Original Article

Some Subsyndromal Psychiatric Symptoms And Executive Functions Performance In Association With Subjective Memory Problems Among A Final Year Medical Students In Mansoura University

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Abstract

Background Subjective memory complaints (SMC) are commonly reported by older people and often prompt concerns about the possibility of cognitive impairment expressed by patients, carers and clinicians. **Aim and objectives** This study aimed to explore the executive functions of a final year medical students with subjective memory problems in Mansoura University. Explore the association between executive functions obtained and the severity of psychiatric symptoms among medical students with subjective memory problems. **Subjects and methods** This study has been conducted in Mansoura Faculty of Medicine, Mansoura Psychiatry Department, through two years from June 2020 to 2022. It was a cross sectional study with analytical component**,** 382 students applied for the inclusion criteria. **Results** prevalence of executive function deficits among students with subjective memory problems as well as, it demonstrates that 28.8% have concern about verbal fluency , only 18.6% of total number of response on stroop-test were >40 , 2errors are detected among 8.4% of the students. **Conclusion** It has been stated that young doctors should be given the same care and support that we expect them to provide to their patients. The same should be extended to medical students in order to promote resilience and personal fulfilment, and for enhancement of professionalism and patient care.

Keywords: Executive Functions Performance; Subjective Memory Problems; Medical Students

INTRODUCTION

The memory problem is the most prevailing issue of all age groups especially medical students who must manage a lot of cognitive load when studying for exams and remembering the material **(1).**
Typically, memory loss or decline is associated with age. However, memory problems in college students is common, impacted by outside variables like alcohol misuse, lack of sleep, poor diet, and mobile devices, and may be linked to psychiatric illnesses **(2).**

A key component of executive functioning is working memory. The term "executive functions" (EFs) refers to a group of cognitive operations that are managed by intricate brain activity **(3).**

A recent agreement states that the WM, cognitive flexibility, and suppression of prepotent impulses are the three fundamental nuclei that make up EFs **(4).** WM stands for the active management and short-term maintenance of information while avoiding distraction. Inhibition, on the other hand, is the capacity to suppress dominant or automatic responses when required, while cognitive flexibility is the capacity to alter and vary the flow of thoughts or activities to numerous tasks that require it. **(5)**

This study aimed to explore the executive functions of a final year medical students with subjective memory problems in Mansoura University. Explore the association between executive functions obtained and the severity of psychiatric symptoms among medical students with subjective memory problems.

Subjects and Methods

This study has been conducted in Mansoura Faculty of Medicine, Mansoura Psychiatry Department, through two years from June 2020 to 2022.
It is a cross sectional study with analytical component.

Ethical considerations Ensure that the rights, safety, and welfare of subjects in research are protected and consistent with applicable legal, ethical, and institutional guidelines. Assess and evaluate the risks and benefits of proposed research, and ensure that risks to human subjects are kept to an absolute minimum and are justified by potential benefits of the research.

Consent It is confirmed from the medical study enrolled in this study and from the ethical committee of Mansoura university- faculty of Medicine.

Target population Fifth year medical students fulfilling the following legibility criteria: Age: 21-30 years old, gender: Gender, students without major psychiatric syndromes, students without chronic medical diseases e.g. endocrinological, neurological, renal, hepatic, cardiac, and chest diseases, as those syndromes may negatively affect their memory functionality.

Study procedure Preliminary study of the fifth year medical students of Mansoura University to find out those who have subjective memory problems
Assessing the working memory of those medical students by using self administered online memory test. https://www.psychologytoday.com/intl/tests/iq/memory-test
Three aspects of executive functions have been assessed: set-shifting, inhibition and verbal fluency respectively through self-administered: Electronic application forTrail Making Test **(https://apps.apple.com/eg/app/trail-making-test-j-lite/id1078507612)** Online Stroop Color and Word Test **(https://psycho-tests.com/test/stroop-test)**, verbal Fluency Tests **(6)**.

