EFFECT OF LONG TERM SMOKING ON POSTURAL STABILITY – AN OBSERVATIONAL STUDY ON CHRONIC SMOKERS BETWEEN THE AGES OF 25 TO 60 YEARS

Physiology

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ABSTRACT

Background Cigarette smoking is one of the largest preventable causes of disease and premature death worldwide. Apart from being a prime contributor to major medical illnesses, and cancer of many organs, it has also been associated with neuromotor deficit. This study evaluates the effect of smoking on the postural stability of chronic smokers between the ages of 25 to 60 years.

Methods 100 healthy subjects were divided in 2 groups: Group A (Smokers) & Group B (Non smokers). Postural stability was assessed using the Sharpened Romberg Test. For statistical analysis, GraphPad InStat DTCG was used. Student's unpaired t-test was applied to compare the results.

Results & Conclusion The performance of smokers was found to be the same as that of non smokers. No group differences were observed on the eyes open trial of the Sharpened Romberg However, on the eyes closed trials, the smokers performed worse than non smokers.

KEYWORDS

INTRODUCTION

Long term smoking has proved to be a prime factor in heart disease, stroke and chronic lung disease, and a contributor to cancer of many organs [1].Tobacco smoking has also been associated with negative effects on several types of neurocognitive functions [2]. Previous cross-sectional studies with cohorts in 30–60 year age range indicated chronic smokers performed more poorly than non-smokers on several measures of neurocognition [3, 4, 5, 6, 7]. Higher pack years was related to lower global cognitive functioning [8].

AIM:

To study the effect of chronic cigarette smoking on the postural stability of smokers and compare with non smokers between the age group of 25-60 years.

METHODOLOGY:

This is an observational, pilot study for an Indian population. 100 age and sex matched participants between the ages of 25 to 60 years were divided in 2 groups; Group A [n=50] consisting of smokers, and Group B [n=50] consisting of non-exposed controls.

INCLUSION AND EXCLUSION CRITERIA:
Group 1 (Smokers)
Inclusion criteria: Should be actively smoking at the time of assessment; smoking at least 10 cigarettes per day for 5 years or more, with no periods of smoking cessation greater than 1month in the 5-years prior to enrollment.

Exclusion criteria:
1. There must not be no history of any;
- Neurologic disorder [e.g., seizure disorder, neurodegenerative disorder, demyelinating disorder etc].
- General medical disorder [e.g., hypertension, myocardial infarction, Diabetes Mellitus etc].
- Psychiatric disorders [mood thought, anxiety, substance/alcohol use disorders].

2. No smoking participant should be engaged in any pharmacological/behavioral smoking nicotine cessation program or used other forms of tobacco at the time of study.

Group 2 (Non Smokers)
Inclusion criteria:
1. Non-smoking participants were required to have smoked less than 20 cigarettes in their lifetime, and
2. There should be no cigarette use in the 10 years prior to study, and
3. There should be no history of use of any other tobacco products.

Exclusion criteria:
1. There should be no history of any;
- Neurologic disorders [e.g., seizure disorder, neurodegenerative disorder, demyelinating disorder etc].
- General medical disorders [e.g., hypertension, myocardial infarction, Diabetes Mellitus etc].
- Psychiatric disorders [mood, thought, anxiety, substance/alcohol use disorders].

Sharpened Romberg Test (SRT): A measure of static postural stability, participants were asked to stand heel-to-toe, with arms crossed across the chest, for 60 seconds. Subjects first completed the task with eyes open and then with eyes closed, and given two trials for each. If a participant was unable to maintain the required position for at least 3 seconds on each of the four trials, the task was discontinued. If they successfully maintained this position for 60 seconds on any of the four trials they were given the maximum score of 60 for any remaining trials. For trials in which the 60 second criteria was not achieved, but the participant was able to maintain the required position for at least 3 seconds, the times were recorded and summed across trials to obtain the total score. Maximum possible score = 240 s.

ANALYSIS:
- Data was presented as mean ± Standard Deviations.
- Statistical analysis between smokers and non smokers was done using Student t-test.
- The results were said to be significant if the value of p obtained is <0.05, moderately significant if p<0.01and highly significant if p<0.001.

OUTCOME:
Table 1. Demographic and clinical measures.

VARIABLE	GROUP A [n= 50] ($\bar{x} \pm$ SD)	GROUP B [n=50] ($\bar{x} \pm$ SD)
Age (in years)	40.72 ± 7.75	39.48 ± 8.75
Cigarettes/day	13.2 ± 4.7	NA
Pack years	14.5 ± 9.5	NA

$\bar{x}$ = Mean
SD = Standard deviation

Pack years: The pack-year is a unit for measuring the amount a person has smoked over a long period of time. It is calculated by multiplying the number of packs of cigarettes smoked per day by the number of years the person has smoked. For example, 1 pack-year is equal to smoking 20 cigarettes (1 pack) per day for 1 year, or 40 cigarettes per day for half a year, and so on [9]. One pack-year is the equivalent of 365.24 packs of cigarettes or 7,305 cigarettes.

