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Comprehension of Posted Highway Traffic Signs in Iraq

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Abstract
Level of posted highway traffic signs (HTSs) comprehension by drivers is used to investigate the effectiveness of the posted HTSs in Iraq. Twenty four HTSs, different characteristics of drivers, and survey with questions of short answer and multiple-choice is selected for this aim. The study results show that there is an increase in the driver comprehension process of HTSs with the increasing of his level of education, level of urbanization of his residence and driving daily practice. Inverse relation occurred with the increasing of driver number of accidents. The results of this research show that it is very important to modify some of the HTSs so as to be easy for comprehending by making it more legible and more appropriateness, also it is recommended to educate drivers to raise there ability to understand the meanings of all the HTSs.

Keywords: Traffic signs, accidents, comprehension, level of education.

قابلية فهم سائقي المركبات للعلامات المرورية المعلقة في العراق

الخلاصة
تم استعمال مستوى فهم سائقي المركبات لمعنى العلامات المرورية المعلقة لغرض تحديد كفاءة أداء هذه العلامات.لأجل هذا الغرض تم استعمال 24 علامة مرورية،استبيان لعدة خصائص مختلفة للسائق، و أسئلة من أنواع متعدد الخيارات و الإجابات القصيرة. أظهرت نتائج البحث تباين في مستوى قابلية السائق لفهم العلامات المرورية يرتفع مع ارتفاع كل من المستوى التعليمي، درجة تحضر منطقة السكن لسائق المركبة، و الممارسة لعملية السياقة. تنعكس هذه العلاقة حيث ينخفض مستوى فهم سائقي المركبات لمعنى العلامات المرورية مع ازدياد عدد الحوادث التي ارتكبها. أظهرت نتائج الدراسة انه من المهم جدا تطوير تصميم بعض العلامات الحالية لتكون أكثر وضوحا و تناسبا مع المعنى المراد منها. مع التوصية بتطوير العلامات المرورية لتكون أسهل فهما ، بجعلها أكثر وضوحا وتناسبا مع المفهوم المراد منها. كذلك التوصية بتثقيف سائقي المركبات لرفع قدراتهم على فهم المعنى المراد من جميع العلامات المرورية.
الكلمات الدالة: العلامات المرورية، الحوادث، قابلية الفهم، مستوى التعليم.

Abbreviations
HTSs : Highway traffic signs
HDM : Highway design manual
MUTCD : Manual on uniform traffic control devices

Introduction

A traffic sign is a devise mounted on a fixed or portable support , whereby a specific message is conveyed by means of wards or symbols officially erected

for the purpose of regulating, warning or guiding traffic[1].

The main purpose of highway traffic signs is to aid the safe and orderly movement of traffic. Signs are needed to give information about highway routs, direction, destinations and point of interest. They are needed to give information special regulations which apply only at specific places or at specific times. They are essential to inform drivers about hazards which are not self-evident [2].

Sign comprehension is critical for effective driving, responses to warnings, and way-finding. Signs that are poorly comprehended increase accident risk and may compromise independence [3].

According to Highway Design Manual (1982) , The effectiveness of sign depends mainly on the following factors:

1) The attention value of the sign.
2) The legibility of the sign.
3) The ease of comprehending the sign message.
4) The appropriateness of the sign message.

Many studies have shown that there are many signs that are confusing to drivers, not easily understood and, sometimes, give more than one meaning. The increased number of traffic control devices causes more confusion and misunderstanding of these devices, and this might increase the number of traffic accidents [4].

This paper will investigate the efficiency of selected traffic signs in Iraq through measuring their comprehension by the driver population based on a survey form distributed to a sample of 1750 persons representing various demographic and socio-economic groups in Iraq. The survey form consisted of 24 selected traffic signs of different types (warning, regulatory, and guide signs) taken from the Highway Design Manual (HDM) of the State Organization of Roads & Bridges in Iraq

Literature Review

Al-Omari et. Al (2001) surveyed of total of 1017 persons with different socio-demographic characteristics to measure their level of comprehension of 30 HTSs using multiple-choice type of questions. Comprehension level arranged from 15.5 to 96.6 %, it was 58% for all survey participants. The worst comprehension level of 15.5% goes to uneven road sign. Numerous signs were confused with other signs [5].

