Journal of Research in Medical and Dental Science
2020, Volume 8, Issue 1, Page No: 37-42

Available Online at: www.jrmds.in
eISSN No. 2347-2367: pISSN No. 2347-2545

The Relationships among Gender, Handedness, GPA, Depression and Visual Memory in the ROCF Test in University Students

Ochilbek Rakhmanov[1], Senol Dane[2]*

[1]*Department of Computer Science, Faculty of Natural and Applied Sciences, Nile University of Nigeria, Abuja, Nigeria*

[2]*Department of Physiology, Faculty of Basic Medical Sciences, College of Health Sciences, Nile University of Nigeria, Abuja, Nigeria*

ABSTRACT

Introduction: The Rey-Osterrieth Complex Figure Test (ROCF) is a widely used neuropsychological test for the evaluation of visuospatial constructional ability and visual memory.

Methods: A total of 138 Nigerian university students were involved in the study. Participants were 66 men and 72 women who were 17-25 years of age. The Rey-Osterrieth Complex Figure (ROCF) test developed by Rey and standardized by Osterrieth used to screen for visual memory. The Self Reporting Questionnaire (SRQ) 20 adapted from WHO was used to screen for depression. Handedness was ascertained by using the Edinburgh Handedness Scale.

Results: There was a negative correlation between Grade Point Average (GPA) and depression score in men and a positive correlation in women. Also, there were negative correlations between depression score and short-term and long-term visual memories in the total sample and women, but not in male students. Additionally, women have higher short-term and long-term visual memories in the ROCF test than men in the present study. Also, the left-handed university students had advantages in terms of short-term and long-term visual memories (ROCF test) than the right-handed ones.

Discussion: A negative in men and a positive in women correlations between GPA and depression score may be related to the gender-related differences in depression. High depression score but in its normal range, especially in female university students, is an important factor to increase both GPA and short-term and long-term memories. The advantage or superiority of left-handed athletes for success and performance or their intrinsic neurological advantage compared to right-handed athletes may result from their high scores in short-term and long-term visual memories in the ROCF test.

Conclusion: ROCF test can be accepted as an important and useful tool to assess and follow the achievement and some behavioral or neuropsychological factors in university students.

Key words: Rey-Osterrieth Complex Figure test (ROCF), Gender, Handedness, GPA, Depression

HOW TO CITE THIS ARTICLE: Ochilbek Rakhmanov, Senol Dane, The Relationships among Gender, Handedness, GPA, Depression and Visual Memory in the ROCF Test in University Students, J Res Med Dent Sci, 2020, 8(1): 37-42.

Corresponding author: Senol Dane

e-mail✉: senol.dane@nileuniversity.edu.ng

Received: 07/12/2019

Accepted: 02/01/2020

INTRODUCTION

The Rey-Osterrieth Complex Figure (ROCF) test was developed by Rey in 1941 [1] and standardized by Osterrieth in 1944 [2]. It is a non-verbal neuropsychological test and is used for the evaluation of visuospatial and visual memory [3]. The ROCF is also a useful test for measuring executive functions of the prefrontal lobe. The ROCF consists of three test conditions: Copy, immediate recall, and delayed recall. The results include scores related to location, accuracy, and organization. The copy trial is used to assess the perceptual analytic process or strategy a subject used to complete the copy and the recall trial is used to assess the accuracy in visual memory [4].

In a recent review article, it has been reported the importance of visuospatial measures in the diagnosis and prognosis of Alzheimer's disease. Block Design and Clock Drawing Tests, Rey-Osterrieth Complex Figure recall and topographical tasks showed the greatest diagnostic potential in dementia. The Benton visual retention, doors and people, and

topographical memory tests showed potential as prognostic markers [5]. It has been reported that men had higher scores than females in the ROCF test [6,7]. However, some studies reported that gender-related effects were negligible [8,9]. As such, the potential for gender to have a clinically meaningful impact on test performance remains unclear.