It is calculated as:
Pack Years = <u>No. of cigarettes smoked per day</u>   X   no. of years smoked
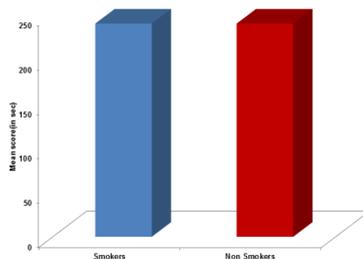
20

Table 2. Domain z-score

Calculating the Standard Score (Z-Score)

Standard Score, $z = \dfrac{X - \mu}{\sigma}$

TERMS:
μ = mean (pronounced 'mu')
X = score
σ = standard deviation (pronounced 'sigma')

GRAPH 1. COMPARISON OF MEAN SCORES IN THE SHARPENED ROMBERG TEST BETWEEN THE TWO GROUPS

	Smokers [n= 50] (mean of z-score) SD	Non smokers [n=50] (mean of z-score) SD
Postural Stability SRT (in seconds)	240	240

In the Sharpened Romberg test, there was no difference observed in the total score between the two groups. All participants were able to complete the task in at least one of the four trials. However in the trials with eyes closed, smokers performed more poorly as compared to non smokers.

DISCUSSION:
Cigarette smoking has been known to have an impact on the neurobiology and studies by Timothy C. Durazzo et al [10] have shown that it affects many aspects of neurocognition, like auditory–verbal, visuospatial learning and memory, cognitive efficiency, executive skills, general intelligence, processing speed and fine motor dexterity.
The majority of research on the neurocognitive consequences of chronic smoking has been conducted with adults greater than 60 years of age and there are relatively a limited number of studies in adults in the 25–60 year old age range [6].

The participants for the study were randomly selected and after applying the inclusion and exclusion criteria, they were divided into two groups, with 50 participants in each group.

Group A- Smokers (cases); Group B- Non smokers (controls)
All the participants were males, and the mean age of both the groups was comparable. The mean age in Group A was 40.72 with a SD of 7.75 years. The mean age in Group B was 39.48 with a SD of 8.75 years.

Sharpened Romberg Test for Postural Stability
A modification of the Classic Romberg test, this is an important clinical sign to assess the integrity of dorsal columns of the spinal cord. The participants of both the groups were given 4 trials each, and the score was calculated by the total duration of time for which the required posture was maintained. Two trials were given with eyes open, and two with eyes closed. If a participant was able to maintain the required posture for 60 seconds on any of the trials, a full score was given for the rest of the trials as well, i.e. a total score of 240 was given.

In this test, the participants of both the groups performed equally well. All participants were able to maintain the required posture for 60 seconds on at least one of the trials, most of them on the eyes open trial, so no group differences were observed on the eyes open trial of the Sharpened Romberg. The mean score in seconds, for both the groups was 240, with no standard deviation However, on the eyes closed trials, the smokers performed worse than non smokers.

This result was different from that obtained in previous studies. Timothy C. Durazzo et al [25] found that smokers were inferior to non smokers, and that the total score of non smokers was higher than smokers by a significant margin.

There are several potential chronic smoking-related biological mechanisms that may work independently, or in concert, to promote the neurocognitive and neurobiological abnormalities demonstrated by smokers [3].

This study has limitations that may influence the generalizability of the findings. Medical, psychiatric and alcohol/substance histories were based on self-report. Additionally, group performances were potentially influenced by factors not directly assessed in this study such as nutrition, exercise, and previous exposure to environmental cigarette smoke or premorbid /genetic predispositions. Also, all of the participants were males, which did not allow for the examination for sex effects.

These results, consistent with the results of several similar studies in the past, point out another perspective of the impact that smoking, even for as short a duration as 5 years can have, on our personal and professional life and ultimately quality of life.

REFERENCES
1. Maritz GS, Mutemwa M. Tobacco smoking: patterns, health consequences for adults, and the long-term health of the offspring. Glob J Health Sci. 2012; 4[4]:62-75.
2. Gibbons LE, Simonen RL, Videman T, Battié MC. Differences in psychomotor reaction time in male monozygotic twins discordant for lifetime cigarette smoking. Percept Mot Skills. 1996; 83[3 Pt 2]:1219-25.
3. Nooyens, A.C., van Gelder, B.M., Verschuren, W.M., 2008. Smoking and cognitive decline among middle-aged men and women: the Doetinchem Cohort Study. Am. J. Public Health 98, 2244–2250.
4. Sabia, S., Marmot, M., Dufouil, C., Singh-Manoux, A., 2008. Smoking history and cognitive function in middle age from the Whitehall II study. Arch. Intern. Med. 168, 1165–1173.
5. Ernst, M., Heishman, S.J., Spurgeon, L., London, E.D., 2001. Smoking history and nicotine effects on cognitive performance. Neuropsychopharmacology 25, 313–319.
6. Richards, M., Jarvis, M.J., Thompson, N., Wadsworth, M.E., 2003. Cigarette smoking and cognitive decline in midlife: evidence from a prospective birth cohort study. Am. J. Public Health 93, 994–998.
7. Iki, M., Ishizaki, H., Aalto, H., Starck, J., Pyykko, I., 1994. Smoking habits and postural stability. Am. J. Otolaryngol. 15, 124–128.
8. Schinka, J.A., Vanderploeg, R.D., Rogish, M., Ordorica, P.I., 2002. Effects of alcohol and cigarette use on cognition in middle-aged adults. J. Int. Neuropsychol. Soc. 8, 683–690.
9. http://www.cancer.gov/dictionary?CdrID=306510 National Cancer Institute definition of pack year
10. Durazzo, T.C., Meyerhoff, D.J., Nixon, S.J., 2010b. Chronic cigarette smoking: implications for neurocognition and brain neurobiology. Int. J. Environ. Res. Public Health 7, 3760–3791.