Al-Madani and Al-Janahi (2002) surveyed the drivers understanding of HTSs in five different countries. For this purposes 28 pictures of HTSs were presented to 4774 driver in each of the following countries: United Arab Emarates, Kuwait, Qatar, Oman, and Bahrain. The questions were of multiple-choice type. The characteristics considered include: experience, accident ratio, age, marital status, sex type, nationality, education, and income. The level of comprehension was 56% and related with education, income, and nationality [4].

Another study was conducted by Shinar et. Al. (1999) they present 31 pictures of HTSs to drivers in four countries to evaluate their understandings of the HTSs, the characteristics considered are: age, education, nationality, job, and year of licensed. They found that older drivers performed the worst [6].

Susan et. Al tests the HTSs comprehension using paper and pencil tests with line drawings of signs and uncontrolled viewing time of the test signs. This study compares these types of tests to dynamic tests using un interaction driving simulator. Multiple-choice tests concerning HTSs

comprehension were administrated to five groups of Texas drivers following exposure, a video of "drive through" from the simulator, or driving in the simulator itself. Results show distinct differences between the presentation media. For signs with fine detail and small text, the video and driving simulator conditions produced more incorrect responses than the paper-and-pencil test [7].

Dick et. Al (2000) studied the change in comprehension level when using electronic signs instead of painted signs. 60 standard HTSs and their electronic counterparts where shown to 127 subjects. They found that many of the subjects preferred the painted signs to the electronic signs [8].

Methodology

The survey instrument was developed so as to cover a wide range of signs and also represents the driver population in Iraq. The process involved selecting the HTSs to be included in the survey, developing the survey format, and choosing a sampling plan that covers all the possible demographic and socioeconomic groups.

Selection of HTSs

The HTSs selection process started by choosing 24 signs, distributed as follows: 8 warning signs, 8 regulatory signs and 8 guide signs as shown in figure (1).

Survey Format

The questionnaire involved short-answer and multiple-choice questions. The short-answer questions were designed to identify drivers' characteristics and the multiple-choice questions evaluated drivers' comprehension of posted traffic signs. The multiple choice format was adopted instead of the open ended format because it takes less time to answer the questions which encourages more people to cooperate and participate. On other hand the survey forms were presented to the drivers showing the signs as color images without the actual driving environment that will equalize its providing some help to the participants in knowing the correct answers, or even guessing or deducing the correct responses from the given choices. There were four multiple-choice responses for each traffic sign; one correct response, two incorrect responses, and a not sure response.

Sampling Plan

1) Age. The participants ages were divided into 5 categories: from 18 to 23 years old, 24 to 30, 31 to 40, 41 to 50, and 51 and older.
2) Gender. The participants were divided into: mail, and female.
3) Education. The participants were divided into: illiterates and primary school graduates, secondary school graduates, colleges graduates, MS graduates, and Ph.D. graduates.
4) Type of vehicle driven; private car, taxi, bus, or truck.
5) Practice of driving; daily or non-daily driving.
6) Area type for residence; urban, suburban, or rural.
7) Involvement in previous accidents: 0, 1, 2, 3+ accidents.

Data Sources

Survey stations were established for distributing the survey forms. The locations were selected such that they have a large concentration of people such as shopping centers, governmental offices, and hospitals. The survey form was distributed, as randomly as possible to 1750 persons covering most of the governorates of Iraq so as to get

representative results for the whole population.

