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Effectiveness of the brain gym exercises verses dual task training on cognitive function- attention, memory and visual motor skills in post covid-19 patients – A comparative study

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Abstract
Attention, memory and visual motor skills gets affected in covid 19 patients. Brain gym exercise and dual task training improving visual motor skills while Brain gym exercises and dual task training both are equally effective in improving attention and memory in covid19 patients.
Objectives: To study the effectiveness of the brain gym exercise verses dual task training on cognitive functions – Attention, Memory and Visual motor skills in post COVID19 patients.
Methodology: In this study total 64 subjects, both male and female with mean age of 36.61 Group A and 37.37 Group B were selected using random sampling method and were allocated into two groups using odd and even method. In group A subjects received treatment according to brain gym exercise protocol along with conventional exercises and in Group B subjects received treatment according to dual task training protocol along with conventional exercises. Pre and post treatment attention, memory and visual motor skills was assessed using Mini-Mental State Examination MMSE, mini cog test and TMT respectively.
Results: The comparison of pre and post MMSE, mini cog scale, and trail making test scores between group A and group B showed varying results. While there was no significant difference in attention improvement between the two groups, both treatments were effective in improving attention in COVID-19 patients. Memory improvement also showed no significant difference, indicating that both treatments were equally effective in enhancing memory. However, a significant difference was observed in visual motor skills improvement, with group A showing better results compared to group B. Overall, both brain gym exercise and dual task training were found to be beneficial in enhancing cognitive function in COVID-19 patients.
Conclusion: Brain gym exercise is more effective than dual task training in improving visual motor skills in covid19 patients at the end of 4 weeks of protocol while Brain gym exercises and dual task training both are equally effective in improving attention and memory.

Keywords: Covid19, attention, memory, visual motor skill, brain gym exercise, dual task training

Introduction

COVID-19 virus caused the entire world to come to stand still. This deadly virus emerged in Wuhan, Hubei Province, China and within no time it spread to the entire world. This virus caused Severe Acute Respiratory Syndrome (SARS) making patient oxygen bound in ICU's on invasive and non-invasive ventilator for long period of time.

The Coronavirus Disease 2019(COVID-19) pandemic caused by the SARS-CoV-2 virus has affected more than hundred million people and led to more than 2 million deaths worldwide.

SARS-CoV-2 is a novel virus and its pathophysiological mechanism on various physiological systems is not to be fully understood.

Coronaviruses primarily affect upper respiratory tracts, but they have been detected both in the brain and cerebrospinal fluids of infected patients. There are several mechanisms through which coronaviruses can damage the nervous system. These may include direct infection injury, virus entering in the blood circulation pathway, neuronal pathway, hypoxic injury, immune injury, and via binding to the angiotensin- converting enzyme2 (ACE2).

The neurotropic capacities of coronavirus allow them to evade the immune response of the host and achieve latency. This makes them a potent factor to cause acute and late neurological effects. Although early indication shows that it is still a potential source for causing short and long-term neuropsychiatric and cognitive complications.

Coronaviruses, use sensory and motor neuronal pathways to enter the Cntral nervous system. Example is neuronal pathway of the olfactory nerve. This is mediated by the organization of olfactory nerves and the olfactory bulb in the nasal cavity and forebrain. The virus thus can reach the brain and CSF, which causes inflammation and a demyelinating actions. If the infection is set, then the virus may reach the whole brain and CSF in less than 7 to 8 days.

Altered olfaction and gustatory problems (anosmia, hyposmia, and ageusia) have been reported in 50% of COVID-19 patient implicating the possibility of central nervous system infection through the olfactory neuronal pathway.

Mechanism of covid19 on the nervous system: Direct infection injury the genetic material and protein of various viruse can be detected in nervous system tissue sample like cerebrospinal fluid or brain. This is suggesting that viruse can directly invade the nervous system and affects the nerves.

Immune injury: Nervous system damage caused by viral infection can be mediated by the immune system. The pathology of severe viral infections is related to the development of a systemic inflammatory response syndrome. Systemic inflammatory response syndrome could be abnormally initiated in severe pneumonia caused by covid19 infection.

Sahil Kohli *et al* stated that the traditionally risk factors for stroke are uncontrolled blood pressure, diabetes, smoking, high cholesterol, sedentary lifestyle, atrial fibrillation, etc., The patients suffering from these risk factors are more likely to suffer from strokes but studies have shown that the covid19 related strokes can happen to any one without any risk factors. As per the literature, viruses like Influenza and Herpes have been linked with heart attacks and brain stroke However, the occurrence of stroke is more common in Corona infection.

