

A PRELIMINARY STUDY OF ROAD SIGNS COMPREHENSION AMONG NEW AND EXPERIENCED DRIVER

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ABSTRACT

Signboard is one of the important tools to transfer information or any message to the user. As an important and necessary tool, it will help the users on the road to get direction, warning of danger, the right action to take and much more. However, sometimes the designs of signboard may confuse, drivers may misunderstand the message and hardly to understand the information given, resulting those signboards to being ignored by the road users and may resulting stress among road users because the information does not help them while on the road. The objective of this study is to identify how far the road users compatible toward the signboard on the road. In this study, an analysis about traffic signboard comprehension among new and experience driver in Johor region, Malaysia was conducted. Results showed no significant differences between new and experience driver in comprehension of traffic sign but suggest the importance of signs conformance to universal ergonomic principles of good design to be comprehended by drivers.

Keywords: Signage System, Driving Experience, Safety perception

1. INTRODUCTION

There are many cases recorded involving the misinterpretation regarding the signboard at the road. Some of them are poor condition of the road signboards apart from showing the inappropriate signboard characteristic that led to people discomfort and misunderstood the message showed. Although traffic signs are very important to the users, they are often not clear to the average driver. In a study conducted in Canada, 60% of the respondents could not identify the signs. These problems happen most of the time because of the wrong design of current road signboard.

Another key of information processing is design of display of road signboard. Almost every house in Malaysia now has a car or motorcycle. Road is used daily by Malaysians for transportation purpose. Road transportation is the cheapest and easiest option available for Malaysians. Daily thousands of people used the road with their own vehicle or public transportation. However, the user should not be burden with the difficulties and confusion while looking at the road signboard where the main objective in there is only for safety and direction purpose.

This study has been carried out to study the fundamental understanding of users in the aspect of road signboard at Johor, Malaysia to give some suggestion in order to establish the ergonomic aspects and recommendation on the road.

2. LITERATURE REVIEW

Road warning signs are an integral part of the general land transportation system. They are used to inform and regulate road users. Road signs that command attention and give a simple and clear meaning are believed to be effective at communicating a message [1]. They should also be compatible with other road signs and have the necessary technical features to effectively function. Various studies have been used to evaluate the ergonomics of road warning signs, which spatial compatibility and conceptual compatibility are two of the five elements that make up sign design [2-4].

The comprehension of drivers is one definitive measure of the efficacy of road warning signs in the field of traffic engineering and cognitive ergonomics. Road warning signs are designed to alert motorists about the dangers of driving [5]. A high level of comprehension indicates that the signs are reliable and have sufficient safety features. Many drivers are not very familiar with symbolic signs. For instance, some of the signs commonly used are not very accurate or have been standardized elsewhere. The design of these road signs is poor and undermines the usefulness of these signs. It shows that even though they are designed to warn, some of the individuals fail to understand the information presented [6].

In a cross-cultural study, the authors analyzed the signs of drivers in different countries with high levels of motorization. They found that the level of motorization affected the comprehension of the signs. The level of comprehension of signs used in different regions is very important in this time of globalization. It has been observed that different signs are very different from those used in the original country. Most of the time, the signs were fully understood by the majority of the drivers. However, some of the signs were not understood at all or even understood by a small percentage of the drivers, the study revealed [7-8].

Backlund and Johansson [9] discovered that the way people recognize traffic signs varies widely among them. This phenomenon has been observed in various studies conducted over the years [10-11]. Motorists' comprehension of the signs was significantly different among age groups. For instance, the level of comprehension of young drivers was 70%, while that of older individuals was 72%. They also found that older drivers and young drivers have difficulties recognizing and understanding the devices used by these drivers.

Understanding road warning signs is a major factor in determining their effectiveness. It can affect the predictions that they make about other road users' actions. According to the requirements of ISO 3864, signs should have a level of at least 67% accuracy when performed in a comprehension test, which a higher level of 85% is also acceptable [12-13]. Road signs should be designed according to the principles of ergonomics, as the concept of ergonomics is a process utilized to improve the quality of life for humans

3. METHODOLOGY

Before the main assessment, each respondent was given questionnaire contained questions on the driver's age, gender, driving license type, driving experience, and average monthly number of kilometers of driving. The assessment was divided into four parts: general instructions, anonymous demographic questionnaire, and traffic sign comprehension. The sign comprehension assessment consisted of 30 colored pictures of selected traffic signs used in Malaysia presented one at a time.