Results and Discussion

Level of comprehension of all 24 posted HTSs included in this research are shown in figure (2), it was 53% for all survey participants. The effect of driver characteristics on comprehension level of posted HTSs in this research is discussed due to:

1-Age

Comprehension level for the age categories (a) (18-25), (b) (26-37), (c) (38-49), and (d) 50 years and older were 59.9, 57.3, 53.6, and 43.1 % respectively. It can be seen that the youngest drivers (18-25) had lowest level of comprehension. Their comprehension level decrease as they become older. The downward trend continues with age to the lowest level of comprehension at the older drivers (50 years and older). Results are shown in figure (3).

2-Marital status

The comprehension level for the marital status categories married, and single were 52*.8, and 53*.9 % respectively. It can be seen (as shown in figure 4) that marital status had non-significant affecting the comprehension level of signs.

3-Education

The education level had significant effect on comprehension level of signs. The category of Ms. and PhD. graduates got the highest level of comprehension. Comprehension level increases as the education level increases. Comprehension level for the education categories (a) illiterates and primary school, (b) secondary school, (c) college, and (d) MS. And PhD. Graduates were 42.3, 51.6, 64.3, and 69.6 % respectively, as in figure 3.

4- Vehicle type

Type of vehicle driven (a) private car, (b) taxi, and (c) bus and truck, had comprehension levels 56.9, 47.3, and 44.7 % respectively. Figure 5 shows that it is very clear that drivers of private car have high significant comprehension levels than drivers of taxi, bus and truck. This is probably due to the fact that most drivers of taxes, buses and trucks had low education levels.

5-Driving practice

Driving practice had an influence on the drivers comprehension levels. As shown in figure (4) comprehension level at (a) practice driving on daily based had 55.6 % while it was 46.7 % at (b) drivers who hadn't practice driving daily.

6- Area type of residence

Comprehension level based on type of residence area (a) urban, (b) suburban, and (c) rural area was 57.4, 48.9, and 38.2% respectively. The effect of drivers area type of residence on their comprehension level is very clear and can be explained by the fact that drivers who live in urban areas are more exposed to different types and frequencies of HTSs. Also, that is because of their higher education level compared to drivers who are living in suburban and rural areas. The same thing applies to drivers who live in suburban when compared with drivers living in rural areas. Results are shown in figure (5).

7- Involvement in previous accidents

The results showed that as the number of accidents increase (0, 1, 2, and 3 and above); the comprehension level decreases (56.2, 52.9, 44.0, and 40.3) % respectively. Figure (3) shows this influence which explains the importance of comprehension of HTSs on people life.

8-Gender

The comprehension level of HTSs-in general- was 53.1, and 54.4 % for males and females respectively. As shown in figure (4) females had comprehension

level slightly higher than males, this may be attributed to the fact that most female drivers had higher education level. Figure (5), shows the level of comprehension for males and females with respect to education level for each. As it was expected, comprehension level for males is higher than for females at the same education level. Comprehension level at secondary schools, colleges, and M.S. and PhD graduates for male and females was 53.4, 46.9 %, 65.3, 56.4 %, and 71.6, 58.7 % respectively.

9-Posted HTSs for all driver categories

Comprehension for all the 24 HTSs was 53 %, the "priority road" sign had the lowest level of comprehension 17.2 %, while "ahead or left" sign had the highest level of comprehension 93.9 %. Many signs that had lower level of comprehension such as fallen rocks, uneven road, and two ways lane sign, that is because of its rare usage on the roads in Iraqi, and because of its non streamlined design.

Misunderstanding occurred with "uneven road" was due to its confusing the drivers who thought that it means is "ridge" sign due to the very close similarity between these two signs. Similar misunderstanding found with other signs such as; "express beginning" sign as "bridge a head" sign and hotel "sign as" hospital sign. Figure (7) shows the very close similarity between "uneven road" and "ridge" signs, and between "hotel" and "hospital" signs.