Methods

Clinical assessment All enrolled students had been interviewed and clinically assessed for psychiatric disorder throughout history taking and applying DSM-5 diagnostic criteria for psychiatric disorders by using SCID (structured clinical interview for DSM disorders) as well as mental state examination, those who have been established to have any form of psychiatric disorders (currently or previously) have been excluded from the study. The enrolled students' socio-demographic status had been collected and they were asked to fulfill the following questionnaire forms

Psychiatric and psychological assessment Memory test Online memory test has been used .The test include testing for: Short Term Memory Test and Working Memory. https://practicalpie.com/free-memory-test/, it's a 5 minute self-administered test composed of 7 questions. The answers range from almost always, often, sometimes, rarely and almost never. The score ranges from 0-100 indicating: great deal of difficulty in memory (0-49)- fairly good memory but occasional memory lapse(50-69)-very little difficulty remembering things(70-100).

Mini- MASQ, developed by Watson, et al., (7) The Mini- MASQ is a 26 items questionnaire was designed to assess symptoms of general distress using a tripartite model, dividing symptoms into 3 groups: symptoms of nonspecific general distress, symptoms specific to anxious arousal and symptoms specific to a hedonic depression. Response options: 5-point Likert scale ranging from 1"not at all" to 5 "extremely". MASQ is reliable and valid instruments according to **Wardenaar et al, (8).**

Executive Function Measures Three aspects of executive function have been assessed: set-shifting, inhibition and verbal fluency.

Trail Making Test The Trail Making Test Parts A and B is a component of the Halstead-Reitan Neuropsychological Test Battery. A page with circled numbers (1-25) is presented and the participant should connect them as quickly as he could (TAT Part A), the other page with both circled numbers (1-13) and letters (A-L) is presented to the participant, and he or she must connect them in an alternating fashion (e.g., 1-A-2-B-3-C, etc.) as quickly as possible. The respondent is thus constantly switching mental sets of numbers and letters for the duration of the task (TAT Part B).
Trail Making Test is used to assess cognitive functioning in two different areas: processing speed (Part A) and executive functioning (mental flexibility and set-shifting) (Part B).
Results for both TMT A and B are reported as the number of seconds required to complete the task; therefore, higher scores reveal greater impairment.
Average Deficient Rule of Thumb: Trail A 29 seconds > 78 seconds Most in 90 seconds, Trail B 75 seconds> 273 seconds Most in 3 minutes

Stroop Color and Word Test A widely utilised neuropsychological test for both experimental and therapeutic purposes is the Stroop Color and Word Test (SCWT). It evaluates the capacity to prevent cognitive interference, which happens when the simultaneous processing of two attributes of the same stimuli is affected by the processing of one stimulus characteristic (**9**).

Verbal Fluency Tests A type of psychological examination known as a verbal fluency test requires participants to create the most words from a specific category in the allotted amount of time (usually 60 seconds). This category can be phonemic, which includes words starting with a specific letter, the most common letter chosen are F, A,S, or semantic, which includes things like animals or fruits. (**6**).
To score the VFT, count up the total number of animals or words that the individual is able to produce. A score of fewer than 17 indicates concern, although some practitioners use 14 as a cutoff

Statistical analysis and data interpretation Data analysis was performed by SPSS software, version 18 (SPSS Inc., PASW statistics for windows version 18. Chicago: SPSS Inc.). Qualitative data were described using number and percent. Quantitative data were described using median (minimum and maximum) for non-normally distributed data and mean± Standard deviation for normally distributed data after testing normality using Kolmogrov-Smirnov test. Significance of the obtained results was judged at the (0.05) level.

Results

The present study is cross sectional study that is carried out to explore the executive functions of a final year medical students in Mansoura University who are established to have subjective memory problems from a group composed of 382 students applied for the inclusion criteria.

