

Original Article

The comparison of executive function among students with / without depression in Shiraz

Fakhri Tajikzadeh^{1*}, Fatemeh Abbasi², Norollah Mohamadi³

1. PhD student of Clinical Psychology, Department of Clinical Psychology, Faculty of Education and Psychology, University of Shiraz, Shiraz, Iran.

2. PhD student of Clinical Psychology, Department of Clinical Psychology, Faculty of Education and Psychology, University of Shiraz, Shiraz, Iran.

3. Professor of Clinical Psychology, Shiraz University, Department of Clinical Psychology, Shiraz, Iran.

*Corresponding author: Department of Clinical Psychology, Faculty of Education and Psychology, University of Shiraz, Shiraz, Iran. Email: F.tajikzade@shirazu.ac.ir

(Received: 30 July 2017; Revised: 20 Augst 2017; Accepted: 24 Oct 2017)

Abstract

Introduction: Effect of executive function deficit among individuals with depression disorder are growing. Therefore, the purpose of this study was to compare the executive function among students with depression and without depression.

Methods: Ex post facto method was used on 15 students with depression and 15 students without depression from students of academic year 2016- 2017 of Shiraz University who were selected through multi-stage random sampling. At first, 200 students were selected by multistage random sampling method from the all-undergraduate students and they have completed Beck Depression Inventory to select the subjects with depression and Millon clinical multi-axial inventory (MCMI III) in order to exclude subjects with personality disorder criteria. Then, students with depression were chosen. 15 students with depression and 15 without depression completed Wisconsin Card Sorting Test (WCST). The findings were analyzed through descriptive statistic, Multivariate variance analysis using SPSS version 16.

Results: The sample ranged from 20-24 with an average age of 19.55. Results indicated that there are the difference between two groups in perseveration error (PE), total errors, and number of categories completed ($P < 0.05$).

Conclusion: Since deficits in cognitive performance and executive function might result in depression, attention to these factors to be modified is efficient.

Declaration of Interest: None.

Key words: Executive function, Depression, Students.

Introduction

Major Depressive Disorder (MDD) may first appear at any age, but the likelihood of onset increases markedly with puberty (1). Researchers have explained individuals with depression show deficits in cognitive performance and MDD is associated with a number of neuropsychological deficits (2). One aspect of cognition relevant to one's capacity to negotiate daily life is executive function, which has been defined as that aspect of cognition affording the ability to deviate

from a "default mode" of stereotyped behavior locked to environmental stimuli (3). Today, wide ranges of theories exist with regard to definitions of cognitive processes and suitable methods to measure executive functions (4). Miyake, Friedman, Emerson Witzki, Howerter, and Wager (5) introduced various theories concerning executive functions, including three dimensions of attention shifting, updating the working memory, and response inhibition. Studies have proposed that the effect of executive function deficit on

depression disorder is growing. Therefore, executive function deficit is most common features of MDD (6).

Many studies have suggested that depression is associated with impairment in executive functions (7) and people with depression function with more deficit in executive function tests compared to healthy people (8, 9). In other ways, depression results in poor cognitive skills relating to executive function. Therefore, the individual may struggle with abilities that are essential for EF components: volition; planning and decision making; purposive action; and effective performance.

Executive functions deficits were important predictors of depression (10, 11). Hence, it may be essential for clinicians to consider the deficit measures of EF in order to deal with depression treatments. Davidovich & et al., (12) concluded that it may be beneficial to target executive functions in preventive programs for individuals at high-risk for depression. Cotrena, Branco, Shansis, Fonseca (13) showed that MDD Patients showed poor attention, low efficiency of executive processing. Project showed that there are executive dysfunctional in people with MDD (14-15). There are a number of studies that have showed the relationship between executive function deficit and MDD (16-18). Awareness and having knowledge about dimensions of depression and dependent variables may help improve society for solving problem. Evidence of cognitive dysfunction in depressive disorders is growing. However, the neuropsychological profile of young adults has received only little systematic investigation, although depressive disorders are major public health problems for this age group.

