Memory Recall and Cognitive Recovery for Alzheimer's and Dementia: A Systematic Neurorehabilitation Program for 42 Dementia Patients Using "BrainNext" Tools at Sancheti Hospital, Pune, India

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Abstract

Introduction: Global increment in the patients suffering from non-communicable diseases such as Alzheimer's and varied Dementia conditions is a global burden and a great challenge for the healthcare systems. The standardized UMACE screening tool research directed finding solution to the problem and led to the development of 'BrainNext", 18 sets with 500+ memory and cognitive exercises (2011 - 2015). The exercises are in a form of laminated sheets, cloth and acrylic material, having external application and no side-effects or invasion; safe, durable, affordable and applicable to normal population < 10 years to find subtle cognitive deficit and neurology disabled population from 2.6 years to elderly, mild to severe conditions. "BrainNext" exercises encompass almost all cognitive functions that any human brain may perform, provides testing page in each Set.

Methods: Patient-centered Memory and Cognitive rehabilitation, systematic step-by-step 4 months program for N = 42 varied dementia profile patients, ages 33 to 84 years, Male = 25, Female = 17, using "BrainNext", with hospital and caregiver support and appropriate time intervals based on "Synaptic Plasticity". Varied dementia patient profiles, Alzheimer's N = 04, Vascular N = 13, Parkinson's N = 04, Age-related atrophy N = 13, Trauma, brain diseases induced memory loss N = 08 were treated. Patients had varied socio-economic, educational and cultural backgrounds. The caregiver and neuro-physiotherapists at the hospital were trained, covering 2 to 3 cognitive domains at a time as applicable, minimum 2 hours training a day at home and 1 hour at the hospital for first 2 weeks, later continued training at home and 3 follow-ups every 15 days, 2 follow-ups for 2 months then as required, adding new exercises each time for 4 months. To measure the progress, 1 to 10 rating scale was used, score1 as 10% and 10 as 100% recovery.

Results: Patients N = 23 with caregiver support and regular follow-up for 4 months improved memory, cognitive tasks and behavior in few weeks with 45% to 75% from the baseline condition, amongst 12 improved up-to caregiver's satisfaction later needed few visits. Patients N = 19 with moderate caregiver support, intermittent gaps and irregular follow-up for 4 months improved memory, cognitive tasks and behavior with 25% to 45% from the baseline condition. "BrainNext" is National and Global award winning product for Neurorehabilitation Innovation and recognized by Indian Academy of Neurology and Govt. of India are safe, durable, easy to use, yield positive results for varied profiles of dementia, establishes evidence of no permeant memory loss in dementia and successfully reverts cognitive deficit up to 75% from baseline condition.

Keywords: *Dementia; Alzheimer's; Memory; Cognitive; BrainNext; Neurorehabilitation*

Abbreviations

UMACE: Universal Memory and Cognitive Exam; YLD: Years Lived with Disability

Introduction

Global increment in the patients suffering from non-communicable diseases such as Alzheimer's and varied Dementia conditions is a global concern and a great challenge for the healthcare systems [1-3].

The research in neurology population, (excluding Alzheimer's and varied dementia profiles), with standardized memory and cognitive screening tool "UMACE" Universal Memory And Cognitive Exam (2011-2013) showed significant memory and cognitive impairment in patients similar to those suffering with Alzheimer's and Dementia [4-6].

The UMACE screening tool research directed finding solution to the problem and extensive research led to the development of 'Brain-Next" 500+ memory and cognitive rehabilitation tools (2011 - 2015). The "BrainNext" tools are developed on the medical neuroscience concept of Synaptic Plasticity, finding the weakness in information processing for the neuron and then filing the information gap by feeding nano information to the weak neurons to ignite effectively. As the neurons become capable to handle the nano information, they start becoming healthier, gaining more information processing capacity day-by-day and producing healthy electrical signals to strengthen and normalize chemical signals and to generate effective synaptic connections. Thus, creating more neural connections helping neurons to deliver desired sensory-motor reaction.

As we started using "BrainNext" tools for in-patients and out-patients at Sancheti Hospital, Pune India with varied dementia profiles the concept proved to be significantly helpful for memory recall and gaining cognitive capacity within weeks' apart from YLD and severity of the disease. After studying > 2000 varied neurology populations with "BrainNext" tools between 2011 - 2018 the work expanded in other cities in India.