Also, it has been reported that left-handed people had the better performance on a test of mental rotation of 3-D patterns than right-preferent individuals [10], that left-handed persons have some advantage over right-handed subjects in imagining the rotations of figures [11]. Also, sex and handedness differences in eye-hand visual reaction times in handball players were reported in which men and left-handed people had the advantage in visual reaction time [12]. It has been suggested that left-handed subjects have probably an intrinsic neurological advantage and therefore the left-handed athletes seem to have some superiority for success and performance compared to right-handed athletes [12,13].

Also, a recent study reported the relationships between depression and visual memory in patients with epilepsy. Persons with lower levels of depression achieved better scores in the Immediate (short-term visual memory) and Delayed recall (long-term visual memory) subtests of the ROCF [14]. This study was conducted to explore the effects of gender; handedness and depression on immediate recall (short-term visual memory) and Delayed recall (long-term visual memory) subtests of the ROCF in university students.

METHODS

Participants

Students (One hundred thirty-eight) who had classes at the time of the study were approached and requested to participate in the study. All of them accepted to participate in this study (66 men, average age=21.12 years, standard deviation, SD=2.02; 72 women, average age=21.35, SD=1.81). They were students of the two different faculties (Faculty of Natural and Applied Sciences, College of Health Sciences) at Nile University of Nigeria, private tertiary institution in Abuja, Nigeria. The age of the participants was not different statistically by sex.

Inclusion criteria

1. Willingness to participate.
2. Only students were allowed to participate.
3. Only undergraduate students studying were included in the study.

Exclusion criteria

1. The study excluded participants that were not willing to be involved.
2. Students with respiratory, metabolic, cardiac, psychiatric or central and autonomic nervous system disease that might change the depression and visual memory scores were not involved.

Procedure

The experimental protocol was by following international ethical standards. The study was performed per under the Helsinki Declaration (1975, revised in 1996-2013). It was a descriptive cross-sectional study. The aims and objectives of the study were explicitly explained to the participants before the commencement of the study. All participants voluntarily gave written informed consent to participate in the study. The study was anonymous. A paper and pencil based method of filling questionnaires was utilized. Participants were administered the Self Reporting Questionnaire (SRQ-20) to get a depression score. All questionnaires were distributed only among first-year students on the university campus. The study was made between September 2019 and November 2019.

Assessment of depression

The English version of a structured self-administered World Health Organization's questionnaire (Self Reporting Questionnaire, SRQ-20) was used to collect the data on depression [14, 15]. The SRQ-20 was developed and validated for international use. Compared to other scales for analysis of depression, the SRQ-20 has better validity and is widely used to assess depression among University students [16,17]. The SRQ-20 scale includes 20 dichotomous (yes/no) questions asking whether participants experienced symptoms of anxiety, depression, or somatic symptoms during the last 30 days before the study [16,17].

Procedure for Rey–Osterrieth Complex Figure Test (ROCF)

The following instructions to conduct the ROCF test were followed [18].

1. All students were given 2 pieces of a blank sheet and were told they would be given a figure which they need to copy to blank paper in front of them. They were also informed that details are important rather than beauty and colorfulness of the picture. Finally, a copy of ROCF is given to everyone at the same time. The time limit was given as 3 minutes, but nearly everyone finished in 2 minutes time period.
2. All sketched papers and original ROCF papers were collected by the invigilator, which took approximately 2-3 minutes. So actually by the instructions of (Meyers & Meyers, 1995), a break of 3 minutes was given [3].
3. Once Step 2 is done, students were requested to sketch the figure from their memory on a 2nd blank sheet. Time limit was given as 3 minutes again, and all figures were collected back once sketches are done. These sketches served as the Immediate Recall test.
4. Meyers, et al. suggested using 30-45 minutes time interval between the Immediate and Delay Recall test [3]. They also suggested using conducting some verbal tasks in between this interval. So we discussed with students about modern scientists and inventors and their impacts on modern technology. This process took between 32-37 minutes in our case.
5. Lastly, students were given a blank sheet and requested to draw ROCF again from their memory. These sketches were served as the Delay Recall test.