In fact, one of the most important gaps in existing knowledge is the lack of experimental and systematic prospective attention to the development of executive dysfunction. Therefore, considering the theoretical and research principles and the scarcity of information on the impact of executive dysfunction on depression in patients, we aimed to determine the effects of executive dysfunction on these people. In this context, relatively small numbers of studies have been conducted on understanding executive

dysfunction induced by depression and the findings are largely equivocal. Also, review of the research literature concerning the study of the relationship between depression and executive dysfunction brings about controversial results. Some studies have found that depression is associated with deficiencies in executive functions (19-20). However, other studies did not observe these deficiencies and impairments in depressed people (21-22). It is very essential to assess the vulnerabilities using prospective programs, psychometric tools, and a sample of people in order to build a systematic scientific basis of etiology and development of depression, to inform people, and to employ empirically supported and preventive interventions.

There is also a growing scientific consensus to show the importance of focusing on early diagnosis and treatment. Therefore, the present study aimed to compare the executive function and personality traits in students with depression and non-depressed students.

Methods

This descriptive research was based on Ex Post Facto Method. Data for the current study was collected from students at Shiraz University. At first, 200 students were selected by multistage random sampling method from the undergraduate students and they completed Beck Depression Inventory to select the subjects with depression and Millon clinical multi-axial inventory (MCMI III) in order to exclude subjects with personality disorders criteria. Moreover, participants were chosen by clinical interview. Then, we chose students with depression. The sample size was determined 15 participants for each group based on a pilot study (23). Students with depression and students without depression completed Wisconsin Card Sorting Test (WCST).

In order to collect data, following instruments were administered:

Millon clinical multi-axial inventory (MCMI III): . The MCMI III is a yes- no answered and 175-item self-report questionnaire assessing personality disorder criteria. This inventory has 22 subscales. This inventory had been

translated to Persian and validity and reliability had been investigated (24). The scale's test-retest reliability is 0/86. Internal consistency of BDI with Koder Richardson 20 of 0.81 to 0.95 is reported in Iran (25).

Beck Depression Inventory (BDI): The BDI is a 0-3 scale and 21 statements assessing distress associated with depression symptoms. The total score is the sum of all items. Whole scores range from 0 to 63 (26). The BDI has demonstrated good psychometric properties for psychiatric outpatients from 0.83 to 0.91 (27). Internal consistency of BDI with Cronbach's α of 0.96 was reported in Iran (18).

Wisconsin Card Sorting Test (WCST): WCST is a widely-used neuropsychological measure of EF, particularly set-shifting (28). Three outcome measures of the WCST included: Perseverative Errors (PE) happens when same answers repeated regardless of stimulus and Categories Completed (CC) are the consequence of every categories

accomplished by the order of the task requested indirectly (29). Naderi (30) examined Wisconsin Sorting Card test in Iranian population, reported test-retest reliability to be 0.85

Results

The ages of the sample ranged from 20-24 with an average age of 19.55. The study sample consisted of 30 students, including 11 (36.7%) girls and 19 (63.6%) boys in Shiraz. Furthermore, the study sample consisted of 30 students, including 15 (50%) depressed students and 15 (50%) non-depressed students in Shiraz. Also, 20.6% of the students' fathers were employee, 66.5% have free jobs, 6.4% were doctor and 0.5% have no job.

Table 1 shows the mean, standard deviation of scores of executive function in students with depression and non-depressed students.

Table 1. The mean and standard deviation of research variables

Variables	Depressed students		Non-Depressed students	
	Mean	Standard deviation	Mean	Standard deviation
Perseveration error (PE)	13.00	6.04	4.40	2.16
Number of complete (N.O.C)	4.53	1.55	5.87	0.35
Total errors (ΣE)	32.20	24.10	6.07	1.90

To assess the difference between two groups in terms of research variables, independent T-Test analysis has been applied. Results of table 2 indicate that there are the differences between two groups in all of variables in this study.

