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Effectiveness of Movement Therapy on Executive Functions of Patients with Post-Stroke Depression

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Abstract

Introduction: Stroke leads to various adverse physical and psychological consequences in the patients. Effective rehabilitation programs minimize post-stroke complications. Several rehabilitation programs exist although it is not clear which method release higher beneficial. Therefore, this study aimed to examine the effectiveness of movement therapy (MT) on the executive functions of patients with post-stroke depression.

Methods: This quasi-experimental study carried out at Elderly Care Centers. Women with stroke experience (n = 36) were selected through purposive sampling and randomly divided into groups MT (N=12) and waiting list control (N=12). Participants assessed with demographic questionnaires, Beck Depression Inventory (BDI), and Wisconsin Card Test (WCST)in pre and post-intervention stages.

Results: The results showed that participants' executive actions in both groups of minds based on stress reduction and therapeutic movement improved (P <0.05). Evaluation of the mean differences showed that in almost all total scores and subscales, the mean scores of the intervention group showed a greater improvement in patients.

Conclusion: movement therapies affected different aspects of executive functions of depressed patients after stroke. It is recommended to develop and examine the effectiveness of integrated mindfulness and movement therapies in Post-stroke depression.

Keywords: MBSR, Movement Therapy, Executive functions, Depression, Stroke

1.Introduction

Acute stroke is defined as the acute onset of focal neurological findings in a vascular territory as a result of underlying cerebrovascular disease (Shatri & Senst, 2018). Stroke recognized as the second leading cause of death worldwide.The lifetime risk of overt stroke is estimated at one in four by age 80 years, and the lifetime risk of silent or covert stroke is almostabout 100%(Musuka, Wilton, Traboulsi, & Hill, 2015). It is a severe medical condition with various adverse

consequences such as serious physical and mental disabilities(Dar et al., 2017).The prevalence of disability among stroke survivors is between 24–54%(Srivastava, Taly, Gupta, & Murali, 2010). World Health Organization (WHO) estimated significant increase in disability-adjusted life years attributable to stroke in low- and middle-income regions such as Iran compared to high-income regions(Oni, Olagunju, Olisah, Aina, & Ojini, 2018). Poststroke depression (PSD) is one of the most common mental consequences after stroke, it accurse among about 30 percent of patients with stroke experiences (Towfighi et al., 2017).Different studies reported a widely variable prevalence of PSD ranged between 10-64% of the patients after stroke (Vojtikiv-Samoilovska & Arsovska, 2018). In Iranian community the prevalence of PSDreported about 46.9%(Dalvand, Gheshlagh, & Kurdi, 2018).PSD often remains unrecognized and/or undertreatedwhile it is contributed with cognitive impairment, increased mortality ,disability,risk of fall , and lower rehabilitation outcome(Paolucci, 2008).

Studies have supported that PSD has underlying biological and psychosocial etiologic factors such as cognitive impairment, female sex, hypercortisolism, poor social network, severity of neurological deficit and previous depression .Clinically significant executive function impairments is frequent following ischemic stroke and is closely connected withdaily living activities dysfunction (Pohjasvaara et al., 2002).

Executive dysfunction including memory impairment are common in post-stroke and depressed patients(Priebe et al., 2016). Deficits in frontal and executive function are among the commonest causes of disability following brain injury. This disability affects planning, strategy application, self-regulation, inhibition, goal-directed behavior, initiation, and insight , these deficits can occur following a ischemia(Levine et al., 2011).Cognitive impairment and executive dysfunction after stroke is a frequent but neglected consequence compared to other neurological deficits such as sensory or motor impairment (Kalaria, Akinyemi, & Ihara, 2016).Executive dysfunction after stroke explained with neuron death, network impairment and mood disturbance(Wei et al., 2015). Some researchers believedPSD is depended on neurological and physical factors(Towfighi et al., 2017; Wang et al., 2018) while others suggest more passive coping and helplessness, low acceptance are associated symptoms of post-stroke depression(Vaezzadeh& Hosseini, 2013).In both approaches on time and appropriate rehabilitation recognized as a vital way of prevention from more disabilities. Neurodegeneration after stroke injury correlated with the rate of motor and cognitive improvement (Farshchi, Akbarfahimi, & Nazari, 2012). Normally neurogenesis start after stroke.Adult neurogenesis is mediated by a series of physiological and pathological processes at all these stages(Lu, Manaenko, & Hu, 2017). In spite of the societal costs associated with executive function disability, there are no widely accepted standardized interventions targeting these capacities.While, targeting executive function in rehabilitation procedure could prevent from next stroke and provide higher quality of life for patients(Sangha et al., 2014). There is some evidence that movement therapy increase rate of adult neurogenesis. As liu et al (2019) movement therapy induces molecular plasticity and facilitates functional recovery after ischemic stroke(Liu, Bi, Cao, Ren, & Yue, 2019). Yau et al believed physical exercise has now emerged as the most

effective way to delay the aged-related cognitive decline associated with various neurodegenerative diseases.(Yau, Gil-Mohapel, Christie, & So, 2014).

