



Investigating the Spread of Neuropsychological Damages among the Employees of the Manufacturing and Industrial Units in Iran's Isfahan Province

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Abstract

Neuropsychology is an academic field that studies relations between the brain and behavior. The present study aims to investigate the spread of neuropsychology, the relations, and correlation among the employees of the manufacturing and industrial units in Isfahan Province. The statistical population has consisted of 500 employees of the manufacturing and industrial units in Isfahan province. This study is survey research and the required data has been gathered using: Bender-Gestalt, Toulouse-Pieron, Jean-Louis Sally, and the *Halstead-Reitan* tests. The findings reveal that the mean of the variable of memory is equal to 10.5 which indicates the medium status of memory in terms of the measurement scale. The spread of neuropsychology damages among the employees of the manufacturing and industrial units in Isfahan province is highly low. Regarding the gender and the industrial unit in which employees are working, the findings show that there is no significant difference in terms of attention among male and female employees at various units. A significant difference was observed between different age groups and employees' education level and memory scores. No significant difference was observed between memory scores in terms of gender and employees at the manufacturing and industrial units. Likewise, there exists a significant relationship between all variables representing neuropsychological damages. People's education is also effective in their brain performances. Thus, managers should provide appropriate and favorable conditions for their employees so that they will less be subjected to neuropsychological damages and their quality and efficiency will be improved in the industries and organizations.

KEYWORDS: Neuropsychological Damages, Visual-structural Ability, Memory, Motor Performance, Attention

1. Introduction

Paying attention to job environments and working conditions of employees in recent years to enhance the quality of work, maintaining health and hygiene, and better and more extraction of employees' experience has been considered by several scholars (Aldrige,1994). Manpower is regarded as the most fundamental capital in industrial units and the industry sector is dependent on people who use their characteristics and capabilities toward manufacturing in the best manner (Benson et al.,1998). Exploring employees' characteristics shows that many damages of employees at the industrial units are due to lack of some capabilities or presence of some

hidden damages which are not identifiable in employment interviews (Benton,2000). Inattention to them can be led to irreparable damages and on the other hand, it decreases productivity in industrial units. Neuropsychological damages are one of the most important damages that are not observable in employees and are just identifiable through accurate neuropsychological assessments. Today, we believe that clinical neuropsychology is a specialized healthcare profession that is focused on assessment and healing the patients suffering from brain disorders (Goldstein,2010). Researchers and scholars divide occupational injuries into three classes: 1) intra-individual damages that include the issues related to an



employee or worker and are led to disorder in his/her job performance. 2) Inter-individual damages that contain the problems with which an employee or worker is faced either inside a firm or outside it about other people and are led to disorder in his/her performance. 3) Meta-individual damages are problems related to an employee's job and are resulted in disorder in his/her job performance. A *syndrome* is a group of signs and symptoms that shows the existence of a disease or damage. It has achieved a massive volume of such knowledge at the level of experience in recent years. Of course, serious methodological criticism has newly been proposed about the analysis based on classical neuropsychology syndromes (Ardila, 2013). Employees' neuropsychological damages are obvious in various intra-individual, inter-individual, and meta-individual sections but undoubtedly, neuropsychological damages are more divided in intra-individual scope. In terms of memory difference, some studies have been carried out, for instance, gender differences can be observed from three theoretical aspects, i.e. biological, social, and psychological (Halpern, 2012). The effect of gender on cognitive capabilities has been observed in larger groups too (Reilly et al., 2016). Miller and Halpern (2014) believe that the inherent brain structure between genders is one of the most important reasons for the sex difference in cognition. In the present study, various neuropsychological damages have been explored among the employees at the industrial and manufacturing units. This study aims to estimate the spread of neuropsychological damages in the statistical population under study. Identification of such damages and disorders provides the ground to perform complementary research for the identification of fundamental reasons as well as taking actions to prevent such damages. Besides, it can inform the experts and specialists of the situation and conditions of working and job environments.

