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ScienceDirect

Procedia - Social and Behavioral Sciences 138 (2014) 11 – 21

Procedia Social and Behavioral Sciences

The 9th International Conference on Traffic & Transportation Studies (ICTTS'2014)

Study on Objective Evaluation Method of Taxi Driver Safety Consciousness

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Abstract

This study aims to conduct researches on the correlation between driver safety consciousness and several indices, and propose an objective evaluation criterion, which can covert immeasurable safety consciousness to measurable objective indices. A number of taxi drivers were selected as study subjects, and their safety consciousness was evaluated by using fuzzy comprehensive evaluation method. Combined with the number of accidents these drivers involve in a year, the correlation between driver safety consciousness and accident numbers was investigated. And combined with GPS surveillance data, the correlation between driver safety consciousness and the mean speed, speed dispersion, and max vehicle speed was analyzed. Then the identification model between max vehicle speed and driver safety consciousness level was established. The results show that driver safety consciousness level is correlated with accident numbers, and not correlated with the mean speed, correlated with vehicle speed dispersion, and highly correlated with max vehicle speed. According to fuzzy identification model, max vehicle speed obtained from statistics circle can be used to evaluate and categorize driver safety consciousness. Verification shows that the driver safety consciousness evaluation model, which based on the max vehicle speed, is effective. It can overcome the demerits of scale evaluation, effectively identify driver safety consciousness level, and provide guidance for driver safety education, management and training.

Peer-review under responsibility of Beijing Jiaotong University(BJU), Systems Engineering Society of China (SESC).

Keywords: Driver; Driver safety consciousness; Accidents; Max speed value; Objective evaluation

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doi:10.1016/j.sbspro.2014.07.176

1. Introduction

Accident causation theory has been one of the hotspots in the study of traffic circles. Most relevant studies showed that the vast majority of traffic accidents were related with human factors. A study from Indiana University showed that drivers were relevant to 90.3% of traffic accidents; another British study showed that 95.0% traffic accidents were relevant to road users; and a study from Norwegian University of Science and Technology showed that 95.0% accidents were caused by human reasons.

Taxis played an important role in urban transportation. However, to save time and increase income, taxi drivers often ran fast on urban roads. Because of the high vehicle density on urban roads and the fact that drivers' income depending on the passenger numbers, their driving behaviors tended to be insecure, in particular under the circumstance of ambiguous legal terms, such as running the yellow light, arbitrary lane change and fast start-stop. In fact, taxi drivers had good driving skills and rich driving experience on urban roads. Compared to other traffic participants, they had higher safety skills in driving. But traffic accident statistics showed that 10.7% accidents were relevant to taxis. To improve taxi operation safety, management companies generally equipped taxis with GPS, which was an effective surveillance means. Why did such few numbers of taxis with high driving skills drivers account for so high percentages of traffic accidents? The question confused many managers. Studies showed that in a traffic system made up by pedestrian, vehicle and road, driver played an extraordinary role and was the key of operation safety.

2. Literature review

Researches on the relation between driver safety consciousness and accidents first appeared in the field of industrial manufacture. And the role of driver safety consciousness in traffic safety started later. A study in Connecticut State, US, showed that among 30,000 traffic accidents in 6 years, 3.9% drivers accounted for 36.4% accidents. In a Japanese taxi company, 25% drivers contributed to 50% of total traffic accidents, and the drivers who had never had any accidents were only 14%. A study in Connecticut State, US, showed that among 30,000 traffic accidents in 6 years, 3.9% drivers accounted for 36.4% accidents. People inclined to higher traffic possibility had the following characteristics: aggressive, irresponsible and socially maladjusted (Liu et al., 2005). An Australia psychologist performed an investigation on the causes of traffic accidents, and he found that driver safety consciousness played an important role in accident occurrence (Liu, 1998). Drivers with aggressive and risky driving behaviors were more likely to have traffic accidents (Zhuang et al., 2005; Naatanen and Sumrnala, 1976). By analyzing 1447 drivers with deadly traffic accidents, Robertson and Baker (1975) found that these drivers had higher traffic violations compared to the drivers without major traffic accidents in two years, and their traffic violations were significantly higher than the average level (Robertson and Baker, 1975). Sumer (2003) pointed that factors related to driving style, risk attitudes, behavioral factors and some temporary factors could directly lead to accidents. Lajunen (1997) pointed that general factors of driver safety consciousness should include cultural factors, sociodemographic factors and relatively stable personal factors (Sumer, 2003). Driving-relevant attitudes and confidence also had great impacts on driving safety (Elander et al., 1993). An investigation on traffic safety consciousness of rural residents in four counties of Guangxi Province, China, showed that the level of education and the financial situation were related to drivers' safety consciousness (Xie et al., 2005). From safety consciousness measurement and evaluation on taxi drivers, Zhang suggested that taxi drivers should be managed according to their safety consciousness level (Zhang, 2007). A study on the relationship between traffic driver safety consciousness and safety behaviors showed that they were inseparable (Rong, 2008). DBQ questionnaire had been constructed to investigate the relation between traffic behavior and traffic accident since 1990 (Reason et al., 1990). And another DBQ factor, named as slips and lapses, was identified in 1995 (Parker et al., 1995). A bus driver driving behavior prediction questionnaire was constructed for 18 projects in 2009 (Sun, 2009). Ulleberg and Rundmo (2002, 2003) put forward a new risk attitude scale in consideration of traffic violation attitude, accident reason and accident risk. Assum designed a questionnaire with 56 questions containing most of road safety questions (Assum, 1997). Through the questionnaire, Iversen studied the relation between the traffic safety attitude and the risk traffic behavior (Iversen, 2004). YiImaz and Celik (2004) found that drivers' risk attitude was related to many factors, including complying with the speed limit, the attention on traffic accidents, adventurous tendency during driving