Scoring of ROCF test

A quantitative scoring system was used. In Rey's scoring system, the ROCF stimulus is divided into 18 sections/units and each unit is scored separately in terms of both accuracy and placement. A standardized scoring system proposed by Meyers, et al. was presented in Table 1 [3]. The total score of every sketch may range from 0.0 to 36.0. The scoring of the pictures was done by researchers personally.

Handedness

Handedness was ascertained by using the Edinburgh Handedness Scale [19]. This generated scores from 100 to -100. Participants having handedness scores from -100 to zero were considered to be left-handed and those with scores from zero to 100 were considered to be right-handed.

Statistical analysis

Measured values are given as a mean +/- standard deviation (SD). Statistical analysis was performed using SPSS for Windows version 18. The Student's t-test was used to compare the depression scores in the participants. A p-value of less than 0.05 was considered statistically significant.

RESULTS

In the total sample, there were significant positive Pearson correlations between Grade Point Average (GPA) and short-term (Immediate recall) (r=0.24, p=0.03) and long-term (Delayed recall) (r=0.26, p=0.03) visual memories in the ROCF test. Besides, there were significant negative Pearson correlations between depression score and short-term (r=-0.255, p=0.005) and long-term (r=-0.26, p=0.04) visual memories (Table 2).

In male subjects, there was a significant negative Pearson correlation between GPA and depression score (r=-0.33, p=0.04). Also, there were significant positive Pearson correlations between GPA and long-term (r=0.29, p=0.04) visual memory (Table 2). In female subjects, unlike male subjects, there was a significant positive Pearson correlation between GPA and depression score (r=0.32, p=0.04). Also, there were significant negative Pearson correlations between depression and short-term (r=-0.35, p=0.03) and long-term (r=-0.4, p=0.001) visual memories (Table 2).

There were gender and handedness related differences in short-term and long-term

Table 1: Scoring of ROCF test.

Score	Accuracy	Placement
2	Accurately drawn	Correctly placed
1	Accurately drawn	Incorrectly placed
1	Inaccurately drawn	Correctly placed
0.5	Inaccurately drawn, but recognizable	Incorrectly placed
0	Inaccurately drawn and unrecognizable, or omitted	Incorrectly placed

Table 2: Correlation statistics (r and p) among age, GPA, depression score, short-term (Immediate Recall) and long-term (Delayed Recall) visual memories.

	GPA	Depression	Short	Long
Total Sample (N=138)				
GPA	-	-0.01, 0.92	0.24, 0.03	0.26, 0.03
Depression	-0.01, 0.92	-	-0.255, 0.005	-0.26, 0.004
Male Subjects (N=66)				
GPA	-	-0.33, 0.04	0.23, 0.11	0.29, 0.04
Depression	-0.33, 0.04	-	-0.19, 0.19	-0.16, 0.27
Female Subjects (N=72)				
GPA	-	0.32, 0.04	0.24, 0.21	0.14, 0.46
Depression	0.32, 0.04	-	-0.35, 0.03	-0.4, 0.001

Table 3: Gender and handedness related differences in short-term (Immediate recall) and long-term (Delayed Recall) visual memories.

Gender-related Differences				
Memory Type	Male Subjects (N=66)	Female Subjects (N=72)	t	p
Short-term	16.32 ± 7.34	20.47 ± 6.06	3.64	0
Long-term	17.02 ± 7.7	21.09 ± 5.86	3.51	0.001
Handedness-related Differences				
	Right-Handers (N=127)	Left-Handers (N=11)	T	p
Short-term	18.67 ± 6.88	22.73 ± 4.88	2.24	0.04
Long-term	19.31 ± 7.01	23.73 ± 4.34	2.32	0.04

visual memories in the ROCF test. Women had statistically significant higher short-term (t=3.64, p=0.00) and long-term (t=3.51, p=0.001) visual memories than men. Also, left-handed subjects statistically significant higher short-term (t=2.24, p=0.04) and long-term (t=2.32, p=0.04) visual memories than right-handed subjects (Table 3).

