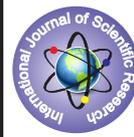


AUDITORY WORKING MEMORY IN INDIVIDUALS WITH ALCOHOL WITHDRAWAL SYNDROME



Medical Science

KEYWORDS:

Nadeem Banu

Intern, JSS institute of Speech and Hearing.

Theaja Kuriakose

Lecturer, JSS institute of Speech and Hearing.

Bhavya M

Grade 1 Clinical Supervisor, JSS institute of Speech and Hearing.

ABSTRACT

Alcohol withdrawal refers to the symptoms that occur after the cessation of alcohol. Most alcoholics have difficulty in problem solving, abstract thinking and memory tasks. In Indian scenario, the studies on effect of alcohol withdrawal on cognitive functioning are scanty. The present aimed to investigate the auditory working memory in subjects who were chronic alcoholics and withdrew from the alcohol consumption. Subjects were divided into two groups. Group 1 consisted of 10 males who were chronic alcoholic and withdrew from the alcohol consumption and Group 2 consisted of 10 non-alcoholic males. Digit ordering task and Paced Auditory Serial Addition Test (PASAT) was administered on the subjects. The results revealed significant differences between the groups. Results showed that individuals with alcohol withdrawal syndrome performed poorer than normal adults. Findings of the study may be useful in educating the public regarding the negative effect of alcoholism in day to day functioning.

Introduction:

Working memory may be defined as the system for the temporary maintenance and manipulation of information, necessary for the performance of such complex cognitive activities as comprehension, learning, and reasoning (Baddeley, 2007). Individuals with impairment in working memory face a lot of difficulties in their day to day living. Alcohol withdrawal refers to a group of symptoms that may occur from suddenly stopping the use of alcohol after chronic or prolonged ingestion. Researchers have shown that there is a link between alcoholism and cognitive deficits. For example, some researchers have observed that cognitive deficits in some alcoholics resemble those seen in normal elderly persons, leading to speculation that alcohol's effect on cognition may be explained as premature aging (Tarter & Edwards, 1986). Parker & Noble (1977) and Parker et al (1983) reported a dose-response relationship between alcohol consumption and diminished scores on certain neuropsychological tests.

For the most severe alcoholics, serious organic cerebral impairment is a common complication, occurring in about 10 percent of patients (Horvath, 1975). The diverse signs of severe brain dysfunction that persist after cessation of alcohol consumption have been conceptualized in terms of two organic mental disorders: alcohol amnesic disorder (memory disorder) and dementia associated with alcoholism (Lishman, 1981; American Psychiatric Association, 1987). Dementia associated with alcoholism consists of global loss of intellectual abilities with impairment in memory function, together with disturbances of abstract thinking, judgment, other higher cortical functions, or personality change (Sullivan, 1990).

Although most alcoholics do not have decreased overall intelligence scores, approximately 45 to 70 percent of these patients have specific deficits in problem solving, abstract thinking, concept shifting, psychomotor performance, and difficult memory tasks (Parsons & Leber, 1981; Eckardt & Martin, 1986; Tabakoff & Petersen, 1988). In addition, structural changes in the brains of alcoholics have been reported (Ron, 1979), as well as reduced cerebral blood flow (Ishikawa et al., 1986) and altered electrical activity (Porjesz & Begleiter, 1981), but there is not yet any clear evidence implicating these changes as the cause of observed cognitive deficits. In Indian scenario, the studies on effect of alcohol withdrawal on auditory working memory are scanty. Hence there is a need to study the impact of alcohol withdrawal on auditory working memory. The present study aimed to investigate the auditory working memory in subjects who were chronic alcoholics and withdrew from the alcohol consumption.