Conclusions and Recommendations

This research found that the whole comprehension level for Iraqi drivers was low. That is -in general- connecting with the efficiency level of education. It is found that numerous signs were confused with other signs. "Uneven road", "Beginning of express way", and "Hotel" signs were the most confusing to respondents. "Ahead or left" sign was the most understood sign. Followed by "no horning", and "bends" signs. Minimum comprehension level was at drivers with low education level "rural" residence area type, "3 and more" accidents, and "illiterates and primary school graduates" education level. On the other hand the group of "PhD and MS graduates" which respect the higher education level, showed the best comprehension level followed by "college graduates", and "(18-25) years old"

It is appeared that comprehension level is directly proportional to education level, urbanization level of the residence area, and the rate of driving practice: and inversely proportional to age, and number of accidents.

Marital status had non significant effect on the comprehension level. Males had higher comprehension level than females at the same education level. Drivers who drive private car had higher comprehension level compared to other types of vehicles.

The significant effect of the drivers education level on their comprehension level was very clear. It is appeared in many categories addition to education level: such as area residence type, and driving vehicle type.

It is recommended that authorities devote special effort to improve drivers comprehension of HTSs. Signs that are confusing drivers should be redesigned or modified so as to be easy for comprehension by making it more legible and more appropriate. Education about traffic engineering specially traffic signs should be initiated at schools, institutes, and universities. Education programs must be used for drivers specially: females, illiterates and primary school graduates, and old kind of them; so as to get better understand of the meaning of HTSs.

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1 Railway crossing	2 Animals	3 Uneven road	4 ridge
			
5 School Area	6 Two ways lane	7 Fallen rocks	8 Bends
			
9 No horning	10 Maximum speed	11 No trucks allowed	12 Maximum hight
			
13 No over taking	14 Maximum load	15 Ahead or left way	16 Roundabout
			
17 Closed road	18 Park	19 Hotel	20 Hospital
			
21 Pedestrian crossing	22 Express beginning	23 Camp	24 Priority road

Figure (1) Highway traffic signs used in the study (MUTCD, 2009).