The extensive study in Epilepsy population > 152 between July 2018-March 2020, ages 2.6 years to 45 years showed significant improvement in memory, cognitive domain and behavior correction within weeks. The application of "BrainNext" extended for neurodegenerative diseases.

Till date clinics in urban India do not witness greater number of dementia population according to the statistics, forgetfulness after 60 years of age is thought and accepted as a natural process even in the literate population. The awareness regarding a new hope for memory and cognitive rehabilitation, with 1st ever Nationally recognized product as "Neurorehabilitation Innovation of the Year Award 2019" by Indian Academy of Neurology "BrainNext", was given a choice of treatment by many dementia patients at Sancheti Hospital, Pune India, the concept is based on "Synaptic Plasticity" [5-9].

The research article illustrates Patient-centered Memory and Cognitive rehabilitation, a step-by-step systematic 4 months program for varied dementia profile patients N = 42, ages between 33 to 84 years using "BrainNext" exercises from Nov. 2019 to March 2020. The program had many treatment combinations with the hospital and the caregiver to provide the best support for the patient following specific time intervals [10,11].

Materials and Methods

"BrainNext" tools, 500+ memory and cognitive brain exercises divided into 18 Sets is a copyright of the author. The product is designed between 2010 to 2015 when the author was doing research on developing a screening tool - "UMACE" (standardized in 2015

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with research funding from Australia) [4]. To find answers for the deficit diagnosed with "UMACE", the author was motivated to develop "BrainNext". The exercises are designed observing deficit of each of the patients visiting clinic and found to be useful for mild to severe cognitive deficit.

The exercises are in a form of laminated sheets, cloth and acrylic material. The material does not have side-effects nor invasion therefore very safe, durable and affordable as it is made locally. It is applicable to all neurologically disabled population from 2.6 years to elderly, for mild to severe conditions. For very severe patients, special tools were designed as necessary. "BrainNext" exercises encompass almost all cognitive functions that any human may perform, treating all memory and cognitive deficit under one umbrella. The foundation is "Synaptic plasticity" that principally works on feeding nano-information for the weak neurons to retrieve its action potential for better depolarization at the presynaptic levels and to improve postsynaptic terminals to multiply receptor binding expanding inter connections, thus helping to re-gain its original capacity to process sensory information and controlling sensory-motor actions accordingly.

As the neuron's action potential increases it induces positive action at post synaptic terminals balancing neurotransmitter's activity, contributing for correction in behavior besides having gap in training or having mild to severe seizure episodes. As the presynaptic and postsynaptic synchronization starts establishing with "BrainNext" exercises, it has been observed that there is no loss of processed information and/or memory retention and the brain does not go backward in learning process. After certain sessions though there is gap the brain continues to acquire new information on its own and positive improvement continues. Apart from the percentage of deficit and the YLD of an individual patient, >10% improvement is seen from the baseline condition within first 15 days.

"BrainNext" has been useful in finding subtle deficit in Normal population for > 950 normal school children below 10 years of age, finding slow learners with varied LD related features and helping to achieve desired scholastic abilities.

Special feature

The "BrainNext" tools have been designed for testing and rehabilitation purposes to address the scarcity of concerned professionals across the Globe. Each "BrainNext" Set has a "Testing Page" that any non-clinical person can use with little training to find out deficit in the affected person and can use the information booklet provided with each set for further training. Individual patients are given mixed set of cognitive exercises to achieve the best results with patient-centered treatment and total Sets can be purchased by clinics/disability care homes/nursing homes/NGOs/hospitals where multiple patients are treated and trained by a group of professionals at a time, either ways the treatment is affordable and accessible with similar efficacy.

The clinical evidence of memory, cognitive and behavior improvement in > 125 epilepsy patients within 19 months at "Epilepsy Foundation" center, Mumbai, India, "BrainNext" has been recognized by Indian Academy of Neurology with first ever announced National award in India - "Neurorehabilitation Innovation of the Year, 2019" [6-8] and many National and Global awards for Innovation in Mental Health with special recognition by Govt. of India.