Table 1: Meaning of selected traffic signs used

| SIGN / TANDA | SIGN MEANING / MAKSUD TANDA |
|-----------------|--|
| 1 | Bicycle lane / <i>Laluan basikal</i> |
| 2 | Caution! Accident Area sign / <i>Awas! Kawasan kemalangan</i> |
| 3 | Reduce speed sign, with speed limit / <i>Tanda kurangkan kelajuan, dengan had laju</i> |
| 4 | No U turn / <i>Dilarang membuat pusingan U</i> |
| 5 | Crossroads T-junction / <i>Persimpangan T</i> |
| 6 | Camera operation zone / <i>Zon operasi kamera</i> |
| 7 | High voltage area ahead / <i>Kawasan voltan tinggi</i> |
| 8 | No left turn / <i>Dilarang membelok kiri</i> |
| 9 | Roundabout ahead / <i>Bulatan dihadapan</i> |
| 10 | For buses and trucks, please drive in the two leftmost lanes / <i>Bas dan lori, sila memandu di dua lorong paling kiri</i> |
| 11 | Rest and service area / <i>Kawasan rehat dan rawat</i> |
| 12 | No right turn / <i>Dilarang membelok kanan</i> |
| 13 | Crossroads Y-junction / <i>Persimpangan Y</i> |
| 14 | Touch N Go |
| 15 | Speed limit / <i>Had laju</i> |
| 16 | Divided road begins / <i>Pembahagi jalan bermula</i> |
| 17 | Detour / <i>Lencongan</i> |
| 18 | No stopping / <i>Dilarang berhenti</i> |
| 19 | End of construction site / <i>Pembinaan tamat</i> |
| 20 | Traffic lights ahead / <i>Lampu isyarat dihadapan</i> |
| 21 | One way / <i>Jalan sehalu</i> |
| 22 | Malaysian state route shield / <i>Jata jalan negeri Malaysia</i> |
| 23 | No entry / <i>Dilarang masuk</i> |
| 24 | Winding road sign / <i>Selekoh berbahaya</i> |
| 25 | Primary milestones / <i>Batu petanda primer</i> |
| 26 | No parking / <i>Dilarang meletak kenderaan</i> |
| 27 | Keep right curve chevron sign / <i>Tanda chevron kekal belok kanan</i> |
| 28 | Obstacles ahead / <i>Halangan dihadapan</i> |
| 29 | Towing zone / <i>Zon tunda</i> |
| 30 | Speed limit zone ends / <i>Zon had laju berakhir</i> |

All selected 30 traffic signs were displayed in a different random order to all participants in the sign comprehension section. Every screen in the comprehension exam featured an image of a single sign, along with the question "What does this sign mean?" and a text field where participants were asked to write the sign's meaning in their own words.

The participants were to be asked first if he or she is willing to cooperate then the face-to-face session will be conducted. A series of question were asked in order to get feedback about existing signboard from the road user itself. They are divided into 2 group which is new and experienced driver. Participant that having their license with less than 8 years of experiences considered as new driver. As for experienced driver, they were classified by having their driving license with more than 8 years of driving experiences. Both group of new and experienced drivers consists of 15 participants, 23 of the participants was male and the others are female.

The participants' feedback in the comprehension questionnaire were coded, as in [14], into one of four categories of accuracy: correct and complete (coded as +2), partially correct (e.g., "no turn" instead of "no left turn" was coded as +1), incorrect (coded as 0), or opposite of the sign's true meaning (e.g., "priority for ongoing traffic" instead of "priority for oncoming traffic" was coded as -2).

4. RESULTS

Table 2: Percentage of sign comprehension for each sign

| Sign | Correct(2) | Partial (1) | Incorrect (0) | Opposite (-2) |
|------|------------|-------------|---------------|---------------|
| 1 | 70.00 | 26.67 | 0.00 | 3.33 |
| 2 | 53.33 | 30.00 | 16.67 | 0.00 |
| 3 | 36.67 | 36.67 | 26.67 | 0.00 |
| 4 | 93.33 | 6.67 | 0.00 | 0.00 |
| 5 | 66.67 | 30.00 | 3.33 | 0.00 |
| 6 | 16.67 | 83.33 | 0.00 | 0.00 |
| 7 | 66.67 | 33.33 | 0.00 | 0.00 |
| 8 | 80.00 | 20.00 | 0.00 | 0.00 |
| 9 | 0.00 | 93.33 | 6.67 | 0.00 |
| 10 | 3.33 | 73.33 | 23.33 | 0.00 |
| 11 | 66.67 | 30.00 | 3.33 | 0.00 |
| 12 | 86.67 | 13.33 | 0.00 | 0.00 |
| 13 | 83.33 | 13.33 | 3.33 | 0.00 |
| 14 | 63.33 | 26.67 | 10.00 | 0.00 |
| 15 | 40.00 | 60.00 | 0.00 | 0.00 |
| 16 | 13.33 | 0.00 | 83.33 | 3.33 |
| 17 | 93.33 | 0.00 | 6.67 | 0.00 |
| 18 | 50.00 | 6.67 | 43.33 | 0.00 |
| 19 | 100.00 | 0.00 | 0.00 | 0.00 |
| 20 | 36.67 | 63.33 | 0.00 | 0.00 |
| 21 | 100.00 | 0.00 | 0.00 | 0.00 |
| 22 | 0.00 | 33.33 | 66.67 | 0.00 |
| 23 | 96.67 | 0.00 | 3.33 | 0.00 |
| 24 | 13.33 | 30.00 | 56.67 | 0.00 |
| 25 | 3.33 | 0.00 | 96.67 | 0.00 |
| 26 | 50.00 | 0.00 | 50.00 | 0.00 |
| 27 | 10.00 | 53.33 | 36.67 | 0.00 |
| 28 | 16.67 | 0.00 | 83.33 | 0.00 |
| 29 | 86.67 | 6.67 | 6.67 | 0.00 |
| 30 | 36.67 | 0.00 | 63.33 | 0.00 |