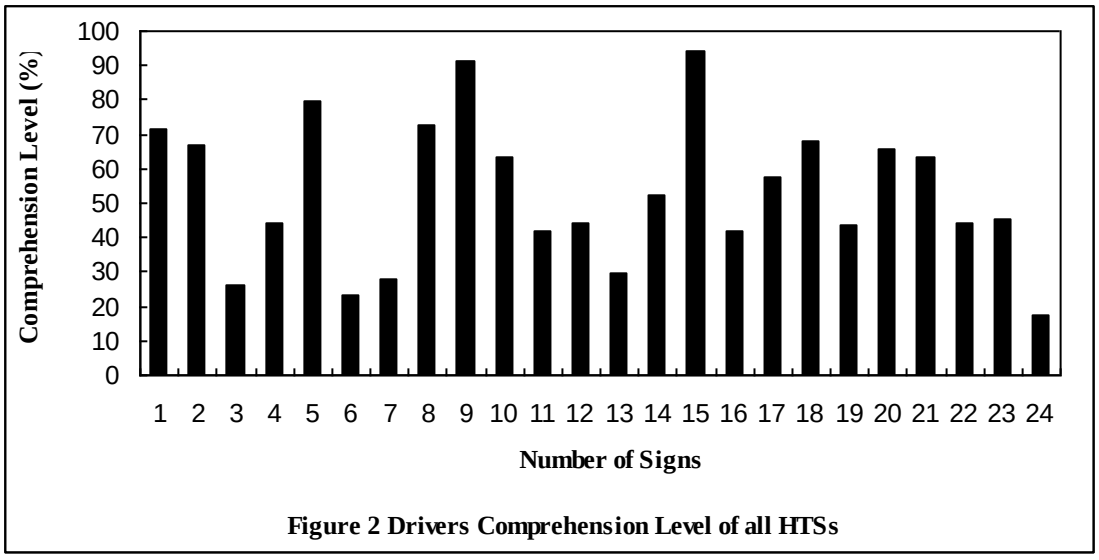

Figure 2 Drivers Comprehension Level of all HTSs

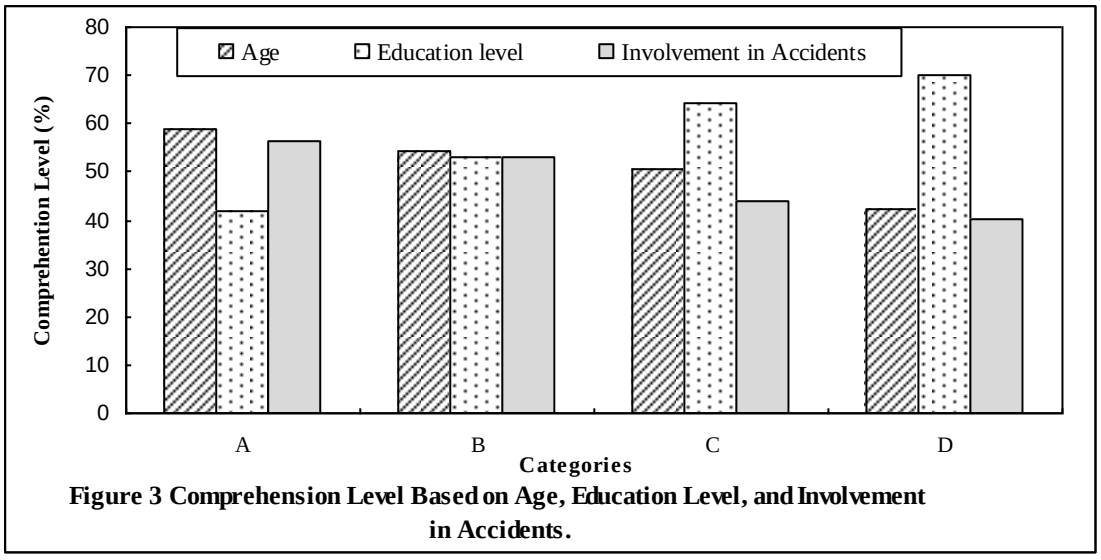

Figure 3 Comprehension Level Based on Age, Education Level, and Involvement in Accidents.