Aim: To compare auditory working memory between normal adults and individuals with alcohol withdrawal syndrome

Objectives

- To compare the performance on digit ordering task between normal adults and individuals with alcohol withdrawal syndrome
- To compare the performance on Paced Auditory Serial Addition Test (PASAT) between normal adults and individuals with alcohol withdrawal syndrome

Method

Subjects: Two groups of subjects in the age range of 30 to 40 years participated in the study. Group 1 consisted of 10 males who were chronic alcoholic and withdrew from the alcohol consumption and Group 2 consisted of 10 non-alcoholic males. None of the subjects had history of speech language and hearing disorders. The subjects in group one were taken from a rehabilitation centre and all were diagnosed as having alcohol withdrawal syndrome by a qualified psychiatrist. Digit ordering task and paced auditory serial addition test was administered on the subjects.

Procedure

Digit ordering task: Digit ordering task involves recalling an increasing number of single digits in the ascending order. The single digit numbers ranging from a series of three to eight numbers were read aloud by the investigator and the subject was required to repeat them back immediately in the ascending numerical order. A score of 1 was given to the subject, when the subject recalled the series of digits correctly in the ascending order and a score of 0 for incorrect or no response.

Paced Auditory Serial Addition Test (PASAT):

A series of sixty single digits were chosen randomly for the preparation of the stimuli. The investigator uttered each number and they were recorded using a digital voice recorder. The numbers were recorded in such a manner that a period of 3 seconds of silence was present between the numbers. These recorded stimuli were transferred to hp Laptop and were saved as .wav file and they were used as stimuli for the study. Stimulus was presented at the most comfortable level of the subject. Each subject was instructed to listen to the series of recorded numbers and add each new digit to the one immediately prior to it. Before the actual testing two to three trials were given to each subject as practice items. Number of correct responses for the test items was noted.

Results and Discussions

The scores obtained on Digit ordering task and Paced Auditory Serial Addition Test (PASAT) in non-alcoholic adults and individuals with alcohol withdrawal syndrome were subjected to statistical analysis using SPSS version 17 software. The mean scores of non-alcoholic

adults for Digit ordering task was 6.9 (SD=0.73) and for PASAT was 24.6 (SD=9.26). However individuals with alcohol withdrawal syndrome obtained poorer scores on both the tasks i.e. 3 (SD=2) and 2.1 (SD= 0.5) for Digit ordering task and PASAT respectively. The mean scores obtained for Digit ordering task and PASAT were compared between the groups using independent sample t test and results revealed significant differences between the groups [$p < 0.05$] in both Digit ordering task and PASAT.

Results showed that individuals with alcohol withdrawal syndrome performed poorer than normal adults. Alcohol withdrawal syndrome includes blackouts, tremors, muscular rigidity, delirium tremens, and seizures (Hillbom et al., 2003; Kosten and O'Connor, 2003). Difficulty forming sentences and performing basic logical calculations have been observed in patients with delirium tremens. Hence poor performance in digit ordering tasks and PASAT tasks could be attributed to the delirium tremens seen in alcohol withdrawal syndromes. Physiologically, Chakravarty and Faingold, (1998) reported that Inferior Colliculus (IC) external nucleus responses were suppressed during both acute alcohol intoxication and alcohol withdrawal. Yang et al., (2001) reported that Spontaneous and acoustically evoked responses are suppressed during acute alcohol intoxication and alcohol withdrawal in the deep layers of the superior colliculus (SC). Evidence from single cell recordings suggest that superior colliculus aids in bottom up aspects of attention (Banich & Compton, 2011). IC has been implicated in attention in some animal studies (Jane et al., 1965; Ryan and Miller, 1977). Hence it can be postulated that suppression of IC and SC in alcohol withdrawal syndromes can cause working memory deficits.

Conclusions

The result of the study indicated better performance for non-alcoholic individuals than that of individuals with alcohol withdrawal syndrome on tasks requiring cognitive demands suggesting poorer cognitive functioning for individuals with alcohol withdrawal syndrome. Findings of the study may be useful in educating the public regarding the negative effect of alcoholism in day to day functioning. Further, rehabilitation centres can use the PASAT and digit ordering tasks to assist in evaluating the effects of different types of interventions on alcohol dependents.