Table (1) Sociodemographic characteristics of the studied students

	n=382	**%**
Age/years		
21	127	33.2
22	143	37.4
23	112	29.3
Sex		
Male	171	44.8
Female	211	55.2
Residence		
Urban	161	42.1
Rural	221	57.9
Grade		
Good	91	23.8
Very good	165	43.2
Excellent	126	33.0

Table (1) showed that 37.4% of the studied cases aged 22 years , 55.2% females , 57.9% rural residence , 43.2% very good grade ,33% excellent grade and 23.8% good grade

Table (2) Memory score of the studied students

	n=382	
Memory	65.31±10.91 (40-83)	
Great deal of difficulty in memory	18	4.7
Fairly good memory but occasional memory lapse	220	57.6
Very little or no difficulty remembering things	144	37.7

Table (2) and Figure (1) showed that mean memory score is 65.31 and standard deviation is 10.91 ranging from 40 to 83. 57.6% classified as having fairly good memory but occasional memory lapse, 4.7% having great deal of difficulty in memory, so the percentage of students with subjective memory problems is 62.3% while 37.7% having very little or no difficulty remembering things.

Table (3) Univariate and Multivariate analysis for prediction of subjective memory problems among studied students

	Univariate analysis		**Multivariate analysis**		
	p	**COR (95%CI)**	**β**	**p**	**AOR (95%CI)**
Age/years					
21	<0.001	2.78(1.61-4.82)	1.13	0.325	3.09(0.327-29.28)
22	*	1.24(0.755-2.04)	0.791	0.398	2.21(0.352-13.81)

23(r)	0.392	1			1
Sex Male (r) Female	0.165	1 1.34(0.885-2.03)			
Residence Urban (r) Rural	0.028*	1 1.59(1.05-2.43)	0.388	0.249	1 1.47(0.762-2.85)
Grade Good (r) Very good Excellent	0.003* 0.001* 0.256	1 2.84(1.56-5.18) 1.31(0.821-2.09)	0.767 0.09	0.284 0.941	2.15(0.53-8.76) 1.9(0.09-9.33)
O-C Symptoms no (r) 8-15 mild 16-23 moderate	<0.001 * 0.999	1 11.75(3.58-38.56) undefined			
General distress ≤20 >20	0.995	undefined			
Anxious arousal ≤16(r) >16	<0.001 *	1 12.48(7.29-21.36)	0.965	0.014*	1 2.62(1.21-5.68)
Anhedonic depression ≤23(r) >23	<0.001 *	1 12.69(7.09-22.71)	1.20	0.003*	1 3.32(1.53-7.22)
Total subsyndromal psychiatric symptoms -ve(r) +ve	<0.001 *	1 48.96(24.68-97.2)	3.29	<0.001*	1 26.89(9.14-79.14)
overall % predicted=85.6%					

Table (3) showed the multivariate analysis of predictors of subjective memory problems that are significant in univariate analysis shows that ; anxious arousal more than 16 increases risk of subjective memory problems by 2.62 times than students with score ≤16 , Anhedonic depression more than 23 increases risk for subjective memory problems by 3.32 times than those with score ≤23 and students with subsyndromal psychiatric symptoms have risk 26.89 more times of subjective memory problems than cases without subjective memory problems. Combination of the previous three factors can predict subjective memory problems by 85.6%

Table (4) Executive function distribution among studied students with subjective memory problems

	n=226	**%**
TMT A	43.77±9.57 40.9(19-56.8)	
TMT B	75.64±32.93 78.2(35-159)	
VF	15.45±4.3 15.5(8-24)	
Stroop (Mean± SD) Total number of responses	31.49±9.75 33(13-47)	
≤40 n (%) >40	184 42	(81.4%) (18.6%)
Stroop Number of correct answers	31.69±10.75 35(11-47)	
Stroop Number of errors n (%) 0 1 2	 97 110 19	 (42.9%) (48.7%) (8.4%)

Stroop Average reaction time for a correct answer in msec.	2278.09±1241.69 1714(1277-5455)

Table (4) shows prevalence of executive function deficits among students with subjective memory problems as well as,it demonstrates that ; 28.8% have concern about verbal fluency , only 18.6% of total number of response on stroop-test were >40 , 2errors are detected among 8.4% of the students.