Methods

Patients N = 42, ages 33 to 84, Male = 25, Female = 17, were diagnosed with different dementia profiles, Alzheimer's N = 04, Vascular N = 13, Parkinson's N = 04, Age-related atrophy N = 13, Trauma, brain diseases induced memory loss N = 08 were treated for memory and cognitive rehabilitation using "BrainNext". Patients had varied clinical history and the neuroimaging revealed evidence for the brain damage as illustrated in table 1. All patients N = 42 belonged to varied socio-economic, educational and cultural backgrounds.

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*Neurological diagnosis	List of Clinical history/Comorbid factors	YLD	Severity scale Total N = 42
*Alzheimer's dementia	Fall/Trauma head injury/Cerebral Atrophy/fitting Dental crowns 24 in 2 months/ Dengue/TB/Coma/	6 months to 26 years	High Moderate to Severe
*Vascular Dementia	HBP/Gliosis/Craniotomy/Hodgkin lymphoma/Seizure disorder/ Epilepsy/		
*Parkinson's Disorder Dementia	Alcohol abuse/Migraine/Vestibular Neuritis		
*Age related atrophy	Shunt infections/Face lift surgery/Chronic ischemia/ Sports injury		
*Trauma/Head Injury	/Chicken guinea/Tempo-hypermetabolism		
	>35 yrs on psychotropic medication for Clinical depression-Hypoperfusion		
*Other brain diseases	C A disease/ cardiac + cerebral ischemia/RA/Chronic lacunar infarct/ Metastasis/Hypoglycemia		
	Hypoxic encephalopathy/Swine flu vaccine allergy		

Table 1: *The "BrainNext" training program patient data Sancheti hospital.*
Diagnosis as written by different Neurologists and Neurosurgeons.

Patients N = 23 followed "BrainNext" program as suggested taking sessions at the hospital and/or with the caregiver at home regularly. The caregiver and neuro-physiotherapists were trained, covering 2 to 3 cognitive domains at a time as applicable. The caregiver supported patient for "BrainNext" training at home for minimum 2 hours a day and simultaneously 1 hour by a neuro-physiotherapist at the hospital for first 2 weeks for patients N = 10. In the third-and-fourth-week alternate day 1-hour training was provided at the hospital and meantime continued training at home. From 5th week onwards the patient was trained at home by the caregiver and no sessions were conducted at the hospital. Follow-up was taken every 15 days for first 3 visits, with re-assessment for the previously identified domain deficit and then adding next level of "BrainNext" exercises, providing training for new exercises and adding new domain each time as necessary, keeping patient-centered approach. Those having lack of visual focus and visual field deficit due to head injury/trauma or lacunar infarct or ischemia involving occipital lobe and/or visual pathways were given specific visual exercises. After 3 follow-ups with 15 days interval in each, 2 follow-ups were taken with a month gap providing more "BrainNext" exercises. After three and half months next follow-ups were given keeping 2 months gap as required by the caregiver. To measure the progress for each domain, 1 to 10 rating scale was used, score 1 as 10% and 10 as 100% recovery.

Out of N = 23, Patients N = 3 had a combination of 1 hospital visit and further follow-up sessions at home due to immobility of patients, and Patients N = 2 were in-patients with severe condition and were provided 2 hours training every day in the hospital by neuro-physiotherapists and 1 to 2 hours training by the caregiver. 1 consultation and 1 follow-up comprising total 3 weeks, were taken inside the hospital and the patients were discharged; they continued their training at home; patient N = 1 was provided virtual assistance for follow-up after discharge as he went out of town.

In the beginning for most of the patients orientation, object identification and memory, establishing neuronal pathways with 3D objects with inner and outer strokes, basic shape recognition, speech correction, following 1 or 2 instructions, visual stability, establishing

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eye-contact, special exercises for placid and/or spastic fine and gross muscles, overall body imbalance, sleep regulation, thirst and hunger regulation, bladder and bowel regulation were considered and treated. With the progress in the above-mentioned domains gradually higher cognitive domains such as critical memory tasks, numerical tasks, word formation and language comprehension, spatial distribution, pattern recognition, mirroring concepts, were added based on the patient's progress at each level. For sleep regulation, bowel and urinary controls, regulating eating habits natural remedies suggested.

Table 2 explains the "BrainNext" training program as carried at Sancheti hospital.