Reference

1. Baddeley, A. (2007) Working Memory: The Interface between Memory and Cognition. *Journal of Cognitive Neuroscience* Vol. 4, No. 3, 281-288.
2. Banich, M. T., & Compton, R. J. (2011). *Cognitive Neuroscience*, 3rd ed. Wadsworth/Cengage.
3. Chakravarty, D.N., & Faingold, C.L. (1998). Comparison of neuronal response patterns in the external and central nuclei of inferior colliculus during ethanol administration and ethanol withdrawal. *Brain Res.* 783: 102-108.
4. Eckardt, M.J. & Martin, P. R. (1986). Clinical assessment of cognition in alcoholism. *Alcoholism: Clinical and Experimental Research* 10(2):123-127.
5. Hillbom, M., Pieninkeroinen, I., & Leone, M. (2003). Seizures in alcohol dependent patients. *CNS drugs*, 17, 1013-1030.
6. Horvath, T.B. (1975). Clinical spectrum and epidemiologic features of alcoholic dementia. In: Rankin, J.G., ed. *Alcohol, Drugs, and Brain Damage*. Toronto: Addiction Research Center, 1-16.
7. Ishikawa, Y., Meyer, J.S., Tanahashi, N., Hata, T., Velez, M., Fann, W.E., Kandula P., Motel, K.F., & Rogers, R.L. (1986). Abstinence improves cerebral perfusion and brain volume in alcoholic neurotoxicity without Wernicke-Korsakoff syndrome. *Journal of Cerebral Blood Flow and Metabolism* 6(1):86-94.
8. Jane, J. A., Masterton, R. B., & Diamond, I. T. (1965). The function of the tectum for attention to auditory stimuli in the cat. *J Comp Neurol* 125: 165-191.
9. Kosten, T.R., & O'Connor, P.G. (2003). Management of drug and alcohol withdrawal. *N Engl Journal Medicine*, 348, 1786-1795.
10. Lishman, W. A. (1981). Cerebral disorder in alcoholism: Syndromes of impairment. *Brain* 104(1):1-20.
11. Parker, E.S. & Noble, E.P. (1977). Alcohol consumption and cognitive functioning in social drinkers. *Journal of Studies on Alcohol* 38(7):1224-1232.
12. Parker, D.A., Parker, E.S., Brody, J.A., & Schoenberg, R. (1983). Alcohol use and cognitive loss among employed men and women. *American Journal of Public Health* 73(5):521-526.
13. Parsons, O.A. & Leber, W.R. (1981). The relationship between cognitive dysfunction and brain damage in alcoholics: Causal, interactive, or epiphenomenal? *Alcoholism: Clinical and Experimental Research* 5:326-343.
14. Parsons, O.A. (1986). Cognitive functioning in sober social drinkers: A review and critique. *Journal of Studies on Alcohol* 47(2):101-114.
15. Porjesz, B. & Begleiter, H. (1981). Human evoked brain potentials and alcohol. *Alcoholism: Clinical and Experimental Research* 5(2):304-317.
16. Ryan, A., & Miller, J. (1977). Effects of behavioral performance on single-unit firing patterns in inferior colliculus of the rhesus monkey. *J Neurophysiol* 40:943-956.
17. Ron, M.A. (1979). Organic psychosyndromes in chronic alcoholics. *British Journal of*

Addiction 74:353-358.

18. Sullivan, E.V., Marsh, L., Mathalon, D.H., Lim, K.O., & Pfefferbaum, A. (1996). Relationship between alcohol withdrawal seizures and temporal lobe white matter volume deficits. *Alcoholism: Clinical and Experimental Research* 20(2):348-354.
19. Tabakoff, B. & Petersen, R.C. (1988) Brain damage and alcoholism. *The Counselor* 6(5):13-16.
20. Tarter, R.E. & Edwards, K.L. (1986). Multifactorial etiology of neuropsychological impairment in alcoholics. *Alcoholism: Clinical and Experimental Research* 10(2):128-135.
21. Yang, L., Long, C., and Faingold, C. L. (2001). Neurons in the deep layer of superior colliculus are a requisite component of the neuronal network for seizures during ethanol withdrawal. *Brain res*, 920, 134-141.