ACE2 enzyme is widely present in various organs including oro-nasal, respiratory, cardiovascular, cerebrovascular, and immune systems. Coronaviruses directly bind to ACE-2 receptors in respiratory epithelial cells because cytokine storm, which causes widespread inflammation in patients with covid19, leading to multiple organ damage and immune- mediated encephalopathy manifesting as delirium and convulsions. It has also been proposed that the spike protein of SARS-CoV-2 can bind to ACE2 receptors in capillaries, breaking the blood-brain barrier and allowing the virus to enter the brain directly.

Neurons have a high density of ACE-2 and high binding to coronaviruses if they cross the blood-brain barrier. SARS-CoV-2 can lie latent in the neurons of patient who are recover from acute effects of covid19, increasing the risk of long-term consequences by causing demyelination and neurodegeneration. Early indications show that the cognitive domains of attention, and memory and visual motor skill appear to be affected by COVID-19. Doctors in a large Chicago medical Centre found that more than 41% of patients with COVID showed neurologic manifestations at the outset, and more than 31% of those had impaired cognition.

Brain Gym exercise: Brain Gym is an academic kinesiological program that is promoted and applied with a consistent learning purpose and is invented by Paul and Gail Dennison, in the 1970s. Brain Gym an activity includes of 26 basic motions, which are believed to improve perception and stimulates brain hemisphere by neural re-modeling to facilitate whole brain learning. The neural mechanism and white matter connectivity of the brain is influence by the intervention of the exercise.

According to Brain Gym literature, the abstract framework on which brain activity is conceptualized is generally simplified and defined along dimensions: laterality, attention and cantering.

The synchronization between the brain's right and left hemispheres, which is considered important for reading, writing, hearing, communicating and being able to walk and think. Focusing, the ability to process information in the brain, which is connected to perception and lack in attention or hyperactivity. The final section, centering, the top and bottom brain parts organized as necessary to combine rational thought with emotion.

A healthy and sharp mind is the origin mantra of a fruitful and happy life. A series of artless exercises can boost the brain function in a better way which makes individual, think sharper, smarter and more assertive. These exercises are recognized as brain gym exercises. 5 It comprises of some really relaxed body movements, which helps to communicate the two hemispheres of the brain while making them work in synchronization. Brain gym exercise is intended to remap or generate neural pathways through positive self-talk, exercise, repetition, and stimulation.

Cognition is a big problem when trying to acquire a new skill or override an old pattern with a novel skill so prior to training breathing relaxation exercises that are suggested. These exercises are really simple and can be done by people of all age groups.

Mostly children and young adults actively perform brain gym exercises. But now, even adults and aged people too practice these exercises. There are various profits associated with brain gym exercises. The major benefits associated with brain gym exercises are as follows: it makes patient learn anything faster & more easily, be more focused & organized, overcome learning difficulties, reach new levels of excellence and start & finish projects with affluence.

Brain gym exercises stimulate brain function to be more effective and facilitate blood flow and oxygen to the brain. It is a series of simple movements that are fun to improve learning skills using the whole brain (improve breathing, stamina, release tension and reduce fatigue). The reason behind brain exercise is to prevent cognitive decline brain (improve lack of attention and lack of concentration).

The brain gym exercises reactivate the neural connections between the body and the brain so as to facilitate the flow of electromagnetic energy throughout the body. This movement supports electrical and chemical changes that take place on all mental and physical events.

According to its founders, the regular performance of Brain Gym results in stimulation and integration of different parts of the brain, especially the corpus callosum, which, in the long term, makes communication between the two hemispheres faster and in a more integrated form for high level reasoning.

On other hand many activities of daily life involve the simultaneous performance of multiple 6 tasks concurrently challenging motor and cognitive functions. The ability to perform multiple tasks common in daily living such as walking while engaged in a concurrent mental task (e.g., walking and talking) becomes impaired in cognitive decline. Dual tasking is the ability to perform two or more tasks at the same time. Many of us perform dual tasks throughout the day without realizing it. For example include walking while talking on the phone, cooking dinner while listening to a podcast, or driving a car while following directions to our destination.

Performing two tasks at one time often leads to a reduction in performance. This is known as the dual task cost - or the difference between single task and dual task performance. However, in physical therapy, we can train one's ability to dual task in order to reduce dual task cost while improving overall function. In this study we will discuss the role of dual task training and how it can be used to improve cognitive performance.