Rehabilitation programs mostly focused on life style and treatment adherence while PSD is highly connected with week treatment outcomes(Vaezzadeh & Hosseini, 2013). Shapiro (Shapiro, 2015)emphasized the insufficienteffectiveness and complications of pharmacological therapies in treating post-stroke depression.Most of studies in this area have focused on the efficacy of medical therapy. Even in the context of the efficacy of pharmacological therapy, studies on post-stroke depression are limited. As the results of a recent review show, out of 32 studies only two studies have addressed non-pharmacological treatment of depression in post-stroke patients and less than 10% of patients have shown remission, indicating the necessity and importance of devising and implementing effective treatment modalities(Ladwig et al., 2018). Treatments such as movement and mindfulness therapies are likely to be effective in improving the condition of patients by involving the mind and body in the healing process.So thisstudy aimed to examine the effectiveness of Movement Therapy on Executive Functions of Patients with Post-Stroke Depression.

Materials and methods

Design &Setting

Study was a clinical trial study with a pre-posttest quasi-experimental design and a control group. Study set down on patients in Elderly Care Centers during 2020.

Instruments

BDI: Depression level of patients diagnosed based on interview and Beck Depression Inventory (BDI). The Beck Depression Inventory included 21 each item scored in three options (0-1-2). The following guidelines have been suggested to interpret the revised BDI minimal range = 0–9, mild depression = 10–16, moderate depression = 17–29, and severe depression = 30–63.Beck and Steer report that Cronbach's α for the revised BDI normative–psychiatric samples range from 0.79–0.90 (Beck, Steer, Ball, & Ranieri, 1996).

eWisconsin Card Sorting Test (WCST), neuropsychologists commonly use the WCST as a test of the integrity of frontal lobe functions ,in this test the coding units are clusters of neurons organized in layers, or assemblies. A sensorimotor loop enables the network to sort the input cards according to several criteria (color, form, etc.). A higher-level assembly of rule-coding clusters codes for the currently tested rule, which shifts when negative reward is received.WCST variables included total errors, perseverative errors, non-perseverative errors, trials to first category, conceptual level responses, categories obtained, and failure to maintain the set(Dehaene& Changeux, 1991).

Intervention

The body psychotherapy sessions held two time a week for 16 sessions and each session was 30-45 minutes.Each session started with a review of the previous session and main session time included new technique with exercise ended with the daily task assignment.

MBSR sessions designed based on Kabat zinas the patients were old with high disability, the sessions were shorter in compare to standard sessions (each session 45-60 minutes). The validity of session's procedure approved by five PhD of clinical psychologist. Physician of elderly care centers checked blood pressure, heart rate and physical condition of participants. Patients with high Apathy removed from sessions and referenced to psychologist of Center. The sessions held by clinical psychologist who trained and conducted researches in mindfulness.

Data Analysis

The study was powered to detect significant effectiveness MT versus WLC groups. Prior to modeling treatment effects, we screened for baseline factors on which the groups differed ($p < 0.10$). Data's described for demographic characters of age, education, marital status etc., mean and standard deviation of outcomes calculated and frequency and percentage of variables presented. Difference of groups examined through Analysis of Covariance (ANCOVA)followed by Tukey poct-hoc test. The groups considered as fixed factor, pretest was covariate and posttest as dependent variable. Analysiswas performed in SPSS 20 using descriptive.

Ethical considerations

The current study followed ethical principles for medical research involving human subjects presented in declaration of Helsinki. Written informed consent was obtained from all participants, including those who participated in the pilot study. In addition, participants gave the right to decline to complete the questionnaire.

Results

Demographic findings showed that the youngest participant was 51 years old and the oldest was 70 years old. The mean age was 58.66 years with a standard deviation of 6.16. Most of participants educated up to high school and were married. The results of descriptive indicated homogeneity of three groups in terms of education, marital status and age ($P > 0.5$).In order to find out difference of groups on executive functions follow-up test run. The results revealed MT and group were significantly different with control group ($P<0.05$) except in case of conceptual level responses (**Table2**).