Successful Cognitive training model of "BrainNext" - Sancheti Hospital Pune, India Nov. 2019 to March 2020						
Sessions	**Procedure for assessment**	**Memory and cognitive domain identified**	**"BrainNext" Sets used**	**Duration of training**	**Time consumed on BrainNext Exercises**	**Min. Improvement**
1	Clinical/General history, MRI and EEG records and Sleep and Eating and Behavior pattern Assessment with "BrainNext" testing tools	Each patient's level of deficit differed/ 3 domain training started	Set 7- Strokes and Acrylic shapes Set13- Object identification and Memory Set 8 - Formations Set 12- Speech and Emotions	15 days	Assessment time 0 day Max time for Patient reaction (after 3rd day the practice time start reducing- 5hrs to 4 and half in 8 days)	> 10% Weak neurons start igniting STM improvement starts for min. 5 minutes Behaviour improves
2	Previous exercises revised	Higher level of previous domains and new 2/3 domains added	Set 7, acrylic shapes added Set13, Set 8 Set 1- Numbers Set 7-Big Stencils added outer and inner stroke Set 12	15 days	4 hrs though exercises increased Independent movements and thinking starts Interest increased	> 20% Neuron's info processing capacity develops Behaviour improves> STM improves more
3	Previous exercises revised	Higher level of previous domains and new 2/3 domains added	Set 7, Set13, Set 8, Set 1 Set 2- Alphabets Set 17-Fine motor Set 12	15 days	3 and half hrs though exercises increased Start doing by themselves	> 30% Neuron's info processing and coding capacity increases STM, LTM, WM improves> Logical thinking improves

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4	Previous exercises revised	Higher level of previous domains and new 2/3 domains added	Set 7, Set13, Set 8, Set 1 Set 2, Set 17, Set 14 - Basic shapes with primary colour association	1 Month	3 hrs though exercises increased Speed increased	> 40% Neuron's info processing and coding capacity increases STM, LTM, WM improves> Reasoning improves
5	Previous exercises revised	Higher level of previous domains and new 2/3 domains added	Set 7, Set13, Set 8, Set 1 Set 2, Set 17 Set 14, Set 10 - Path finding	1 Month	2 and half hrs though exercises increased	> 50% Neuron's info processing and coding capacity increases STM, LTM, WM improves
6 *SOS	Mostly same are carried for practice	Higher exercises added if needed	--	2 Months	---	> 60% normalization facilitates self-learning

Table 2: The "BrainNext" training program as carried at Sancheti hospital.
*SOS - Training sessions arranged as required after 4 months of scheduled program.

Results and Discussion

Patient N = 23 out of N = 42 with caregiver support and/or sessions at the hospital with regular follow-ups were observed improving more than 5% in the first week and progressing more than 10% by 2 weeks significantly enhancing cognitive capacity. Alzheimer's dementia patients N = 4 who had severe disorientation started orienting in first 2 to 3 days as the "BrainNext" treatment started and continued to recover day-by-day. By the end of 1st week Alzheimer's and other severe dementia patients having disorientation, lack of eye contact, lack of instructions following capacity were seen improving by more than 10%.

Vascular dementia patients, Head injury patients, Parkinson's disorder dementia patients and some of the age-related atrophy patients having hemiparesis improved in fine motor controls in the first 15 days. Some of the dementia patients having aphasia and/or speech deficit started recovering by the end of first 15 days of treatment. Initially all patients required more time (3 to 4 hours) to complete the given exercises but by the end of 30 days most of the patients required less time (2 to 2 and half hours) to complete the set of training with increased cognitive capacity. There was no special training provided or pharmacological intervention needed to control behavior, but the neurorehabilitation based upon synaptic plasticity produced balanced neurotransmitter binding thus normalizing behaviour. Apathy, agitation, aggression, apraxia, irrelevant speech, aphasia, lack of desire and motivation, lack of facial expressions with few words, lack of face recognition of close family members, lack of coordination with environmental moods and lack of social expressions were the prominent behavioural discomforts in the beginning and observed to be minimizing. As the cognitive responses started improving, patient's emotional expressions un-observed by the caregiver for many years were noted prominently. Logical thinking started improving by the end of one month that came as a pleasant surprise for the caregiver. Pain and temperature senses became prominent those were absent for many years, and a sense of "cautiousness" seemed improved after many months and years.