Dual-task intervention in comparison to single stimulation is unclear, but in healthy older adults the simultaneous conduction of a mental and a physical task (dual-task) seems to be particularly efficient to increase cognitive function in particular if mentally challenging activities are simultaneously performed with multimodal physical exercises.

According to past studies, dual task training appear to provide more consistent cognitive or motor function benefits in older adults, when compared to the other exercise interventions. There are different types of dual task training:

for example, dual task training with two motor assignments like strength training and balance training exercised simultaneously (called motor-motor dual task training) and motor-cognitive dual task training, having cognitive task associated with resistance training (called motor- cognitive dual task training). Dual-task training (DTT), such as the combination of cognitive training and motor training have shown improvement in memory, balance.

Researchers frequently adopt the dual task (DT) technique (i.e., simultaneous performance of 7 two tasks) to explore multitasking ability as well as the effects of different training. Significant decrements cognitive performance is observed in older adults when cognitive tasks are performed while walking.

Material and methods

Study design: Comparative study

Study setting: Physiotherapy OPD and clinics in and around city.

Study population: Recovered Covid19 patients

Sample size: 64 Sample size

Sampling technique: Simple Random sampling

Allocation method for selection of sample: 1:1 allocation by Odd and even number.

Method of selection of study subjects

A. Inclusion criteria

1. Age 20 to 50 years
2. Both male and female
3. Patients recovered from COVID19
4. CT severity score 9 -25 (moderate to severe)
5. Patient with mild (20-25) and moderate (10-20) score of MMSE don sit to stand with or w/o support 12
6. Positive for cognitive impairment score of Mini-Cog Test 13
7. Patients with trail A (>78 secs) for trail B (>273 secs) score of TMT Scoring of at least 30/56 on BBS 14
8. Participants who willing to participate in this study.

B. Exclusion criteria

1. Patients with active infections
2. Any severe mobility problems
3. Other neurological conditions like stroke, Parkinson's disease etc.
4. Any musculoskeletal and orthopedic conditions

C. **Withdrawal criteria**

1. Subject's participation in this project is completely voluntary.
2. Subject may withdraw from the project for any reason (or no reason at all), at any time, without penalty of any sort, or loss of benefit to which he/she would otherwise be entitled.
3. The individuals which miss more than 4 sessions will be included as dropouts.
4. Subjects will be informed and explained about the right to Withdrawal of Participation while obtaining consent. The data collected on the participant to the point of withdrawal remains a part of the study database

Conclusion

Brain gym exercise is more effective than dual task training in improving visual motor skills in covid19 patients at the end of 4 weeks of protocol while Brain gym exercises and dual task training both are equally effective in improving attention and memory.