Table 2. Comparison of executive function in university students with / without depression

Variables	T	Df	P
Perseveration error (PE)	1.93	98	0.001
Number of complete (N.O.C)	2.70	98	0.000
Total errors (ΣE)	6.81	98	0.000

Conclusion

The purpose in this project was comparison of the executive function and personality traits in students with depression and non-depressed students. Results showed that students with depression in comparison with non-depressed

students have higher perseveration error and total errors, and lower number of complete ($P < 0.05$).

According to the results, when an individual suffer from depression, not only cognitive and emotional expressions are disrupted, some aspects of cognitive processes that somehow are more invisible than other symptoms seem to have deficits. These aspects are related to abilities to intend, plan, make decision, act purposively and perform effectively. As the most complex of behaviors, executive functions are intrinsic to the ability to respond in an adaptive manner to novel situations and are also the basis of many cognitive, emotional, and social skills.

Studies confirming the relationship between executive dysfunction and depression are based largely on comparisons between specific diagnostic groups (31). The other studies showed that executive function impairments may be related to current and past severity

and/or chronicity in those with MDD (32, 33) that is concordant with the present study. In a theoretical review on depression, Nakano & et al (34) showed that executive dysfunction are the most substantial variables. These executive dysfunction processes implicated aberrant in depression.

Findings of that review admits the role of executive dysfunction and personality traits access to internal states and biased attention (35, 36), that is concordant with the present study. Letkiewicz et al. (37) acknowledged that executive function deficits in daily life prospectively predicted to increase depressive symptoms. Rogers & et al. (38) examined the role of executive dysfunction in depression. They stated that inflammatory factors such as personality traits and the other variable could act on the brain and result in the executive function. Patients with MDD performed worse than control participants in cognitive functions (39). Therefore, Considering the deficit measures of EF is essential for clinical use in order to deal with depression treatments. For instance, it might be useful for selecting the right technique and more compatible treatment plan.

The limitation of this study was that the samples were selected only from Shiraz city. The other limitation was the small sample size and just used questionnaires. Therefore, for further studies, it is suggested that subjects would be selected from different cities and even villages. Also, using interviews help researcher for accessing better result and good information. In addition, it is suggested that researchers use the other appropriate questionnaires. The results of this study may not generalize to geriatric or lower-functioning populations. Future research should endeavor to elucidate the synergistic impact of comorbid depression on executive functioning (40). Indeed, there is some evidence that anxiety compounds the effects of depression on memory performance (41); therefore, we should pay attention the other variables. Also, further research with larger samples is needed to address this issue.

Acknowledgements

Authors would like to thank all the people who

honestly cooperated to fulfill the tasks to have accurate results. The authors wish to thank the colleagues and all the participants in the study.

References

1. American psychiatric association. Diagnostic and statistical manual of mental disorders (DSM-5). Fifth Edition (2013).
2. Rock P L, Roiser J P, Riedel W J, Blackwell A D, Cognitive impairment in depression: a systematic review and meta analysis. *Psychol Med*. 2014; 44: 2029–2040.
3. Mesulam M. The human frontal lobes: transcending the default mode through contingent processing. In: Stuss, D.T., Knight, R.T. (Eds.), *Principles of Frontal Lobe Function*. Oxford University Press, Oxford: 8–30
4. Wood W L M. Impairment and executive functioning associated with symptoms of sluggish cognitive tempo, ADHD, anxiety, and depression [MSc. thesis]. New York: Syracuse University (2013).
5. Miyake A, Friedman N P, Emerson M J, Witzki A H, Howerter A, & Wager T D. The unity and diversity of executive functions and their contributions to complex “frontal lobe” tasks: A latent variable analysis. *Cognitive Psychology*. 2000, 41(1): 49–10.
6. Trivedi, M.H., Greer, T.L., Cognitive dysfunction in unipolar depression: implications for treatment. *J.Affect.Disord*, 2014.152–154: 19–27.
7. Alves M, Yamamoto T, Arias-Carrion O, Rocha N, Nardi A, Machado S, et al. Executive function impairments in patients with depression. *CNS & Neurological Disorders - Drug Targets*, 2014. 13(6): 1026–4.
8. Otte C, Wingenfeld K, Kuehl L K, Kaczmarczyk M, Richter S, Quante A, et al. Mineralocorticoid receptor stimulation improves cognitive function and decreases cortisol secretion in depressed patients and healthy individuals. *Neuropsychopharmacology*, 2014. 40 (2): 386–9.
9. Dumas M, Smolders C, Brunfaut E, Bouckaert F, & Krampe R T. Dual task performance of working memory and postural control in major depressive disorder. *Neuropsychology*, 2012; 26(1): 110–8.
10. Lezak M D, Howieson D B, Bigler E D, & Tranel D. Neuropsychological assessment. Fifth Edition. *Oxford University press*, 2012.

