



Traffic sign perception among Jordanian drivers: An evaluation study

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ABSTRACT

Highway traffic control signs are commonly used to regulate, warn, and guide road users. It is widely believed that traffic signs comprehension has a tremendous effect on traffic safety. The primary objective of this research is to investigate the relationship between drivers' personal characteristics and their familiarity/comprehensibility with a thirty nine posted traffic signs. To this end, 400 surveys were distributed among Jordanian drivers. The results showed that the familiarity level of traffic signs is higher than comprehensibility level. On average 79%, 77%, and 83% of the drivers were familiar with regulatory, warning, and guidance traffic signs, respectively. On the other hand, only 61%, 66%, and 75% of the drivers comprehended regulatory, warning, and guidance traffic signs, respectively. "Narrow Bridge", "Divided Roadway a Head", "Dead End" and "Highway" received the lowest comprehensibility scores among drivers. Participants with commercial driving license had higher familiarity and comprehensibility levels than those with regular license. Drivers with a driving experience more than 11 years show more familiarity and comprehensibility for traffic signs than those with less than 2 years driving experience. The number of traffic violations did not have a significant effect on traffic signs familiarity and comprehensibility.

1. Introduction

Traffic accidents are of primary concern to transportation agencies. Worldwide, thousands of peoples are killed and injured on roads each day. In spite of seriousness of road traffic accidents, successful prevention measures can be established by the strong commitment of stakeholders. In developing countries, numbers of road traffic accidents and their severity levels are unprecedented compared to developed countries. This is due to the rapid and unplanned urbanization, inadequate transportation infrastructure, and the lack of a legal regulatory framework in developing countries. Statistics in Jordan showed that 102,441 road traffic accidents had occurred during 2014 and resulted with a total of 688 deaths and 14,790 injuries (JTI, 2015). The percentage of traffic accidents that occur due to in compliant with regulatory traffic signs was found to be about 2.2% (JTI, 2015). Therefore, there is a need to study the relationship between drivers' personal characteristics and their familiarity/comprehensibility with traffic signs. Several research efforts had been made to investigate the main contributing factors to traffic signs comprehension level.

Ben-Bassat and Shinar (2015) studied the impact of drivers' age on their comprehension of traffic signs. Traffic signs with and without context were examined. Also, response time for traffic signs was investigated. The results showed that younger drivers performed significantly

better than older drivers for both accuracy and response time. Also, they found that the presentation mode (with or without context) did not affect the traffic sign comprehension. However, the presence of context did increase the time it took drivers to comprehend the sign meaning.

Shinar and Vogelzang (2013) examined the effect of using traffic signs with different display conditions (i.e., signs with only symbolic display, sign with text only, sign with both text and symbolic) on drivers' comprehension and response time. They found that the display condition of traffic signs had an impact on drivers' comprehension and response time. Adding text along with symbols had improved the drivers' comprehension level and reduced the time it takes to comprehend the signs.

Al-Madani and Al-Janahi (2002a) studied the impact of drivers' personal characteristics on their comprehension of 28 traffic signs used in Bahrain, Kuwait, Oman, Qatar and United Arab Emirates. The personal attributes considered were: experience, accidents per experience ratio, age, marital status, gender, nationality, educational background and monthly income. The results showed a lack of traffic signs comprehension by drivers. Only 56% of the posted traffic signs were comprehended. Nationality and gender of drivers were found to have an impact on traffic sign comprehension, whereas age, marital status, experience and accident rates had no effect on driver comprehension of signs.

Kirmiziloglu and Tuydes-Yaman (2012) assessed the drivers'

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comprehensibility of 30 selected traffic signs, which are commonly used and critical for traffic safety in the City of Ankara, Turkey. A sample of 1478 paper-based surveys was distributed. The results showed that the majority of traffic signs were not well known by drivers. Out of 30 signs, only 12 were correctly identified by 70% or more of the participants.

Dissanayake and Lu (2001) evaluated the traffic control device comprehension by international and domestic drivers in the United States. They found that domestic drivers had a better understanding of traffic signs, markings, and traffic signal indications than international drivers.