References

1. Williamson EJ, Walker AJ, Bhaskaran K. Factors associated with COVID-19-related death using Open SAFELY. Nature,2020:584:430–6.
2. Yuki K, Fujiogi M. COVID-19 pathophysiology: A review. Clin Immunol,2020:215:215.
3. Wu Y, *et al*. Nervous system involvement after infection with COVID-19 and other coronaviruses. Behav Immun,2020:87:18-22.
4. Kumar S, Veldhuis A, Malhotra T. Neuropsychiatric and cognitive sequelae of COVID-19. Front Psychol,2021:12:2-12.
5. Beyerstedt S, Casaro EB. COVID-19: angiotensin-converting enzyme 2 (ACE2) expression and tissue susceptibility to SARS-CoV-2 infection. Eur J Clin Microbiol Infect Dis,2021:40(5):905-19.
6. Graham EL, Clark JR, Orban ZS. Persistent neurologic symptoms and cognitive dysfunction in non-hospitalized COVID-19 "long haulers". Ann Clin Transl Neurol,2021:8(5):1073-85.
7. Siroya VV, Naqvi WM, Kulkarni CA. Importance of Brain Gym as exercise in physiotherapy and rehabilitation. Int J Adv Res Dev,2020:4:116-9.
8. Dawood RF, Mostafa Darweesh HA. Impact of Brain Gym Training on Cognitive Performance of Undergraduate Nursing Students. EJHC,2022:13:1.
9. Legg TJ. Brain exercise to improve memory, cognition and creativity, 2021. Available from: https://www.medicalnewstoday.com/articles/brain-exercises
10. Falbo S, Condello G, Capranica L. Effects of physical-cognitive dual task training on executive function and gait performance in older adults: a randomized controlled trial. Biomed Res Int,2016:2016:12.
11. Jardim NY, Bento-Torres NV, Costa VO, Carvalho JP. Dual-task exercise to improve cognition and functional capacity of healthy older adults. Front Aging Neurosci,2021 Feb:13:589299.
12. Xiao X, Wu ZC, Chou KC. A multi-label classifier for predicting the subcellular localization of gram-negative bacterial proteins with both single and multiple sites. PLoS One,2017:6:20-592.
13. Saito Y, Nakamura S, Tanaka A. Checking the validity and reliability of the Japanese version of the Mini-Cog using a smartphone application. BMC Res Notes,2022:15(1):1-5.
14. Wagner S, Helmreich I, Dahmen N, Lieb K, Tadić A. Reliability of three alternate forms of the trail making tests A and B. Arch Clin Neuropsychol,2011:26:314-21.
15. Seeßle J, Waterboer T, Hippchen J. Persistent symptoms in adult patients 1 year after coronavirus disease 2019 (COVID-19): a prospective cohort study. Clin Infect Dis,2022:74:1191-8.
16. Vindegaard N, Benros M. Immunopsychiatry of COVID-19 pandemic. Brain Behav Immun,2020:89:531-42.
17. Sklinda K, Górecki A. Ischemic background of brain fog in long haul COVID-19 – a nuclear magnetic resonance spectroscopy-based metabonomic analysis. Preliminary results. Pol J Radiol,2021:86:75.
18. Tani H, Dulla CG, Huguenard JR. Glutamine is required for persistent epileptiform activity in the

disinhibited neocortical brain slice. J Neurosci,2010:30(4):1288–300.
19. Donzis EJ, Tronson NC. Modulation of learning and memory by cytokines: signaling mechanisms and long term consequences. Neurobiol Learn Mem,2014:1:115.
20. Graham EL, Clark JR, Orban ZS, Lim PH, A. Persistent neurologic symptoms and cognitive dysfunction in non-hospitalized COVID-19 “long haulers”. Ann Clin Transl Neurol,2021:8:1073-85.
21. Fage BA, Chan CC, Gill SS. Mini-Cog for the diagnosis of Alzheimer's disease dementia and other dementias within a community setting. Cochrane Database Syst Rev,2019:9:2.
22. Yang L. Screening for dementia in older adults: comparison of Mini-Mental State Examination, Mini-Cog, Clock Drawing test and AD8, 2016, 11.
23. Wojdon J, Wiśniewska D, editors. Public in public history. Routledge, 2021.
24. Bowie CR, Harvey PD. Administration and interpretation of trail making test,2006:390:88.
25. Cancela JM. Efficacy of Brain Gym® Training on the Cognitive Performance and Fitness. J Aging Phys Act,2015:88:303.
26. Yágüez L, Shaw KN, Morris R. The effects on cognitive functions of a movement-based intervention in patients with Alzheimer's type dementia: a pilot study. Int J Geriatr Psychiatry,2011:26(2):173-81.
27. Kulkarni C, Khandale SR. Effect of brain gym exercises on the attention span in young adults. Int J Adv Res Dev,2019:4(4):71-5.
28. Cherry K. What Is Neuroplasticity? 2022 Feb 18. Available from: https://pubmed.ncbi.nlm.nih.gov/32491743/
29. Kuo HT, Yeh NC. Effects of different dual task training on dual task walking and responding brain activation in older adults with mild cognitive impairment. Sci Rep,2022:12(1):1-1.
30. Fritz NE, Cheek FM, Nichols-Larsen DS. Motor-cognitive dual-task training in neurologic disorders: a systematic review. J Neurol Phys Ther,2015:39(3):142.
31. McElvaney OJ, McEvoy NL. Characterization of the inflammatory response to severe COVID-19 illness. Am J Respir Crit Care Med,2020:202(6):812-21.
32. Huang C, Huang L. Six-month consequences of COVID-19 in patients discharged from hospital: a cohort study,2021:397:220-32.
33. Carfì A, Bernabei R, Landi F. Persistent symptoms in patients after acute COVID-19. JAMA,2020:324(6):603-5.
34. Sklinda K, Górecki A. Ischaemic background of brain fog in long-haul COVID-19 - a nuclear magnetic resonance spectroscopy-based metabonomic analysis. Preliminary results, 2021, 86.