2. Theoretical Framework and Review of Related Literature

Neuropsychology is a branch of brain research in recent years is regarded as a specialized field in psychology. It expounds the relationship between brain and behavior and intends to find out how the brain acts, for example, which mechanisms are important in thinking, learning and feeling; how they are measured, and what their effect is on human behavior (Brain and Norris, 2004). In the most general definition, neuropsychology studies the relationships between brain and behavior scientifically and regarded the necessity for

formal development of a specialized, applicable and clinical field after the Second World War (Lezak et al., 2012). Or neuropsychology, as a science, that studies the relationships between brain and behavior is specialized health care professionals in the clinical field which is focused on studying, evaluating, and curing patients who suffer from brain disorders (Ghavami, 2018). Indeed, the role of the human brain is associated with psychological activities and looking for the organization of the nervous system. On the other hand, given the importance of vision in human beings as the most significant factor for comprehension in the living environment, the status of vision has been determined more than ever and persuades the researchers and scholars to determine and rehabilitate its disorders using neuropsychology (Calut, 2003). Neuropsychology is classified into two subsets of clinical neuropsychology and empirical neuropsychology. The main difference between the two subsets is that clinical studies are carried out on patients with brain injuries while healthy people are explored in empirical studies. Thus, research methodology in clinical and empirical neuropsychology is different. Clinical neuropsychology studies the patients who have problems due to physical injury (trauma) or biochemical changes of the brain. It examines the lack of intelligence, personality, and sensory-motor actions through appropriate tests and explores its results with the type and the area where the brain is injured. The results of these studies help specialists diagnose brain damages and rehabilitate patients suffering from brain injury. Conversely, empirical neuropsychology examines how the brain of healthy people acts through its special methods. In such studies, the subject performs certain tasks, and, in this way, the accuracy and speed of the subject's duty are measured. Through the obtained results, it will be found that how his/her brain acts. Hence, the variables including psychophysiology and electrophysiology are measured (Brain & Norris, 2004). In 1987, a joint working group determined base standards for clinical neuropsychology training and published the first formal instructions about education, granting credentials and qualification for neuropsychologists. The clinical scope is more of a scientific-professional medical specialty which studies, evaluates, and cures behavioral consequences of brain injury or cerebral palsy (Stringer, 2011).

Lezake believes that most injured people lose their ability to perform the previous job (Lezake, 2013). Having reviewed the research literature and given their studies, Damasio and Damasio concluded that

the *apperceptive agnosia* occurred more due to bilateral damage to the middle part of the occipital lobe and posterior superior temporal sulcus. If the breadth of trauma is very high, it will be led to blindness (Damasio & Damasio, 1995). Agnosia guarantees a deficiency in the ability to transfer the information between the visual cortex and brain mechanisms related to the tongue. It means that the individual's perceptive ability is sufficed for object designing but his/her linguistic mechanisms do not receive the required information to articulate a suitable word or think about the nature of things (Carlson, 1999). Lassonda (2000), Wall and Egger (2000) found that there was a difference between patients with brain lesions and control patients who were comparable in terms of age, education, job status, and level of linguistic intelligence through vision test. Other studies found findings on a relatively high frequency of deficient performance in brain injury patients and provided information about the characteristics of the diagnosis function for the groups. Friedhoff (1998) conducted a study on 12 patients suffering from chronic carbon monoxide poisoning and found that the performance of 11 patients in the vision test was mainly deficient. The first actions to establish a psychometrics laboratory and develop tests to evaluate the patients were conducted by Sheferd Ivory, Franz, and then Holstid (Stringer, 2011). Moreover, several studies have been conducted about the relations and correlation of neuropsychological among the people which those of Moura et al. (2015), Biotteau et al. (2016) Melby, et al. (2016), Johnson, et al. (2016), Peijnenborgh, et al. (2016), can be mentioned. The present study aims to Investigate the spread of neuropsychology, the relations, and correlation among the employees of the manufacturing and industrial units in Isfahan Province. For this purpose, the research objectives are formulated as below:

2.1. Research objectives

This study aims to identify the spread of neuropsychology damages (structural-visual, motor, information processing, and memory) in employees at the manufacturing and industrial units in Isfahan province. To this end, the following research questions were proposed and tested:

1. To what extent are neuropsychology damages spread among the employees of the manufacturing and industrial units in Isfahan province?
2. Are male and female employees having various education levels and ages who are working in various manufacturing and industrial units differ

in terms of mental activities such as attention and processing speed?

3. Are male and female employees having various education levels and ages who are working in various manufacturing and industrial units differ in terms of memory?

4. How is the correlation of the indexes representing neuropsychology damages?

3. Research methodology

This study is survey research. The statistical population consisted of 3000 employees at the industrial units in Isfahan province in 2018. Using the below formula, 500 employees were selected as the statistical sample. Considering that one of the main objectives of this study was to prepare the standard neuropsychology tests along with their psychometrics indexes for the industrial community, the minimum sample volume should be equal to 500. This is because calculating validity and reliability indexes and standardization of tests need this sample volume. The research sample was selected via cluster sampling. The American Educational Research Association defines validity as the degree of support of evidence and theory from interpretations of the obtained test scores from the suggested uses for tests (AERA, 2014). As an action in this regard, a comprehensive set of tests for the excellent cognitive (executive) functions of the brain has been validated for the assessment of brain injury patients in the southeast of Iran in recent years (Ghavami et al., 2015).

The formula to calculate the sample size is as below:

$$n = s.z/d$$

3.1. Research tools

The required data on the research background and literature has been gathered using historical study. Bender-Gestalt test was employed to measure visual-structural abilities (Gaztaniga et al. 2003). It is among the six widely used tests in the world (Hurti & Lindeman, 2005). Its validity and reliability have been confirmed in various studies (Hecaen & Perenin, 2001; Marshal, 1998; Peterson, 2003). To measure mental activities like attention and processing speed, Piron and Toulouse test was utilized and to measure memory, Jean-Louis Sally test was used. Similarly, the Moed test was employed to measure motor performance.

4. Findings

Table 1 shows descriptive statistics indexes such as mean, standard deviation, variance, etc. for criterion variables. Data indicates that mean of the variable of

memory is relatively equal to 10.5 which shows medium memory status in terms of the measurement scale. About the Bender-Gestalt test that measured visual-structural ability, the mean was obtained equal to 25.7. Comparing it with descriptive ratings of the above test illustrates the lack of disorder of any organs in the sample under study.

Table 1. Descriptive indexes of the research variables

	Number	Mean	Standard deviation	Variance	Minimum score	Maximum score
Memory	500	10.452	5.50	30.20	1	23
Attention	500	199.330	86.90	7545.30	89	450
Visual-structural ability	500	25.7039	6.60	43.43	11	45
Motor performance (Went)	500	11.800	2.50	6.22	7	20
Motor performance (Return)	500	12.100	2.90	8.20	6	19
Motor performance (Total)	500	14.840	4.63	21.50	3	30

The data in Table 2 show that the model for the variable of memory is greater than the mean. Mean, median, and mode for the variable of mental abilities such as attention and information processing show positive skewness of the scores on the above-mentioned variable. The scores related to the visual-structural ability that has been measured via the Bender-Gestalt test reveal that the distribution has positive skewness. The scores of motor performance (went, return, and total) reveal that the distribution of scores is natural in the three variables.