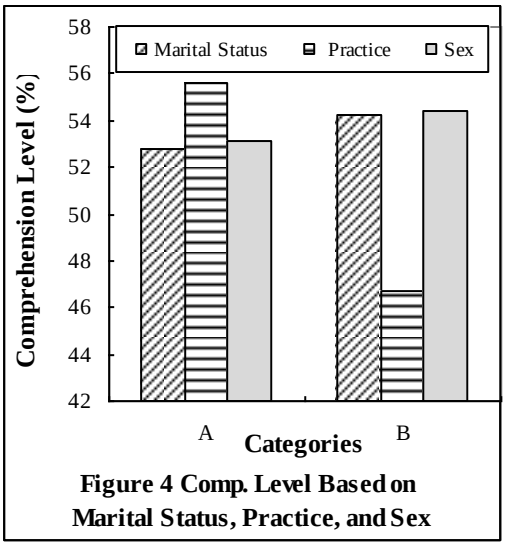

Figure 4 Comp. Level Based on Marital Status, Practice, and Sex

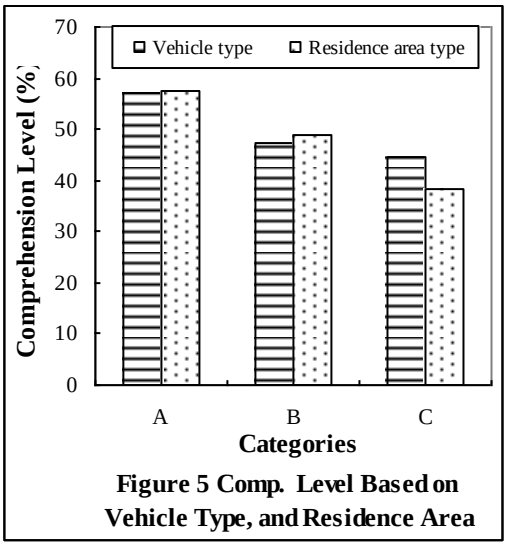

Figure 5 Comp. Level Based on Vehicle Type, and Residence Area

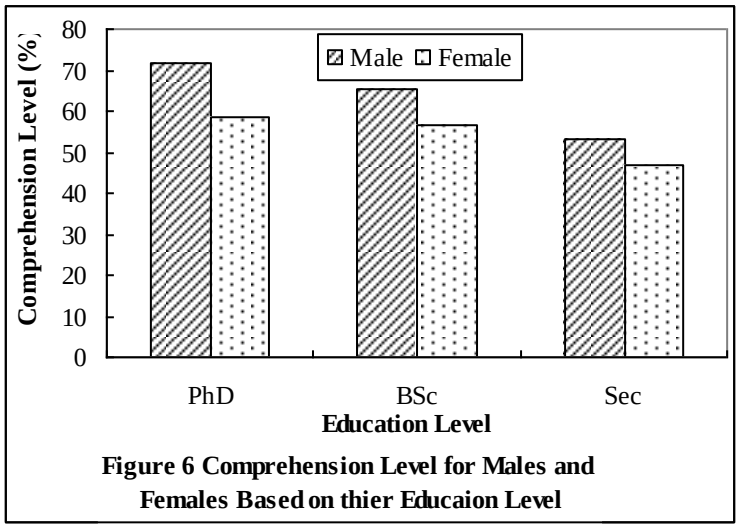

Figure 6 Comprehension Level for Males and Females Based on thier Educaion Level

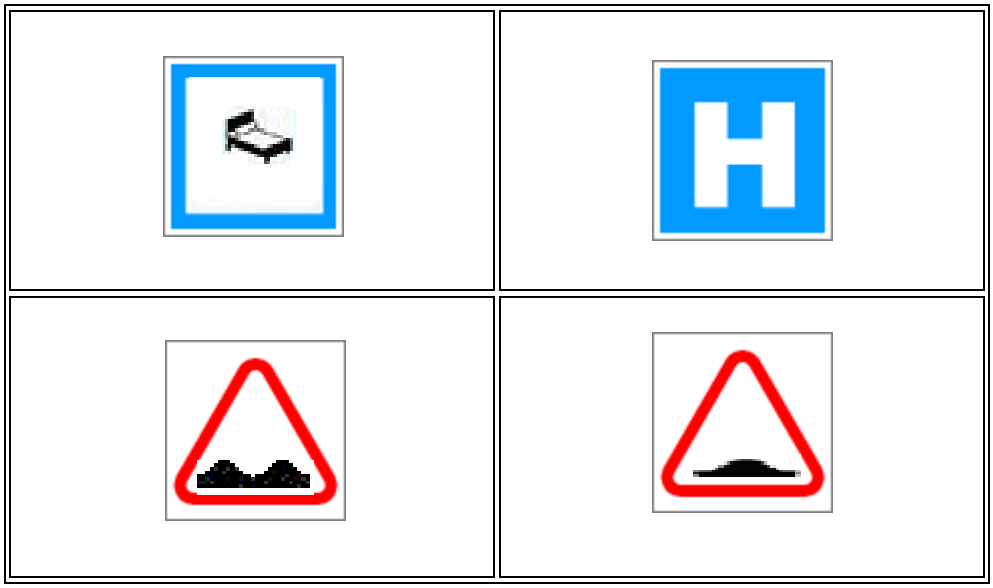

Figure 7 Similarity between "uneven road" and "ridge" Signs, and "hotel" and "hospital" Signs.