DISCUSSION

Executive function is referred for the advanced mechanisms comprising many components of cognitive processes [20,21]. The executive function consists of several processes including working memory [22]. Executive dysfunction can cause impairments in planning, cognitive fluency, and judgment without lowering intelligence [23]. Also, executive dysfunction is taken into consideration as a basic mechanism of pervasive developmental disorders and attention-deficit/hyperactivity disorders [24,25]. ROCF has been used for the evaluation of visuo-constructional ability in copy condition and the evaluation of visual memory in recall condition [26]. It has been reported that patients with Parkinson's disease [27], and obsessive-compulsive disorders [28] copied the ROCF using a less organized strategy. Therefore, it is accepted that ROCF reflects executive functions such as organization and planning. In the present study, there was a negative correlation between GPA and depression score in men and a positive correlation in women. This gender difference showed again that gender is a very important factor in behavioral studies including depression and school achievement. Previous studies reported the higher depression scores in female than in male subjects [29-31]. In the present study, a negative in men and a positive in women correlations between GPA and depression score may be related to the gender-related differences in depression.

Also, there were negative correlations between depression score and short-term and long-term visual memories in the total sample and women, but not in male students. These results suggest that high depression scores but in its normal range, especially in female university students, is an important factor to increase both GPA and short-term and long-term memories. In a lot of neuropsychological tests, there is a positive relationship between intelligence and performance on the ROCF (visual memory). The number of years' education is often used to give an estimate of intelligence, and there is evidence to suggest that education may affect scores on the ROCF [20].

Additionally, women have higher short-term and long-term visual memories in the ROCF test than men in the present study. These results were not consistent with some previous studies in which men had higher scores than females in the ROCF test [6,7]. However, some studies reported that gender-related effects were negligible [8,9]. These results may result from racial or cultural diversities because the subjects were from Africa.

Also, the left-handed university students had advantages in terms of short-term and long-term visual memories (ROCF test) than the right-handed ones. It has been known that left-handed people had the better performance on a test of mental rotation of 3-D patterns than right-preferent individuals [10], that left-handed persons have some advantage over right-handed subjects in imagining the rotations of figures [11]. Also, sex and handedness differences in eye-hand visual reaction times in handball players were reported in which men and left-handed people had the advantage in visual reaction time [12]. It has been suggested that left-handed subjects have probably an intrinsic neurological advantage and therefore the left-handed athletes seem to have some superiority for success and performance compared to right-handed athletes [12, 13]. The advantage or superiority of left-handed athletes for success and performance or their intrinsic neurological advantage compared to right-handed athletes may result from their high scores in short-term and long-term visual memories in the ROCF test.

CONCLUSION

ROCF test can be accepted as an important and useful tool to assess and follow the achievement and some behavioral or neuropsychological factors in university students.