Table 2. Central tendency indexes related to the criterion variables

	Memory	Attention	Visual ability	Motor performance (Went)	Motor performance (Return)	Motor performance (Total)
Number	500	500	500	500	500	500
Mean	10.45	199.3	25.7	11.8	12	14.5
Median	10.50	186	24	12	12	14
Mode	11	100	21	11	12	14
Sum of scores	5226	99665	12851.9	5888.6	6052.1	7239
Point 25%	6	123	21	10	10	11
Point 50%	10.50	186	24	12	12	14
Point 75%	14	266	31	13	14	18
Point 100%	23	450	45	20	19	30

The data in Tables 1 and 2 is the response for the first question, i.e., to what extent are neuropsychology damages spread among the employees at the industrial units in Isfahan province. It shows that the spread of neuropsychology damages among the employees at the manufacturing and industrial units in Isfahan province is highly low.

To respond to the second question, i.e., are male and female employees having various education levels and ages who are working in various industrial units different in terms of mental activities such as attention and processing speed, one-way analysis of variance was used. The results are presented in Table 3.

Table 3. Levin test to explore equality of error variance

P	df_2	df_1	F
0.000	385	114	2.299

Table 4. ANOVA test for the estimation of attention scores in terms of gender, education level, age and type of the industrial unit

Source	Sum of squares	Df	Mean of squares	F	Significance level	Eta
The modified model	1.8	114	15890.4	3.132	0.000	0.481
The interaction model	5711020.7	1	5711020.7	1125.5	0.000	0.754
Age	138639.8	4	34659.9	6.831	0.000	0.096
Gender	0.039	1	0.039	0.000	0.988	0.000
Education level	202493.1	3	67497.7	13.30	0.000	0.094
The industrial unit	19437.8	3	6479.3	1.277	0.282	0.010

The Levin test (Table 3) which is about equality of variances of the groups rejects the null hypothesis ($P=0.000$). The results of variance analysis are represented in Table 4 and reveal that the difference between five age groups is significant ($P=0.000$). Regarding the education level, the results indicate that the difference between the four groups of education level is significant. With regard to sex and the industrial unit, the information in Table 4 show that there is no significant difference between male

and female employees at different industrial units in terms of attention.

In order to respond to the third question, i.e., are male and female employees having various education levels and ages who are working in various industrial units differ in terms of memory, analysis of variance (ANOVA) was employed and the results are displayed in Table 5.

Table 5. Levin test to explore equality of error variance

Significance level	df_2	df_1	F
0.000	385	114	2.475

Table 6. One-way analysis of variance. Dependent variable: memory

Source	Sum of squares	Df	Mean of squares	F	Significance level	Eta
The modified model	7184.4	114	63.081	3.081	0.000	0.477
The interaction model	16204.9	1	16204.9	792.192	0.000	0.673
Age	282.1	4	70.53	3.448	0.009	0.035
Gender	1.5	1	1.5	0.069	----	0.000
Education level	817.025	3	272.343	13.314	0.000	0.094
The industrial unit	84.7	3	28.244	1.381	----	0.011

The data in Tables 5 and 6 show that a significant difference was observed between various age groups, employees' education level, and memory results. Besides, no significant difference was observed among the

memory scores in terms of gender and the employees at the manufacturing and industrial units.

With regard to question 4, i.e., how is the correlation of the indexes representing neuropsychology damages, the results are presented in Table 7.

Table 7. Matrix of correlation coefficients between the indexes representing neuropsychology damages

	Memory	Attention	Visual-structural ability	Motor performance (Went)	Motor performance (Return)	Motor performance (Total)
Memory	1	0.81**	0.44**	0.31**	0.36**	0.25**
Attention	0.81**	1	0.36**	0.31**	0.34**	0.22**
Visual-structural ability	0.44**	0.36**	1	0.44**	0.51**	0.48**
Motor performance (Went)	0.31**	0.31**	0.44**	1	0.83**	0.52**
Motor performance (Return)	0.36**	0.34**	0.51**	0.83**	1	0.63**
Motor performance (Total)	0.25**	0.22**	0.51**	0.52**	0.63**	1

** Correlation is significant at the level 0.01 ($p<0.01$).

The data in the above table show that there is a significant relationship among all variables representing neuropsychology damages. This relationship is significant in all cases at a level of less than 0.01.