Al-Madani and Al-Janahi (2002b) investigated the role of age, marital status, gender, nationality, educational background and monthly income on drivers' comprehension of traffic signs. A total of 28 symbolic warning and regulatory signs were investigated. Results showed substantial problems with the comprehension level among drivers regarding traffic signs. The percentage of drivers who correctly identified regulatory and warning signs was around 55 and 56%, respectively. Age, gender, education and income played a major role in determining drivers' comprehension of signs, whereas marital status showed no significant effect. Drivers who are young, female, with low education levels or low income understood signs significantly worse than drivers who are old, male, with high education levels or high income. Drivers from Europe and USA were significantly better than Asian and Arab drivers. These findings were believed to be important for road signs' designers in terms of international applications.

Al-Madani (2000) studied the relationship between drivers' understanding of posted signs in Bahrain, Qatar and United Arab Emirates (UAE) and some of their safety related characteristics. These characteristics were driving experience, accident involvement, experience per accident, citations received in the last 3 years on speed limit violations, and seat belt usage. A total of 28 posted signs were investigated. These were categorized as warning and regulatory. A questionnaire was distributed to 6000 drivers in the three countries. Over than 2820 (47%) responded back. Comprehension of posted signs for drivers with many years of driving experience proved to be significantly better than those with less experience. Furthermore, the seatbelt usage is also found to increase with the increase in the understanding of posted signs.

Liu and Ho (2012) studied the effect of age and symbol design features on passengers' comprehension of symbols and the performance of these symbols with regard to route guidance. Results showed that older adults experienced greater difficulty in understanding particular symbols as compared to younger adults. Familiarity was the feature that most highly correlated with comprehension of symbols while accuracy of semantic depiction was the best predictor of behavior in following routes.

Ng and Chan (2008) investigated the effect of driver factors and sign design features on the comprehensibility of traffic signs. The results showed that number of years with driving license and education level were significant predictors in sign comprehensibility. Unexpectedly, the driver factors of age group, years of active driving, hours of driving, last time driving, driving frequency, and non-local driving experience had no effect on comprehension performance.

Shinar et al. (2003) evaluated the comprehension levels of highway traffic sign symbols used in different countries; to identify the underlying rules that affect comprehension levels, and recommend approaches to deal with the problem. They compared comprehension levels of different traffic sign symbols in four countries with moderate to high levels of motorization, namely: Canada, Finland, Israel, and Poland. Five different driver populations were sampled in each country, namely: novice drivers, college students, tourists, problematic drivers, and elderly drivers. There was a significant difference in comprehension among specific sign messages, different countries, and different driver populations. Signs were comprehended best when they were consistent with the general ergonomic guidelines for display design as they relate to spatial compatibility, conceptual compatibility, physical representation, familiarity, and standardization. Illustrations of compliance and violations of these principles were presented, and their implication for traffic safety was also

discussed.

In a study conducted by Dewar et al. (2001), the level of comprehension of virtually all symbol highway signs in the U.S. Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) among young, middle-aged, and elderly drivers was evaluated. Results of this study showed that elderly drivers had a weak understanding of traffic sign symbols used on U.S. roads.

2. Research methodology

In this paper, the relationship between drivers' personal characteristics and their comprehension and familiarity with traffic signs were investigated. Three types of traffic signs - regulatory, guidance, and warning signs - were studied. Drivers' personal characteristics considered were: age, marital status, gender, license category, educational background, monthly income, driving experience, and number of traffic violations. Drivers' familiarity and comprehension of traffic signs was evaluated according to their responses to the survey questions. According to the American National Standard Institute (ANSI Z535.3), 85% correct response criterion was adopted for traffic signs comprehensibility and familiarity (Wolff and Wogalter, 1998). In this study, traffic signs

Table 1
Regulatory, warning and guidance traffic signs investigated in this study.

Regulatory Traffic Sign					
					
					
Warning Traffic Sign					
					
					
Warning Traffic Sign					
Guidance Traffic Sign					
					

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