Discussion

The memory problem is the most prevailing issue of all age groups especially medical students who must manage a lot of cognitive load when studying for exams and remembering the material **(1).**

A key component of executive functioning is working memory. The term "executive functions" (EFs) refers to a group of cognitive operations that are managed by intricate brain activity **(3).**

The present study aimed to explore the executive functions of final year medical students with subjective memory problems comorbid with subsyndromal psychiatric symptoms in Mansoura University.

For achieving this aim, the researcher carried out a cross-sectional study targeting 382 students in final year of faculty of medicine-Mansoura University. The legibility criteria were students with age between 21-30 years old, both genders, students without major psychiatric syndromes, and Students without chronic medical diseases.
The mean memory score among medical students under study was 65.31±10.91ranging from 40 to 83.
57.6% (n= 220) of them had fairly good memory but occasional memory lapse, 37.7% (n= 144) of them had very little or no difficulty of remembering things, while 4.7% (n=18)of them had Great deal of difficulty in memory.

The obtained results came in consistent with **Ishak et al., (10)** who found that most of the medical students,around 59% , had the medium level of memory score (40 to 70) in comparison with 57.6% in our study. Almost 24% students had excellent g memory score (exceeds 70) while in our study there were 37.7%, conversely 17% students scored poorly (less than 20) in Ishaks' tests compared by 4.7% I current study.

The increased levels of memory problems may be due to that the levels of mental health and well-being difficulties have been found to be high amongst students, with up to 29% of students reporting clinical levels of distress. Medical education may experience severe psychological stress due to their medical education. Dehydration, melancholy, anxiety, stress, lack of sleep, hyperthyroidism or hypothyroidism, epilepsy, and seizures are a few of the disorders that might affect memory. Dietary consumption, sleeping patterns, use of smartphones, and liking for memories were all found to be positively correlated.

In our study we did further assessment for those who have subjective memory problems along with subsyndromal psychiatric symptoms among fifth year medical students by assessing different aspects of executive functions.
The score of students in our study for both TMT A and B which are reported as the number of seconds required completing the task; therefore, higher scores reveal greater impairment, were within average which is a good indicator for set shifting abilities of executive functions.

The mean for trail making test-part A in our study is 43.77 with SD 9.57 and median 19-56.8, the average is 29 seconds and considered deficient if more than 78 seconds needed to complete the task, while the mean for trail making test- part B is 75.64 with SD 32.92 and median 35-159, the average is 75 seconds and considered deficient if more than 273 seconds needed to complete the task.

In contrary to our study comes **Singh et al., (11)** which stated that primary neuropsychological deficit in psychiatric symptoms is executive dysfunction, in the form of difficulty in set-shifting and response inhibition. So that, individuals with psychiatic symptoms performed worse than healthy controls on trail making tests (TMTs) A and B. This suggests that the more severity of symptoms, the more impairment on TMT-A. However, there was no significant correlation between psychiatric symptoms and TMT-B. in addition, those with psychiatric symptoms took significantly longer time than the non symptomatic group to complete both TMT-A and TMT-B.
This contrast in results may be due to that our study was performed on medical students who have high IQ, high resilience to stressors, type A personality and more insistence on achievement required for their academic study and clinical future giving them the power to control set-shifting abilities.