5. Discussion and conclusion

In the previous fifty years, we have witnessed the ever-increasing development and attention to an applicable and specialized scope in clinical psychology known as neuropsychology or the science which studies the relations between brain and behavior. In the present study, the spread of neuropsychology damages among the employees at the manufacturing and industrial units in Isfahan province has been explored. The obtained results from various tests show that managers should provide appropriate and favorable working conditions for their employees so that they will less be subjected to neuropsychological damages and their quality and efficiency will be improved in the industries and firms. These are explored in the following.

Work allocates a great portion of every person's life. Humans satisfy their living needs through work and at the same time, enjoy it and live for it. Work is the necessity of development that provides the interests of the nation and people in society. The workforce creates a productive part of society. For this reason, the conditions, the environment, and paying attention to mental health in the work environment are highly important. Researchers classify various types of job damages into three classes: intra-individual damages that include the issues related to an employee or worker and lead to disorder in his/her job performance; inter-individual damages that contain the problems with which an employee or worker is faced either inside a firm or outside it in relation to other people and are led to disorder in his/her performance; and meta-individual damages that are problems related to an employee's job and are resulted in disorder in his/her job performance.

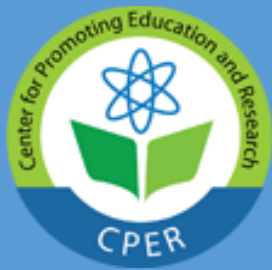
Neuropsychological damages of employees are obvious in various intra-individual, inter-individual, and meta-individual sections. But undoubtedly, they are more divided in intra-individual scope. In the current study, different neuropsychological damages among the employees at the manufacturing and industrial units were explored. The purpose of this study was first to estimate the spread of neuropsychological damages among the statistical population under study. Clearly, identifying and diagnosis such damages and disorders provide the ground to perform complementary research for the identification of fundamental reasons as well as taking

actions to prevent such damages. Besides, it can inform the experts and specialists of the conditions in the work environments.

About the research question on the spread of neuropsychological damages among the employees at the industrial units, the results indicate that the obtained mean of memory capability is equal to $M=10.45$. Comparing the above index with ratings of the employed tool shows that memory of the group under study is relatively average and thus, employees have had a relatively suitable memory and intelligence. Memory capabilities show the mental power of people to some extent. Thus, it can be stated that the employees at the industrial units have a relatively suitable memory capability in terms of the memory power of the group under study and probably via generalizing the results to the target population. This finding probably indicates that the employees at the industrial units have fewer problems in intra-individual damages. The attention and information processing, it should be pointed out that the total mean of the sample group is equal to $M=199.330$. It can be concluded that attention among the employees at the industrial units is at the normal level and from this aspect, intra-individual damages have not been observed.

With regards to visual-structural abilities which were measured via the Bender-Gestalt test, it must be indicated that mean of the subjects under study was equal to $M=25.70$. This illustrates the lack of disorder and damage in visual-structural abilities among the employees. When the differential diagnosis score goes beyond 75, brain lesion is suspected. However, the obtained mean indicates a lack of brain lesions. Regarding motor performance, the results show that mean of motor performance is totally equal to $M=14.48$ that implies a suitable time to perform motor performance on the employed test in this study.

The difference between employees of various ages has been significant in terms of attention and speed of information processing ($p<0.01$, $f=3.448$). The results of the present study are consistent with those of another study (Friedhoff, 1998) regarding that there is a difference between attention and speed of information processing of employees of various ages. Other studies have found similar results in this regard (Carlson, 1999). The results demonstrate that employees in the age range 3-40-year-old have obtained the highest mean in attention and information processing. On the other hand, about the education level, the results show that employees who have had B.A. and higher degrees have the highest mean in attention and information processing. Perhaps, the implicit explanation for this finding is that whatever the



education level of employees at the industrial units is higher, the damages and deficiencies related to attention and concentration are less observed in them. Given that attention and concentration are the most important aspect in the cognitive field of employees, whatever capabilities are higher, the efficiency and effectiveness of employees will be enhanced. Considering this finding, managers should take into account people's education as one of the important factors in employees' efficiency. Moreover, the findings show the importance of evaluation of attention and information processing at the time of employment that can be evaluated as one of the major indexes in employees' selection.

