LETTERS TO THE EDITOR

Neurobehavioral Study on Accident-prone Motor-vehicle Drivers in China

Key words: Motor vehicle accident—Accident-proneness—Reaction time—Neurobehavioral test—Case-control study—Discriminant function analysis

In our previous studies,1,2,3) it was shown that the mortality from motor vehicle accident is affected by various psychosocial factors such as social mobility, high income, aging population, occupation, type of automobiles and climate. In this study, we aim at exploring neurobehavioral predictors which could distinguish the traffic accident-prone drivers from safe drivers; eleven factors are examined by univariate and discriminant function analyses in 31 traffic accident-prone drivers and the same number of matched safe drivers, who worked for three traffic companies in Hefei city of China.

The accident-prone drivers examined were 31 registered drivers aged 18–55 years (24 males and 7 females), who were selected from 73 drivers who caused more than three traffic accidents which had been registered in the records of 2,723 traffic accidents by the Traffic Police Department of Hefei City (population 881,400, 1982) in China during the 1980–84 period. For the remaining 42 accident-prone drivers, control subjects could not be found under the strict matching conditions described below; therefore those drivers were excluded from a study population. The accident-prone drivers (cases) worked for three traffic companies as either long- or short-distance drivers, freight transporters, or urban transportation workers. They operated vans (9 cases), buses (18 cases), or tricars (4 cases). Their education levels were primary school in 5 persons, junior high school in 16 persons and senior high school in 10 persons.

Control subjects were 31 registered drivers employed by the same companies; they had never caused a traffic accident. They were individually matched to cases by sex, age (five-year span), marital status, education level, driving experience, driving training, kind of vehicle and traveling route. There were no significant differences in visual acuity (Landort’s ring), hearing ability (audiometer), visual field (Confrontation test), arm length and leg length between the

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cases and the controls ($p > 0.05$).

Neither the cases nor the controls had ever suffered from any neuropsychiatric illness or head injury. None had ingested drugs or alcohol during 12-hour periods prior to testing.

The cases and the controls underwent psychological testing every workday morning for two weeks. Tests were conducted in a uniform sequence in our laboratory, and examiners were blind as to the case or control status of each subject. Examiners were trained by a psychologist over a period of six weeks both with didactic sessions and practice with volunteers.

The following tests were administered:

Revised Wechsler Adult Intelligence Scale (WAIS-R): Ten subtests, except vocabulary, of the Chinese edition of the WAIS-R were administered and verbal and performance IQs were calculated from subtests scores.4

Eysenck Personality Questionnaire (EPQ): Extroversion (E point), neuroticism (N point), psychoticism (P point) and lie (L point) were determined by the Chinese condition.5

Simple reaction time (SRT): Either a red, green or white lamp was lit at random intervals and in changing order. Subjects were asked to push a button as fast as possible when any one of three lamps was lit (visual SRT) or when a buzzer sounded (acoustic SRT). Measurement was reported 10 times for five minutes with random time intervals between stimuli. The average reaction time was calculated.

Choice reaction time test (CRT): Subjects were instructed to push a button as rapidly as possible only when the lamp designated as the “target” was lit (visual CRT). Similarly, in the visual-acoustic CRT the measurement was performed using one of the three lamps and the buzzer sound given simultaneously as a “target” stimulus. Reaction time to the “target” stimulus and the number of errors, i.e. responses to the stimulus other than the “target”, were each recorded. Both operating procedure and calculation of average reaction time were the same as in the SRT.

The paired-sample t test was conducted to compare the 11 factors between accident-prone drivers and the matched controls. Using 6 significant factors selected from the all 11 factors, the linear discriminant function analysis was performed by the stepwise method to identify accident-prone drivers. The 31 accident-prone drivers and the 31 controls were discriminated by the discriminant function model introduced.6

The values for psychoticism, extroversion, neuroticism and CRT-error were significantly higher in the cases than in the controls; the value for performance IQ was significantly lower in the cases than in the controls (Table 1). The
A linear discriminant function introduced was \[ Z = -0.070X_1 + 0.099X_2 + 1.269 + 1.343X_3 - 0.595 \], in which \( X_1 \) was performance IQ; \( X_2 \), extroversion; \( X_3 \), number of errors in visual CRT; \( X_4 \), number of errors in visual-acoustic CRT. The standardized canonical discriminant function coefficient was 0.780 for performance IQ, 0.860 for extroversion in EPQ, 0.798 for number of errors in visual CRT, 1.080 for number of errors in visual-acoustic CRT.
The values for 6 variables (i.e., performance IQ, psychoticism, extroversion, neuroticism, visual CRT and visual-acoustic CRT) were significantly different between accident-prone drivers and control drivers in the univariate analysis. This result suggests that accident-prone drivers possess lower performance IQ, higher errors of reaction, and higher tendency of psychoticism, extroversion or neuroticism.

Four variables were selected by the stepwise discriminant analysis (p<0.01). The standardized canonical discriminant coefficients for these 4 variables indicated that errors in visual-acoustic CRT was the most important predictor of accident-prone driver, followed by extroversion, errors in visual CRT, and performance IQ. It is thus suggested that the most marked traits of accident-prone drivers is higher errors of reaction. However, owing to the small number of subjects tested in this study and to the complex nature of traffic accidents, further studies are needed.

REFERENCES

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