Indian J Physiol Pharmacol 2014; 58(1) : 104–107

Short Communication

Avoidance of driving in young adults and decreased cognitive functions

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Abstract

Decrease in cognitive function is known to be the main cause of driving cessation in old age but the same has not been clearly established in young adults. Previous research has implicated a variety of psychological factors related to fear of driving in young adults. Present study focuses on the measure of cognitive skills in such individuals who avoid driving in spite of an opportunity and necessity to do so. Cognitive function tests for two domains – speed and attention were performed in young female non drivers and drivers. Our results show a highly significant decrease in cognitive ability ($P<0.05$) in non drivers compared to the drivers. Our study indicates that decreased cognitive functions may be the main cause of cessation of driving seen in small but significant group of population.

Introduction

Driving is a complex highly skilled motor function which almost every individual learns in his/her life. It has become a necessity especially in the present day urban setup. One of the important aims of every adolescent is to learn driving and obtain a valid driving license. The quality of driving – speed, precision & smoothness of driving varies highly among individuals. However there is a small population of individuals, who learn driving, even obtain a license but start avoiding driving much to the inconvenience of themselves and others. Such people prefer not to drive in a given situation and also switch over to alternate mode of transport even though they have every opportunity to drive like availability of vehicle at house, a valid driving license or daily need for travelling.

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(received on January 4, 2013)

Driving behavior is closely linked to non driving life styles and behaviors. Life styles reflecting high rates of risky behaviors, poor impulse control and aggression in non driving contexts predict high risk driving and negative driving outcomes (1). Driving related fear and its impact on behavior & functioning has been studied extensively over the past two decades (2, 3). Much of this literature examines driving activity from the perspective of specific phobia and post traumatic stress disorder. A range of problematic driving behaviors (e.g – disorientation, driving below speed limit, slowing for green lights) have been found in individuals who continue to drive in spite of feeling anxious while driving (4). Increased occurrence of general driving errors has also been noted among anxious drivers (5).

Available literature suggest that fear of driving involves a range of pathologies including specific phobia, PTSD, Panic disorder, agoraphobia, social phobia

and generalized anxiety disorder (6). Majority of the studies done are on individuals who continue to drive in spite of fear to drive and no literature is available in individuals who have stopped driving or totally avoid driving. Also research done so far concentrate mainly on psychological factors involved and not much importance is given to the motor skills per se. Studies done on older individuals have found that driving cessation in older individuals is primarily due to decrease in cognitive functions as a result of aging. However the role of cognitive skills has not been given its due importance in younger individuals who avoid driving. Present study concentrates on the role of cognitive abilities of young individuals who avoid driving & decreased motor skills as the possible cause for avoiding driving.

Materials and Methods

Present study was conducted among the college students of Bangalore city. Study was conducted in females since they are found to have elevated rates of driving anxiety and are more likely to stop driving compared to males (7). A total of 36 non drivers were recruited for the study from various colleges of Bangalore city. An individual was considered as non driver when she was not driving any vehicle even though she had a valid driving license, had accessibility to vehicle at home and also there was a daily need for driving. Of the 36 subjects, 6 were excluded due to various reasons. Three subjects were excluded since they had met with accident and therefore had stopped driving, two subjects had severe life trauma (death of mother recently in one subject and death of brother in an accident in another subject) and one subject was on treatment for psychological problems. Those individuals who did not have a valid driving license and those who had not learnt driving due to non availability of vehicle at home were not considered for the study. 25 female college students who regularly drove two wheelers formed the control group (drivers). Those students who also drove four wheelers were excluded from the study. All the participants were between 18 and 21 years of age. Institutional ethical clearance was obtained prior to the start of the study. Participants' written informed consent was obtained. They were screened for their vision and all of them met the minimum criteria with regard to their vision for obtaining driving license. The participants were then tested for two cognitive domains – Speed and Attention. Speed was tested by Finger tap test (Motor speed) and Digit symbol substitution test (Mental speed). Attention was tested by Color trials (Focused attention) and Digit Vigilance test (Sustained attention). The tests were administered according to the instructions provided in the NIMHANS Neuropsychology battery (8).

Digit symbol substitution test

A sheet containing numbers 1-9 randomly arranged in four rows of 25 squares each was provided to the subject. The subject was made to substitute each number with a symbol using a number-symbol key given on top of the page. The time taken to complete the test formed the score. Digit Symbol Substitution tests the visuomotor coordination, motor persistence, sustained attention and response speed. Rapid information processing is required in order to substitute the symbols accurately and quickly.