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Typical fine motor behavior of touching/holding regular things, chewing, jaw movements, gross motor behavior of ascending and descending stairs or walking on flat surfaces or slopes, stride width and speed started improving by the end of 1 month of "BrainNext" tools training.

Sleep cycles regulation with natural solution (Cardamom and Nutmeg powder mixed with lukewarm milk) observed within one week improving information coding and processing and memory retention for concerned patients. Regular medicines were continued for a certain time and then reduced for many patients as they started improving.

Patients N = 23 with the caregiver support, followed memory and cognitive rehabilitation training program as suggested with or without hospital support could recover 45% to 75% at the end of 4 months from base-line condition, while they continued training further.

Table 3 explains the improvement in all dementia patients at the end of 4 months with "BrainNext" program; amongst 12 patients improved up-to caregiver's satisfaction needed no further regular visits for follow-ups, were continued with online support as required. Rest of the patients were continued with online follow-up sessions due to current Covid-19 situation. The caregivers were relieved a bit as patients gained cognitive capacity and could continue "BrainNext" exercises without much assistance at the end of 1 month.

Systematic Memory, Cognitive, Behavioural recovery for 42 Dementia patients using "BrainNext" tools at Sancheti Hospital, Pune, India, 17th Nov. 2019 to 13th March.'2020 (different training models)		
Dementia profiles N=42 M = 25 F = 17 Ages = 33 to 84 years	Different combinations "BrainNext' treatment models with similar efficacy by following guidelines	"BrainNext" Memory and Cognitive training tools program at Sancheti Hospital + Caregiver support (baseline 0%) *Patient N=23 with caregiver support and regular follow-up improved 45% to 75% from the baseline condition, amongst 12 improved up-to caregiver's satisfaction needed little support after 4 months
1. Alzheimer's D. N= 04 2. Vascular D. N= 13 3. Parkinson's D. N= 04 4. Age-related atrophy N=13 5. Trauma, brain diseases induced memory loss N= 08	1) "BrainNext" Memory and Cognitive training tools program at the Sancheti Hospital *2 weeks everyday 1-hour, patient-centered training by Neuro-physiotherapists	
	2) "BrainNext" Memory and Cognitive training tools program by the caregiver at home *2 weeks everyday 2/3 hours training at home as per the caregiver and patient's convenience	Patients N=19 with moderate caregiver support, intermittent gaps and irregular follow-up for 4 months improved memory, cognitive tasks and behavior with 25% to 45% from the baseline condition.
	3) "BrainNext" Memory and Cognitive training program follow-up and caregiver support at home *15 days follow-up for 2 months + new exercises *1-month follow-up for next 2 months + New exercises	

Table 3: The "BrainNext" training program as carried at Sancheti hospital.
*Patient No. 23 followed "BrainNext" program as directed and observed positive changes within first 2 weeks and further progress faster every day and every week.

Patients N = 19 with moderate caregiver support, intermittent gaps and irregular follow-up for 4 months improved memory, cognitive tasks and behavior with 25% to 45% from the baseline condition. The irregular patients did take some sessions at the hospital but could not maintain consistency in visits. Besides being irregular the patients could gain positive input with the given exercises every week, though little slow in the percentage of improvement as compared to regular patients.

The in-patients N = 2 admitted in December 2019 mid-weeks were supported with hospital sessions and the caregiver; recovered >30% from baseline condition in 3 weeks and were discharged and supported at home.

Conclusion

"BrainNext" tools application is extremely safe, easy, affordable and have no physical invasion like other clinical applications available globally and can treat any level of cognitive deficit caused by any type of neurological disorder/disease, applicable to large number of population from ages 6 months to elderly. The product is divided into 18 sets encompassing almost all cognitive tasks that any human may perform. The 2 dimensional and 3 dimensional concepts designed on 3 levels - base, middle, higher help ignite neurons systematically by creating information processing capacity and expanding it step-by-step. Individual patients are supported with combination of cognitive exercises per visit with the assessment facility provided with "BrainNext" and guided accordingly. Complete sets with more than 30 exercises in each, are used by bigger clinical facilities capable of treating multiple patients at a time.

