical motor aphasia (15.6%).Dysarthria along with swallowing deficits has been reported, affecting respiration, phonation, resonance, articulation, and prosody. Cognitive communication disorder or inappropriate communication following hemiplegia may impair social interacting and reintegrating which can ultimately lead to frustrating or embarrassing experiences. Persons with TBI can suffer from delayed word recall to reduced emotion while communicating with others. They find difficulty specially in word finding and language processing. Brain-injured persons show impairments in self-focused conversation and in interpreting linguistic humor.

Language functions are significantly associated with the functional and cognitive status of the brain injured persons. Speech and language therapy, including constraint-induced aphasia therapy (CIAT), computer-assisted therapy, melodic intonation therapy, and neurostimulation techniques like transcranial direct current stimulation (tDCS), have been found to improve dysarthria and aphasia in acquired brain injured persons. The principle behind CIAT is massed practice, with language tasks of increasing difficulty and using constraint of compensatory (nonverbal) communication strategies.

Executive functions

Executive function can be defined as the mental capacity to "engage successfully in independent, purposive, self-serving behavior." Executive function allows the person to plan or set goals, initiate behavior, solve problems, anticipate

consequences, monitor performance, and respond flexibly and adaptively. Impairments in executive functions may include an inability to perform these cognitive processes and impede daily activities.

A number of studies have reported metacognitive strategy training (directed at improving self-monitoring and self-regulation) are more effective compared to conventional rehabilitation in improving posttraumatic executive dysfunction. Metacognitive strategy training helps to assess individual's performance and reduces or prevents errors by structured and repetitive cueing, or by encouraging repeated assessment and self- monitoring. Complex tasks can be broken into smaller steps and directly teaching individuals using step-by-step procedures. Cicerone *et al*. have also mentioned that metacognitive strategy training facilitates the treatment of attention, memory, language deficits, and social skills.

Besides the metacognitive training, problem-solving training (PST) and goal management training have shown favorable outcome in posttraumatic executive function. Hewitt *et al* have reported that autobiographical memory queuing can improve the performance on planning tasks and can be an effective component of PST. Charters have recommended the use of electronic reminder systems to help daily functioning for acquired brain injured persons.

Methods

Observation studies were included in the review best on the objectives of the current review inclusion and exclusion criteria were prepared and based on that various data base was used in the selection of the study. The collected studies were checked for clarity and content and then used for the review.

Criteria for sample collection

2- criteria, via inclusion and exclusion criteria were used for the collection of sample.

Inclusion criteria

- Barthel index (BI) 50-65 points
- Mini-Mental State Examination (MMSE) ≥11 points
- Subject's agreement to participate in a trial
- Patients with 50 year and above

Exclusion criteria

- BI from <50 or >65 points
- MMSE <11 points
- Subjects unable to speak (diagnosed aphasia)
- Uni lateral neglect syndrome
- Other neurological or mental health disorder

Electronic data base searching

Data base searched.

PubMed, Online journal, Access open, Google scholar.

Data extraction and quality assessment

PRISMA flow diagram was used to select the articles eligibility criteria were assessed for extracted data included study were evaluated on the basis of relevance appropriateness clarity and methodology.

Those studies that were not meeting the criteria were included. Articles selected for review were assessed by two independent reviewers, the data extracted included participants, year of publication, Study methods, types of interventions and outcomes.

Analysis

Steps 1

Obtain data were tabulated and classified as author, study design, year of publication, setting, method, samples size, type of intervention, components of interventions and outcomes.

Step 2

Identifying the findings of studies, the study were identifying with there settings, method and sample size,type of intervention and component of intervention

Step 3

Categorizing the findings, findings were categories under headings of effect of enhanced occupational therapy intervention on the study cognitive rehabilitation in hemiplegia

Result

The reviewed study included 250 potentially relevant articles out of which 200 studies where included as duplicate, 25 articles are excluded as they not meet inclusion and exclusion criteria. 15 articles are not mention the category of participants and 10 studies were reviewed.