Digit vigilance test

In this test a sheet was provided which contained numbers 1 to 9 randomly ordered and placed in rows. There were 30 digits per row and 50 rows on the sheet. The digits were closely packed on the sheet. The subject had to focus on the target digits 6 and 9 amongst other distracter digits and had to cancel the digits as fast as possible without missing the targets or cancelling wrong numbers. Inability to sustain and focus attention levels leads to both increased time to complete the test as well as errors. The time taken to complete the test formed the score.

Color trials test

Color trials test was conducted to test for focused attention. It had two parts. Part I required sustained attention, perceptual tracking and simple sequencing. Part 2 required mental flexibility in addition to the above. In color trials 1 the numbers from 1 to 25 were printed in black on pink (for odd numbers) or yellow circles (for even numbers). The numbers were randomly spread and the subject had to point to successive numbers in ascending order. In color trials 2 the numbers from 2 to 25 were printed twice, once

on pink circles and once on yellow circles. The numbers were randomly spread and the subject had to point to numbers in alternate colours with successive numbers being in ascending order. The time taken to complete the test formed the score.

Finger tap test

The finger tapping test measured the speed with which the index finger of each hand can tap. It consisted of a tapping key mounted on a box. The tapping key was connected to a counter. The subject was asked to tap the key with index finger. Both the hands were tested separately. The subject was given a total of 5 trials lasting 10 seconds each. The average number of taps formed the score.

Statistical analysis

The data was analyzed using student t-test. The difference was considered statistically significant whenever $P \leq 0.05$. SPSS V.11.0 was used for analysis of data.

Results

Results of present study show a significant difference between drivers and non drivers in all the cognitive function tests performed wherein non drivers had a lower cognitive ability when compared with the drivers.

TABLE I: Comparison of Cognitive functions between driver and non driver group.

Parameters	*Drivers*	*Non drivers*	*P-value*
DSST	121.84±9.75	133.73±14.50	0.001
DVT	369.52±75.67	441.67±3.50	0.001
Colour trial 1	43.48±8.83	54.87±12.94	0.001
Colour trial 2	142.24±29.08	167.30±3.106	0.003
Finger tap	47.99±7.22	42.59±9.54	0.024

Data presented are mean±SD. The data was analyzed using students 't' test.

Discussion

Non drivers constitute a very small but significant group of population. Present study indicates that they have increased levels of anxiety compared to the drivers. This is in accordance with previous studies which have shown greater levels of anxiety among individuals who fear driving (9). Female gender has been associated with higher risk of driving cessation (10). Prior data from the Maryland project indicate that female drivers self-regulate and limit their driving more so than male drivers (11).

The role of cognition in driving has been discussed extensively in elderly drivers. Studies have shown that reduced cognitive function is the main cause for cessation of driving in these individuals (12, 13). Recent longitudinal analyses of older adults have highlighted the importance of cognition, visual speed of processing, in particular, to main-tained driving mobility (14). Studies have shown that age, days driven per week, and cognitive speed of processing for a divided attention task, predicted driving cessation above and beyond demographic variables and physical functioning. Research has consistently reported that older adults tend to self-impose limits on their driving in order to compensate for changes in physical or cognitive ability and increase their sense of safety, such as avoiding driving in situations considered more challenging (e.g. at night and in heavy traffic) (15).

As discussed earlier, literature suggests that fear of driving involves a range of pathologies including specific phobia, PTSD, Panic disorder, agoraphobia, social phobia and generalized anxiety disorder (6) and no single specific cause is attributed to this condition. Present study focuses on the cognitive abilities of younger individuals who fear driving and therefore avoid it. Results of the present study show a significant decrease in cognitive ability of non drivers compared to the drivers. These results are similar to the findings seen in older individuals who stop driving. Similar results seen in elderly people who stop driving and young non drivers indicate that the primary cause for fear/cessation of driving is a diminished cognitive ability as seen in both the populations. A variety of other causes attributed to fear of driving in previous studies may result as a consequence of decreased cognitive ability. This is evident from the fact that decreased cognitive function is seen in all subjects unlike other suggested causes which are seen in few individuals only.

Conclusion

Our study indicates that the primary cause for cessation of driving in young individuals is decreased cognitive ability and other reasons attributed in various other studies may be additional factors contributing to a reduction in cognitive function.

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