Similarly, the findings reveal that there is a significant correlation among the vast majority of variables. This is true both about the variables representing neuropsychology damages such as attention, memory, visual-structural ability, and motor skills and indicates correlation among demographic variables including age, sex, education level, and type of work unit of employees with pathological variables. This finding is consistent with most previous studies in this field (Peterson, 2003). The obtained results reveal that first, there is a significant relationship among all brain actions under study such as attention, memory, visual-structural ability, and motor skills of employees. Second, age has been effective in the performance of attention, memory, visual-structural ability, and motor

skills. Likewise, people's education level has been effective in their brain performances. In other words, whatever people have higher education levels, their brain and neuropsychological performance such as attention and memory will be enhanced, and conversely, whatever people's education is lower, the mean of performance is low on the above-mentioned cases. Given the obtained findings, researchers emphasize that managers and business owners must consider people's education as one of the important factors in employees' efficiency. In addition, these findings show the importance of evaluation of attention and information processing of memory, visual-structural ability, and motor skills. Therefore, managers should provide appropriate and favorable working conditions for their employees so that they will less be subjected to neuropsychological damages. This is because there is a basic need to invest in neuropsychology studies and develop diagnosis methods and rehabilitation programs for brain injury patients according to the report by the World Health Organization (WHO, 2013). Thus, exploring disorder in the function of the neural system and *cerebral palsy* and damages of employees in the work environments is essential to improve their quality and efficiency in the industries and firms. Finally, managers should receive instructions on employees' security and health in physical and psychological grounds.

References

- Aldrige, J.W. (1994). Neural coding of serial order. *Psychological science*, 4(319), 55-62.
- American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. (2014). *Standard for educational and psychological testing*. Washington, DC: American Educational Research Association.
- Ardila, A. (2013). A new neuropsychology for the XXI century. *Archives of Clinical Neuropsychology*, 28(8), 751-762. Doi:10.1093/arclin/act036.
- Benson, D.F. & et al. (1998). *Aphasia*. Clinical Neuropsychological, 3: New York.
- Benton, B. (2000). Aphasia and lateralization of language. *Cortex*, 22, 71-79.
- Biotteau, M.; Albaret, J. M.; Lelong, S. & Chaix, Y. (2016). Neuropsychological status of French children with developmental dyslexia and/or developmental coordination disorder: Are both necessarily worse than one? *Child Neuropsychology*. 31(5), 1-20.
- Brain, R. & Norris, F.H. (2004). *The remote effects of cancer on the nervous system*. New York: Grune and Stratton.
- Calut, W. (2003). How radical animal activity try to misled human people. *American Psychologist*, 39 (1), 700- 705.
- Carlson, N.R. (1999). *Physiology of behavior*. Allyn & Bacon, A.
- Damasio, A.R & Damasio, H. (1995). Amnesia caused by herpes simplex encephalitis in basal forebrain. *Handbook of neuropsychology*. 3, 101-107.
- Friedhoff, A.J. (1998). *Gilles of Tourette syndrome: Advances in neurology*. (ed. 35). New York: Ravan Press.