Characteristics of the articles

Out of 10 studies

S. No	Study author	Year of publication	Research design	No. Of participation	Sample characteristics	Theme	Sub theme
1.	Alexandra Pantzartzidou 1, Yannis Dionyssiotis2 *, Eleftherios Stefas1, Eleni Samlidi3, Triantafyllos Georgiadis1 and Emmanouil Kandylaki	2017	Non-randomized control study	96 Patients	Hemilegia	Effect of RehaCom cognitive rehabilitation software on working memory and processing speed in chronic ischemic stroke patients	To investigate effectiveness of RehaCom cognitive rehabilitation software compared to creative activities program in neuropsychological parameters in patients with cognitive deficits due to acquired central nervous system disorder
2.	Robertson, Ian H	2010	Pilot study	30 Patients	Brain Injury	Setting goals for cognitive rehabilitation.	Aim of which is the maximization of the functional independence and adjustment of the brain- damaged individual.
3.	Chanuk Yoo1), Mi- hyun Yong2), Jaeyeop Chung3), Yeongae	2015	Experiment al study	46 Patients	Stroke	Effect of computerized cognitive rehabilitation program on cognitive function and activities of	The objective of this study was to examine the effect of cognitive rehabilitation using a computer on cognitive function and activities of daily living in stroke patients

	Yang					living in stroke patients	presenting impairment of cognitive function.
4.	Anna M. Laurel J. William P H. Branch	2016	Experiment al study	50 Patients	Stroke	Cognitive rehabilitation intervention for neglect and related disorder	Aims of these study is focus on progress in rehabilitation of higher brain functions
5.	A.M. Barrett, MD and Tufail Muzaffar, MD	2015	Qusi experimental study.	30 patients	Stroke	Spatial cognitive rehabilitation and motor recovery after stroke.	Aim of this study is suggest that spatial retraining might greatly increase the efficiency and efficacy of motor rehabilitation, directly addressing the burden and cost of paralysis after stroke
6.	Keith D. Cicerone, PhD, Donna M. Langenbahn, PhD, Cynthia Braden, MA, CCC-SLP, James F. Malec, PhD,	2017	Experiment al study	140 Article	Traumatic Brain Injury	Evidence- Based Cognitive Rehabilitation	To update our clinical recommendation s for cognitive rehabilitation of people with traumatic brain injury (TBI) and stroke, based on a systematic review of the
	Kathleen Kalmar,						Literature from 2003 through 2008.
7.	Madison Elliot	2013	Experiment al study	26 studies	TBI & stroke	Efficacy of memory rehabilitation therapy	The primary purpose of this meta-analysis was to determine the overall effect size (ES) in these studies
8.	Ana Lúcia Faria, Andreia Andrade, Luísa Soares & Sergi Bermúde z i Badia	2016	Randomized controlled trial	18 Patients	Post Stroke	Benefits of virtual reality based cognitive rehabilitation through simulated activities of daily living	The VR-based intervention involved a virtual simulation where memory, attention, visuo- spatial abilities and executive functions tasks are integrated in the performance of several daily routines.
9.	Charlie SY Chung, Alex Pollock, Tanya Campbell, Brian R Durward	2013	Observation al study	35 patients	Stroke	Cognitive rehabilitation for executive dysfunction in adults with stroke or other adult non- progressive acquired brain damage	To determine the effects of cognitive rehabilitation on executive dysfunction for adults with stroke or other non-progressive acquired brain injuries.
10	Hwi-Young Cho, Ki-Tae Kim, Jin- Hwa Jun	2015	Randomized control trial	25 patients	Stroke	Effects of computer assisted cognitive rehabilitation on brain wave, memory and attention of stroke patients	This study investigated brain wave, memory and attention changes in adult stroke patients using computer assisted cognitive rehabilitation (CACR).

Conclusion

After studying the various articles related to study Cognitive Rehabilitation in Hemiplegia. Since my review of rehabilitation 10 years ago, considerable progress has been made, not only in the development of cognitive rehabilitation methods that improve practical, daily-life function in brain-damaged people, but also in the crucially important arena of binding cognitive rehabilitation into its theoretical home of cognitive neuroscience. Limb Activation Training is an example of a theoretically derived training procedure that has now been clinically evaluated in clinical trials, showing that we now have an effective cognitive rehabilitation procedure for one important cognitive disorder-unilateral neglect. Cognitive rehabilitation cannot develop its full clinical potential until its goals are informed and modified by the basic science of cognitive function.

Already, this basic science has led to the development of counter-intuitive methods of rehabilitation. Cognitive scientists and rehabilitationist must work ever more closely if both fields are to fulfil their potential for furthering scientific understanding of the brain and improving the lot of brain-damaged people.

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