Table (1). Mean (SD) and results of analysis of covariance of group's comparison

variables	measurement	Mindfulness Mean(SD)	MT Mean(SD)	Control Mean(SD)	F	Eta
total errors	Pre -test	12.60(1.17)	12.20(2.25)	13.90(2.77)	41.70*	0.60
	Post test	8(2.30)	7.60(3.33)	12.90(2.77)		
perseverative errors	Pre -test	21.10(6.96)	20.70(8.23)	19.81(3.45)	52.04*	0.79
	Post test	26.90(6.24)	26.20(8.43)	20(3.68)		
non-perseverative errors	Pre -test	25.90(6.47)	24.50(7.83)	25.36(4.29)	20.47*	0.60
	Post test	19.80(5.13)	19.91(6.96)	25.36(4.29)		
trials to first category	Pre -test	8.40(2.17)	11.30(3.05)	9.27(3.13)	13.07*	0.49
	Post test	6.50(2.27)	8.50(2.71)	10.27(3.22)		
conceptual level responses	Pre -test	3(1.05)	3.20(1.13)	2.54(1.03)	6.90**	0.33
	Post test	4.20(0.91)	4.90(1.19)	3.45(0.82)		
categories obtained	Pre -test	2.80(1.22)	2.70(0.67)	2.90(1.37)	12.01	0.47
	Post test	4.50(1.17)	4.30(1.25)	2.90(1.37)		
failure to maintain the set	Pre -test	3.90(1.19)	3.40(0.84)	3.09(1.30)	13.91*	0.50
	Post test	2.50(0.97)	1.80(0.63)	3(1.34)		
	Post test	18(4.98)	18.80(4.68)	12.18(5.21)		
WMS	Pre -test	5.40(2.63)	6.70(2.21)	5.90(2.70)	35.24*	0.72
	Post test	8.50(2.46)	9.10(2.60)	6.18(2.30)		

*P<0.05

Table (2). Comparison of groups mean difference in executive function variables

variables	MD	SE	Sig
total errors	3.11	0.83	*0.001
perseverative errors	5.35	0.62	*0.001
non-perseverative errors	-4.94	1.03	*0.001
trials to first category	1.05	0.21	0.001*
trials to first category	-0.95	0.25	0.003*
conceptual level responses	-1.55	0.38	0.001*
categories obtained	1.42	0.28	0.001*
failure to maintain the set	5.07	0.98	0.001*

WMS	-2.21	0.35	0.001*

*P<0.05

Discussion

The purpose of this study was to investigate the effectiveness of MT on executive functions of patients with PSD. The results of the pre-posttest evaluation showed that the scores of the test group after the intervention in the executive functions (Cursi Test, Memory Card, Tower of London Test and Wisconsin Card Sorting) showed a significant improvement compared to the control group. This implies that participants after intervention were more capable to plan, organizing, abstract reasoning, concept formation and cognitive performance than the control group. Continuous mindfulness training can affect the brain structure, memory, learning and emotional regulation. In addition, the results of research indicate the effect of mindfulness on core cognitive activities such as attention function and working memory(Shahidi, Akbari, & Zargar, 2017). During the sessions, participants were able to focus more on the present moment by examining and connecting with the mind, with greater awareness of their daily control and performance.

Recovery from stroke often entails long-term and intense rehabilitation that focuses primarily on reducing physical limitations. However, even when physical recovery is achieved, enduring psychological and social difficulties can persist(Hamilton, Radlak, Morris, & Phillips, 2017). This study introduced a comprehensive programs which affected various executive function. This study was the first randomized controlled trial of movement therapy, which included executive function in PSD patients. Therefore involved with several limitations. First, although we identified positive effectiveness of MT on executive functioning although different level of changes observed. Some patients showed high and some others week progress. Some reasons for this may include the personality, pre stroke cognitive function, education, level of brain damage as well as theoretical and practical limitations of test design and administration. Fatigue, worry, fear and lack of motivation in patients, which limited the number of samples to ten patients in each group. The lack of previous studies limited the comparisons of achievements and differences and similarities of results. Participants' low computer literacy in understanding completing tests limited participants to educated individuals, and it is unclear how these results would be achieved in those with lower education. Due to the time limitation of the research team, it was not possible to follow-up the

results during the following, so these findings suggest that patients should be prioritized in the post-stroke treatment process and that effective non-judgmental therapies such as movement therapy may be a useful approach. It is also suggested that future studies of these studies be performed in larger groups with different age groups and demographic characteristics and compare these groups. Integrating mindfulness interventions and comparing them with other interventional methods in people with post-stroke depression are other suggestions of this study.

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