The "BrainNext" tools are research-based products based on the neuroscience concept of "Synaptic Plasticity" and designed on the principle of igniting weak neurons by feeding nano information that can be processed effectively in lesser time, producing effective electrical signals and chemical signals to pass on to other neurons and ultimately generating desired sensory motor behavior. Behavioural issues caused by damage to neurons is corrected as the neurons become healthy without pharmacological intervention.

The clinical statement poised by the author in the "BrainNext" book supports the fact that there is crystal clear difference between the psychological disorders caused due to neurotransmitter imbalances and neurophysiological/neurobiological damage that creates structural deficit in the neuron. In psychological disorders the biogenic amines and their origins are structurally healthy and due to incapability to translate the nerve impulse, impacting action potential that invades and depolarizes presynaptic terminal causing undesired neurotransmitter actions and connectivity to post synaptic potential that changes the excitability of the postsynaptic cell, resulting into varied psychological behavioural projections, which could be maintained with psychotropic medications.

The comorbidity of physical damage to cerebral, cerebellar, brain stem and other parts of the brain are extremely critical while considering behavioural aspects in memory and cognitive impairment and "BrainNext" gives evidence of behavioural correction aligned with cognitive rehabilitation ; not treating directly behavioural disturbances but works well while treating on the neuroscience concept of synaptic plasticity.

The key concept of increasing cognitive capacity of weak neurons in a desired direction is to find exact deficit of individual brain and understanding the level of each deficit; and feeding with correct information at each visit assessing and training the brain for the next level. Following the program regularly in the first month is extremely necessary to get results faster and following further program as suggested is very important to have consistent progress in memory and cognitive enhancement. Aligning with the fact of dearth of professionals in neuropsychology and/or neurorehabilitation; accessibility and affordability of such services the author has developed simple assessment facility in each set that any caregiver or non-clinical person can be trained with little training and can use the tools for neurorehabilitation purposes, fulfilling both purposes with same tools for assessment and rehabilitation.

"BrainNext" award winning tools are safe, durable, easy to use, yield positive results apart from varied dementia profiles, provides evidence that there is no permeant memory loss in Alzheimer's and other dementias and successfully reverts cognitive deficit up to 75%, from baseline condition keeping it consistent.

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Acknowledgment

Conflict of Interest

None.

Bibliography

1. Population Reference Bureau, USA. Today's Research on Aging. Population Reference Bureau, USA. Program and Policy Implications (2012): Issue 25.

2. Khadilkar S. "Neurology: the scenario in India". *Journal of the Association of Physicians of India* 60 (2012): 42-44.

3. Saxena S., *et al*. "Dementia: a public health priority". World Health Organization United Kingdom. WHO Press (2012).

4. Kardile M., *et al*. "The development of a new screening tool for cognitive impairment in India: the universal memory and cognitive exam (UMACE)". *International Journal of Health Sciences and Research* 8.5 (2018): 226-234.

5. Kardile M. "Subcortical dementia developed at high altitude in Himalayas - an army case study investigation with MMSE and new UMACE diagnostic tool". *Journal of Alzheimers Disease and Parkinsonism* 6.3 (2016).

6. Kardile M. "Excellence in diagnosis in culturally diverse settings: the development of Universal Memory and Cognitive Exam (UMACE)". Oral presentation at "The 26th Annual Conference of Alzheimer Europe" Copenhagen, Denmark Alzheimer's Europe (2016).

7. Kardile M and Surya N. "Epilepsy Case study poster presentation". 21st Joint Annual Conference ECON. Indian Epilepsy Association and Indian Epilepsy Society: Ahmedabad (2020).

8. Kardile M and Surya N. "Epilepsy and Cognitive rehabilitation >125 patients". Award paper 27th Annual Conference IANCON, Indian Academy of Neurology: Hyderabad (2019).

9. Kardile M and Surya N. "Epilepsy Case study oral presentation". 7th Annual Conference IFNRCON 2019- Indian Federation of Neuro-rehabilitation and Neurorehabilitation Sub-Section of Indian Academy of Neurology, Mumbai (2019).

10. Haring H. "Cognitive impairment after stroke". *Current Opinion in Neurology* 15.1 (2002): 79-84.

11. Hanna P., *et al*. "Predictors of mild cognitive impairment in early-stage Parkinson's disease". *Dementia and Geriatric Cognitive Disorders Extra* 3.1 (2013): 168-178.