According to Stroop Color and Word Test which concern with inhibition abilities, the mean total number of responses in one minute is 31.49 ranging from 13 to 47 with 81.4% are ≤ 40 showing significant percentage of deficit in this ability, mean number of correct answers on stroop-test is 31.69 ranging from 11 to 47. Number of errors is distributed as following; 48.7% score 1, 42.9% score 0 and 8.4% score2.**Ghimire et al., (12)** assessed selective attention ability in Nepalese medical students , using classical English version of Stroop test and stated that Average reaction time for a correct answer is 2278.09 msec. , exactly as found in our study, ranging from 1277 to 5455. The error made was 1.5 (0-3) compared with (0-2) in our study on stroop test ($p<0.001$). 60% (18) of

students made error in test (p<.001). On the other hand, **Upadhayay & GUraGai, (13)** examined scores of Stroop test in male and females medical students. They found that median (min-max) of Correct response (%) was 95.24 (86.36, 100), median (min-max) of Normal response time (ms) was 1142.78 (1018.37, 1286.63), median (min-max) of Interference response time (ms) was 1359 (1266.25, 1521) compared with 2278.09 msec in our study. Results of Stroop Test among Indian medical students made by **Khullar et al., (14)** showed that percentage of correct answer of incongruent trial was 89.35 ± 2.51, the reaction time of incongruent trial was 31.15 ± 8.03 s compared with 22.78sec in our study.

This results may be due to that inhibitory control is affected by chronic aversive circumstances, and being in a state of distress as a consequence of studying medicine facing different disorders and patients and fear of upcoming responsibilities, harsh lifestyle including decreased sleep, multiple exams as well as comorbid psychiatric symptoms which affect emotional limbic system mechanism as well as prefrontal one (dorsolateral prefrontal cortex) and decreasing level of resilience leading to inhibitory control deficits.

Mean verbal fluency is 15.45 ranging from 8 to 24 with 28.8% show score less than 17 words per minute which indicate deficits in verbal fluency. The current results can be explained as verbal fluency tasks are used for establishing the presence of specific cognitive deficits. Deficits in the productivity on the semantic (SF) and phonemic fluency (PF) tasks in relation to healthy subjects have been used as arguments for deficits in semantic memory, executive functioning, linguistic processing, etc. in populations with mild cognitive impairment, depression, bipolar disorder, obsessive-compulsive disorder, and many others (**15**). As we can see ,medical students are continuously under high academic stress and pressure, they may had one or more of subsyndromal psychiatric symptoms, such as anxiety, depression, which may be negatively affect their verbal fluency.

There was statistically significant association between subjective memory problems and age, residence, grade. Subjective memory problems are detected more among younger age groups with 75.6% of the students aged 21 years have subjective problems in memory which may be due to that this is the commonest age among fifth grade medical student according to Egyptian educational system. 67.0% of students with rural residence which may be due to the percentage of medical student distribution in Mansoura faculty of medicine as Mansoura university serves a large area that contains a lot of villages, 76.9% of students with good grade which may be the median score for students in our faculty,

Similarly to our results **Tomita et al., (16)** found that memory impairments were related to age of the students but not to their gender. The study also emphasized the strong association between depressive status and subjective memory complaints. Also, **Pellicer-Porcar et al., (17)** found greater association between anxiety among university students and memory complaints

Nunes et al. (18) found significant differences between the participants with and without cognitive impairment in terms of age and sex; the participants with cognitive impairment were older and consisted of more male participants. The Spearman correlation analysis and logistic regression indicated that anxiety was associated with memory difficulties at the level of $p < 0.005$.

The memory problem is the most prevailing issue of all age groups particularly medical students, who deal with high cognitive load, while managing the syllabus and retaining the content at the time of examination **(1).**
Working memory is an essential factor for executive functions. Executive functions (EFs) are an umbrella term for various cognitive processes controlled by a complex neural activity **(3).**

Recently, there has been a consensus that three basic nuclei compose EFs: WM, cognitive flexibility, and inhibition of prepotent impulses **(4).** WM refers to temporary maintenance and active control of information, avoiding distraction. For its part, cognitive flexibility is the ability to change and modify the course of thoughts or actions to multiple tasks that require it, and inhibition is the ability to inhibit dominant or automatic responses when is necessary **(5).**

Conclusions

It has been stated that young doctors should be given the same care and support that we expect them to provide to their patients. The same should be extended to medical students in order to promote resilience and personal fulfilment, and for enhancement of professionalism and patient care.

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