11. Knouse L E, Barkley R A, Murphy K R. Does executive functioning (EF) predict depression in clinic-referred adults?: EF tests vs. rating scales. *Journal of Affective Disorders*, 2013;145, 2 (20): 270–275.
12. Davidovich sh, Collishaw S, Thapar A K, Harold G, Thapar A, Rice F. Do better executive functions buffer the effect of current parental depression on adolescent depressive symptoms? *Journal of Affective Disorders*, 2016. 199: 54- 64.
13. Cotrena Ch, Branco L D, Shansis F M, Fonseca R P. Executive function impairments in depression and bipolar disorder: association with functional impairment and quality of life. *Journal of Affective Disorders*, 2016. 190: 744–753.
14. Mackin R S, Nelson J C, Delucchi K L, Raue P J, Satre D D, Kiesses D N, Alexopoulos G S, Arean P A. Association of Age at Depression Onset with Cognitive Functioning in Individuals with Late-Life Depression and Executive Dysfunction Original Research Article. *The American Journal of Geriatric Psychiatry*, 2014. 22, 12: 1633-1641.
15. Manning K J, Alexopoulos G S, Banerjee S, Morimoto S S, Seirup J K, Klimstra S A, Yuen G, Kanellopoulos T, Gunning-Dixon F. Executive Functioning Complaints and Escitalopram Treatment Response in Late-Life Depression. *The American Journal of Geriatric Psychiatry*, 2015. 23 (5): 440–445.
16. Morimoto S S, Gunning F M, Wexler B E, Hu W, Ilieva I, Liu J, Nitis J, Alexopoulos G S. Executive Dysfunction Predicts Treatment Response to Neuroplasticity-Based Computerized Cognitive Remediation (nCCR-GD) in Elderly Patients with Major Depression. *The American Journal of Geriatric Psychiatry*, In Press, 2016.
17. Wang Y P, & Gorenstein C. Psychometric Properties of Beck Depression Inventory-II: a Comprehensive Review. *Revista Brasileira de Psiquiatria*, 2013. 35 (4): 416-431.
18. Dobson K S, Mohammad khani P. Psychometric characteristics of the Beck Depression Inventory-II in patients with major depressive disorder in partial remission. *Social Welfare and Rehabilitation Sciences*, 2006. 8, 82. [Persian]
19. Vergara-Lopez C, Lopez-Vergara H I, & Colder C R. Executive functioning moderates the relationship between motivation and adolescent depressive symptoms. *Personality and Individual Differences*, 2013. 54(1): 18–2.
20. Wagner C A, Alloy L B, & Abramson L Y. Trait rumination, depression, and executive functions in early adolescence. *Journal of Youth and Adolescence*, 2014. 44(1): 18–3
21. Fujii Y, Kitagawa N, Shimizu Y, Mitsui N, Toyomaki A, Hashimoto N, et al. Severity of generalized social anxiety disorder correlates with low executive functioning. *Neuroscience Letters*, 2013. 543: 42–46
22. Holler K, Kavanaugh B, & Cook N E. Executive functioning in adolescent depressive disorders. *Journal of Child and Family Studies*, 2013. 23(8): 1315–24.
23. Delavar A. Research Methods in psychology and educational Sciences. Tehran: Edited Press; 2007.
24. Khaje Mogahi N. Basic preparation Persian form for Millon clinical multiaxial inventory in Tehran. [Thesis for Master of clinical psychology]. [Ahvaz, Iran]: Psychiatric institute, Iran University, 1995. [Persian]
25. Sharifi A A, & Karami A A. guide for the Millon clinical multiaxial inventory III. Tehran: Psychometric publication, 2008. [Persian]
26. Smitherman T A, Huerkamp J K, Miller B I, Houle T T, O'Jile J R. The relation of depression and anxiety to measures of executive functioning in a mixed psychiatric sample. *Archives of Clinical Neuropsychology*, 2007. 22: 647-654.
27. Besharat M. Survey of psychometric indicators for beck depression inventory.[dissertation], Tehran University, 2004. [Persian]
28. Heaton R K, Chelune G J, Talley J L, Kay G G, Curtiss G. Wisconsin Card Sorting Test manual. Lutz F L: Psychological Assessment Resources, 2008.
29. Mahurin R K, Velligan D W, Hazleton B, Davis J M, Eckert S, & Miller A L. Trail Making Test errors and executive function in schizophrenia and depression. *The Clinical Neuropsychologist*, 2006. 20: 271–288.
30. Naderi N, Rasolian M, Yasami MT, Ashaieri H. A study of information processing and some of neuropsychological functions patient with obsessive-compulsive disorder. Psychiatry Institute of Tehran 1994. [Persian].
31. Melkas S, Vataja R, Oksala K J N, Jokinen H, Pohjasvaara T, Oksala A, Leppävuori A, Kaste M, Karhunen P J, Erkinjuntti T. Depression–Executive Dysfunction Syndrome Relates to Poor Poststroke Survival. *The American Journal of Geriatric Psychiatry*, 2010. 18 (11): 1007-1016.