As shown in Table 2, Sign 19 (End of construction) and Sign 21 (One way) was answered 100% correct by the participant. For the sign that mostly answer partially correct are Sign 6 (Camera operation zone), Sign 9 (Roundabout ahead), Sign 10 (For buses and trucks, please drive in the leftmost lane), Sign 15 (speed limit), Sign 20 (traffic light ahead) and Sign 27 (keep right curve chevron). For the sign that mostly answered incorrect by the participants are Sign 16 (divided road begin), Sign 22 (Malaysian state road shield), Sign 24 (winding road sign), Sign 25 (primary milestone), Sign 28 (obstacles ahead) and Sign 30 (speed limit end). Only Sign 1 (bicycle lane) and Sign 16 (divided road begin) was answered opposite from the actual meaning. In general, all participants had no problem to recognize all selected signs. Incorrect category such as in Sign 25 and Sign 28 suggest a few types of road signs in Malaysia still can't be recognized in general. It can be seen from the data in Figure 1 that 51.1 % of participants feedback are in correct and complete category, 25.7% for partially correct and 23.0% in incorrect category. There were only 0.2% respondent showed opposite of the meaning.

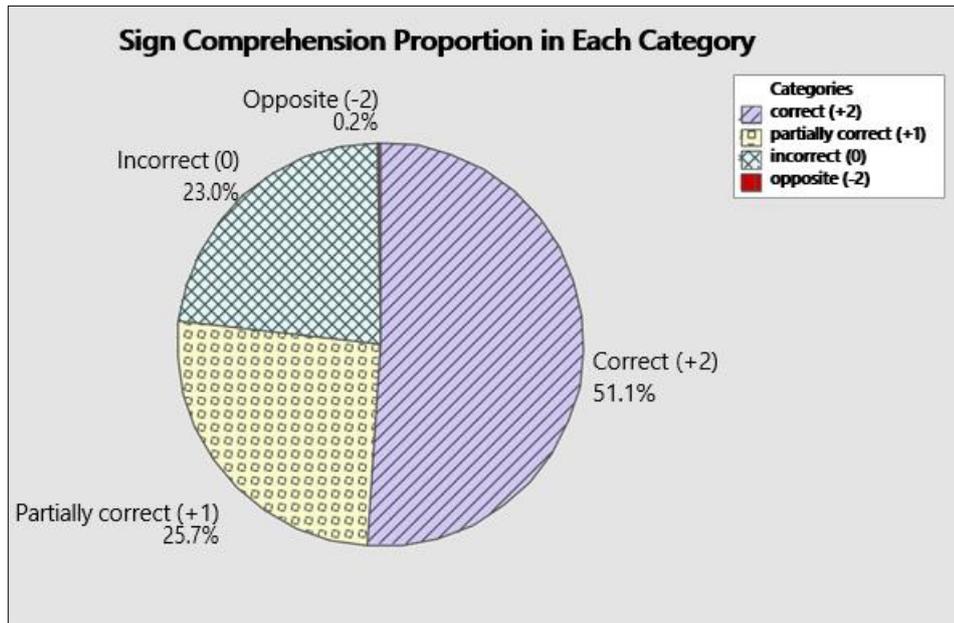


Figure 1: Percentage of sign comprehension score within each category

Figure 2 provides the results comparing new and experienced drivers. The correct answer (+2) for experienced driver is 50.67% while for new driver is 51.56%. Closer inspection of the results showed that experienced drivers score the higher percentage on Sign 19 (end of construction), Sign 21 (one way) and Sign 23 (no entry) with 100% score, 93.33% answered correctly on Sign 4 and Sign 17, 86.67% answered correctly on Sign 12, Sign 13 and Sign 29. For the new driver, they scored 100% correct on Sign 19 and Sign 21, 93.33% answered correctly on Sign 4, Sign 17 and Sign 24, 86.67% answered correctly on Sign 1, Sign 8, Sign 12 and Sign 29.