REFERENCES

1. Rey A. The exam of psychological dance is the traumatic experience of phalopathy. Archives de Psychologie 1941; 28:286-340.
2. Osterrieth PA. Le tests the copy d'une figure complex. Contribution and the study of perception and the mood. Archives de Psychologie 1944; 30:206-353.
3. Meyers JE, Meyers KR. Rey complex figure test under four different administration procedures. Clin Neuropsychol 1995; 9:63-67.
4. Corwin J, Bylsma FW. Translations of excerpts from andre´ rey's psychological examination of traumatic encephalopathy and PA osterrieth's the complex figure copy test. Clin Neuropsychol 1993; 7:3-21.
5. Salimi S, Irish M, Foxe D, et al. Can visuospatial measures improve the diagnosis of Alzheimer's disease? Alzheimer's Dement 2017; 10:66-74.
6. Bennett-Levy J. Determinants of performance on the rey-osterrieth complex figure test: An analysis, and a new technique for single-case assessment. Br J Clin Psychol 1984; 23:109-119.
7. Gallagher C, Burke T. Age, gender and IQ effects on the rey–osterrieth complex figure test. Br J Clin Psychol 2007; 46:35-45.
8. Boone KB, Lesser IM, Hill-Gutierrez EH, et al. Rey-osterrieth complex figure performance in healthy older adults: Relationship to age, education, sex, and IQ. Clin Neuropsychol 1993; 7:22-28.
9. Fastenau PS, Denburg NL, Hufford BJ. Adult norms for the rey-osterrieth complex figure test and for supplemental recognition and matching trials from the extended complex figure test. Clin Neuropsychol 1999; 13:30-47.
10. Porac C, Coren S. Lateral preferences and human behavior. Springer Verlag 1981.
11. Sanders B, Wilson JR, Vandenberg SG. Handedness and spatial ability. Cortex 1982; 18:79-90.
12. Dane S, Erzurumluoglu A. Sex and handedness differences in eye-hand visual reaction times in handball players. Int J Neurosci 2003; 113:923-929.
13. Ziyagil MA, Gursoy R, Dane S, et al. Left-handed wrestlers are more successful. Percept Mot Skills 2010; 111:65-70.
14. Adewuya AO, Ola BA, Aloba OO, et al. Depression amongst Nigerian university students. Prevalence and sociodemographic correlates. Soc Psychiatry Psychiatr Epidemiol 2006; 41:674-678.
15. Adeniyi AF, Okafor NC, Adeniye CY. Depression and physical activities in a sample of Nigerian adolescent levels, relationships and predictors. Child Adolesc Psychiatry Ment Health 2011; 5:1-10.
16. Salle E, Rocha NS, Rocha TS, et al. Depression rating scales as screening tools for depression in high school students. Rev Psiq Clín 2012; 39:24-27.
17. Hersi L, Tesfay K, Gesesew H, et al. Mental distress and associated factors among undergraduate students at the University of Hargeisa, Somaliland: A cross-sectional study. Int J Ment Health Syst 2017; 11:39.
18. Shin MS, Park SY, Park SR, et al. Clinical and empirical applications of the rey-osterrieth complex figure test. Nature Protocols 2006; 1:892.
19. Oldfield RC. The assessment and analysis of handedness: The Edinburg Inventory. Neuropsychol 1971; 9:97-114.
20. Fastenau PS, Denburg NL, Hufford BJ. Adult norms for the rey- osterrieth complex figure test and for supplemental recognition and matching trials from the extended complex figure test. Clin Neuropsychol 1999; 13:30-47.
21. Stuss DT, Levine B. Adult clinical neuropsychology: Lessons from studies of the frontal lobes. Annu Rev Psychol 2002; 53:401-33.
22. Tranel D, Anderson SW, Benton A. Development of the concept of 'executive function' and its relationship to the frontal lobes. In: Boller F, Grafamm J, Handbook of Neuropsychology, Elsevier; 1994; 6:125–148.
23. Kolb B, Whishaw I. Fundamentals of human neuropsychology. 3rd Edn New York: WH Freedom and Co 1990.

24. Ozonoff S, Pennington BF, Rogers SJ. Executive function deficits in high-functioning autistic individuals: Relationship to theory of mind. J Child Psychol Psychiatry 1991; 32:1081-1105.

25. Barkley RA. Behavioral inhibition, sustained attention and executive functions: constructing a unifying theory of ADHD. Psychol Bull 1997; 121:65-94.

26. Chiulli SJ, Haaland KY, LaRue A, et al. Impact of age on drawing the rey–ostterieth figure. Clin Neuropsychol 1995; 9:219–224.

27. Grossman M, Carvell S, Peltzer L, et al. Visual construction impairments in parkinson's disease. Neuropsychol 1993; 7:536-547.

28. Savage CR, Baer L, Keuthen NJ, et al. Organizational strategies mediate nonverbal memory impairment in obsessive-compulsive disorder. Biol Psychiatry 1999; 45:905-916.

29. Leach L, Christensen H, Mackinnon A, et al. Gender differences in depression and anxiety across the adult lifespan: The role of psychosocial mediators. Soc Psychiatry Psychiatr Epidemiol 2008; 43:983-998.

30. Birhanu A, Hassein K. Prevalence and factors associated to depression among ambo university students, Ambo, West Ethiopia. J Health Med Nurs 2016; 25:26-34.

31. Christina ON, Akin OM, Salisu RA, et al. The effects of sex, physical defect on body, acne on face and education on depression in Nigerian University students. J Res Med Dent Sci 2019; 7:103-108.