- Gaztaniga, M.S., Lary, C. & Magham, G.S. (2003). The role of stress and negative emotion in an occupational crisis. *Journal of Psychology*, 109, 3-15.
- Ghavami, H., Raghibi, M., Tamini, B.K., & Rahimi-Movaghar, V. (2015). Cross-cultural adaptation of executive function tests for assessments of traumatic brain injury patients in southeast Iran: Construct validation. Manuscript under review. (Presented also as a keynote speech at the 6th ICCS, 2015).
- Ghavami, H. (2018). Clinical neuropsychology and brain injury patients in Iran. *The Sina Trauma and Surgery Research Center* at Tehran University of Medical Sciences.
- Goldstein, G. (2010). What is neuropsychology? In E.R. Arzubi, & E. Mambrino (Eds), *A Guide to Neuropsychological Testing for Health Care Professionals* (pp. 3-34). New York, NY: Springer.
- Halpern, D. F. (2012). *Sex Differences in Cognitive Abilities* (4th ed.). NY: Psychology Press.
- Hecaen, R.G. & Perenin, J.R. (2001). The frontal lobes. *Clinical neuropsychology*. 2, 123- 131.
- Hurti, M. & Lindeman, M. (2005). The role of perception and vision ability in work. *Journal of Career Development*, 29(10), 19-33.
- Johnson, S., Strauss, V., Gilmore, C., Jaekel, J., Marlow, N. & Wolke, D. (2016). Learning disabilities among extremely preterm children without neurosensory impairment: Comorbidity, neuropsychological profiles and scholastic outcomes. *Early Human Development*. 103, 69-75.
- Lassonda, M.H. (2000). *The facilitator influence of the corpus callosum on intra-hemispheric processing*. New York.
- Lezak, M.D., Howieson, D.B., Bigler, E.D., & Tranel, D. (2012). *Neuropsychological assessment* (5th ed.) New York, NY: Oxford University Press.
- Lezake, M.D. (2013). *Neuropsychological assessment*. 2, New York.
- Marshal, B. (1998). Form specific visual priming in the right cerebral hemisphere. *Journal of Experimental Psychology*, 18, 49-75.
- Melby-Lervag, M; Redick, T.S.; & Hulme, C. (2016). Working memory training does not improve performance on measures of intelligence or other measures of “Far Transfer”. *Perspectives on Psychological Science*, 11(4), 512–534.
- Miller, D., & Halpern, D. (2014). The new science of cognitive sex differences. *Trends in Cognitive Sciences*, 18 (1), 37-45.
- Moura, O., Simões, M. R., & Pereira, M. (2015). Executive functioning in children with developmental dyslexia. *The Clinical Neuropsychologist*, 28(1), 20-41.
- Muchinsky, P.M. (2005) *Psychology applied to work: An introduction to industrial and organizational psychology*. Wads worth, Thomson learning.
- Peijnenborgh, J. C., Hurks, P. M., Aldenkamp, A. P., Vles, J. S., & Hendriksen, J. G. (2016). Efficacy of working memory training in children and adolescents with learning disabilities: A review study and meta-analysis. *Neuropsychological Rehabilitation*, 26(5-6), 645-672.
- Peterson, A. (2003). Formal organizational initiatives. *Journal of Management*, 33(11), 1234- 1241.
- Reilly, D., Neumann, D. L., Andrews, G. (2016). Sex and sex role differences in specific cognitive abilities. *Intelligence*, 54, 147-158.
- Stringer, A. Y. (2011a). Clinical neuropsychology. In J.S. Kreutzer, J. De Luca, & B. Caplan (Eds.), *Encyclopedia of clinical neuropsychology* (pp. 591-594). New York, NY: Springer.
- Stringer, A. Y. (2011b). Neuropsychology. In J.S. Kreutzer, J. De Luca, & B. Caplan (Eds.), *Encyclopedia of clinical neuropsychology* (pp. 1769-1772). New York, NY: Springer.
- Wall, P. & Egger, M.D. (2000). Formation of new connections in adult rat brains after partial differentiation. *Nature*, 321, 524- 540.
- World Health Organization. (2013). *Global status report on road safety: Supporting a decade of action*. Geneva, Switzerland: WHO Press.