32. De Lissnyder E, Koster E H, Derakshan N, DeRaedt R. The association between depressive symptoms and executive control impairments in response to emotional and non-emotional information. *Cogn. Emot*, 2010. 24: 264–280.
33. Bredemeier K, Warren S, Berenbauma H, Miller G A, Heller W. Executive function deficits associated with current and past major depressive symptoms. *Journal of Affective Disorders*, 2016. 204: 226–233.
34. Nakano Y, Baba H, Maeshima H, Kitajima A, Sakai Y, Baba K, Suzuki T, Mimura M, Arai H. Executive dysfunction in medicated, remitted state of major depression. *Journal of Affective Disorders*, 2008. 111 (1): 46-51.
35. Ottowitz W E, Dougherty D D, Savage C R. The neural network basis for abnormalities of attention and executive function in major depressive disorder: implications for the application of medical disease model to psychiatric disorders. *Harv.Rev.Psychiatry*, 2002. 10: 86–99.
36. Paelecke-Habermann Y, Pohl J, Leplow B. Attention and executive functions in remitted major depression patients. *J.Affect.Disord*, 2005. 89: 125–135.
37. Letkiewicz A M, Miller G A, Crocker L D, Warren S L, Infantolino Z P, Mimnaugh K J, Heller W. Executive function deficits in daily life prospectively predict increases in depressive symptoms. *Cogn. Ther. Res*, 2014. 38: 612–620.
38. Rogers M A, Kasai K, Koji M, Fukuda R, Iwanami A, Nakagome K, et al. Executive and prefrontal dysfunction in unipolar depression: are view of neuropsychological and imaging evidence. *Neurosci.Res*, 2004. 50: 1–11
39. Anderson T M, Knight R G. The long-term effects of traumatic brain injury on the coordinative function of the central executive. *J Clin Exp Neuropsychol*, 2010. 32: 1074–1082.
40. Gansler D A, Suvak M, Arean P, Alexopoulos G S. Role of Executive Dysfunction and Dysexecutive Behavior in Late-Life Depression and Disability. *Am J Geriatr Psychiatry*, 2015. 23 (10): 1038-1045.
41. Kizilbash A H, Vanderploeg R D, & Curtiss G. The effects of depression and anxiety on memory performance. *Archives of Clinical Neuropsychology*, 2002. 17: 57–67.