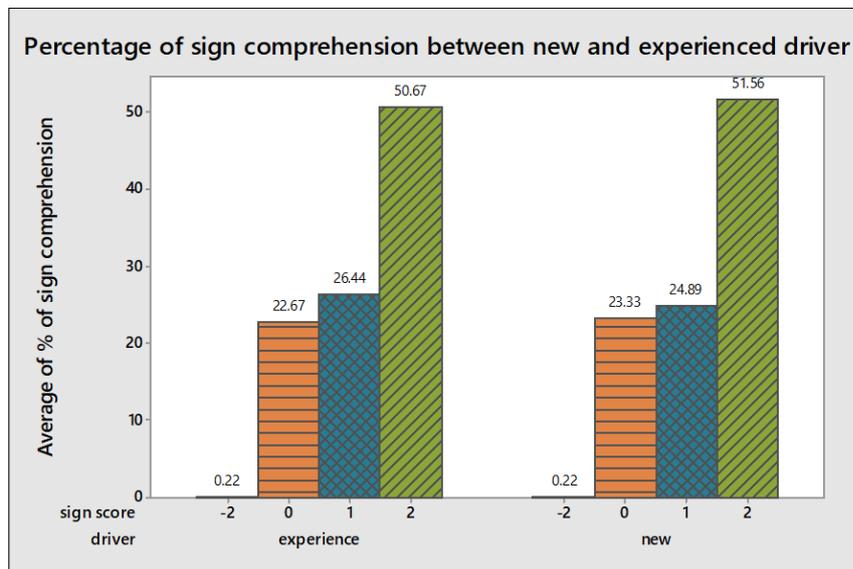


Figure 2: Percentage of sign comprehension between new and experienced driver

Turning to the results for the partially correct (+1) for experienced driver is 26.44% while the new driver is 24.89%. Experienced drivers score higher percentage than the new driver. Each highest score in the category is 93.33% which is on Sign 9. For incorrect (0), new driver scores slightly higher than experienced driver with 23.33% while experienced driver only score 22.67%. Experienced driver higher score is 100% incorrect on Sign 25 and new driver highest score in

incorrect category is Sign 16 with 93.33%. For opposite score, new and experienced driver share same score which is 0.22%. New driver score on Sign 1 while experienced driver score on Sign 17 in "Opposite" category. Despite new driver showed a slightly better comprehension results overall, there were no significant differences were found in each category between new and experienced driver. Together these results provide important insights into characteristics of each selected signs.

5. DISCUSSION AND CONCLUSION

The study aims to determine the effectiveness of road signs used in Malaysia in terms of comprehension. One of the important things regarding the signboard is the comprehensibility toward the message that being represent to the user. The results shows that the percentage of user's respondent is high regarding their understand ability and comprehension toward most of the selected signboard. The results also shows that the difficulties for understanding certain signboard along the road that have been chosen for the study is suitable. Some of the signboards are easy to understand because it provides clear, message and easy to understand. When the signboard is hard to understand, the comprehension level among the users will drop. Apart from that, with the low comprehension level among users toward the road signboard, it might result hazard or danger to the users if the signboard provided is misunderstood. Therefore, the easier and effective signboard should be constructed specially for new users in order to make they understand the message provided.

In this study, the comprehensibility of the road signboard among new and experienced drivers to the difficulties of understanding were not found to be related. This result contradicts with previous studies that showed experience and age were both beneficial for young drivers. However, beside the probability of insufficient number or participants, those effects were independent from driving miles differences among different age and experience levels [14]. Furthermore, many factors come into play when it comes to assessing the risk of driving for someone who has a late license. This is because, in most cases, late licensure is triggered by important life changes. Some individuals may be able to regain their driving privileges after having their licenses revoked or suspended due to various traffic offenses.

Results of this study also might suggest correlations between probability of sign comprehension and the extent to which the sign complies with every one of three ergonomic principles: compatibility, familiarity, and standardization [15]. The compliance of signs with the compatibility and standardization principles should be extended to be evaluated independently in the future to understand the situation in Malaysia. Furthermore, cross-cultural studies reveal that differences in the way people communicate can be attributed to differences in sign design standards and convention in each culture. Establishing uniform international standards for the signage industry will help minimize cultural differences and improve safety. Having traffic signs that are designed according to the guidelines set by ergonomics will improve the sign's design and make it easier to understand for both local and non-local drivers. The findings of this study have important implications for designers of road traffic signs to provide the future guidelines for good design.

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