# Effect of Signs Types on Level of Traffic Signs Understanding of Motorcyclists

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**Abstract.** Insufficient comprehension of traffic signs among motorcyclists is a contributing factor to traffic accidents. Furthermore, the ability to comprehend these signs is closely tied to the cognitive process of accurately interpreting the information conveyed, with one of the key influencing factors being the representation of signs themselves. Therefore, this research aimed to examine the effect of sign types on the understanding of traffic signs, utilizing an experimental research approach that employed a between-subject, randomized multi-group design. A sample of 80 motorcyclists aged 17-25 residing in the Jakarta, Bogor, Depok, Tangerang, and Bekasi (Jabodetabek) areas was involved in the research. Participants were exposed to ten unfamiliar warning signs displayed on a computer, presented in three different formats, namely symbol, text, and symbol + text. Understanding of traffic signs was measured by level of signs comprehension (accuracy). The results showed that signs types significantly affected understanding of traffic signs. Furthermore, text and symbol + text signs resulted in higher level of understanding compared to symbols. The research implied the need for textual elements in the designs of warning signs to optimize understanding of traffic signs among motorcyclists.

**Keywords:** Traffic signs, understanding of signs, signs types, motorcyclists in Jabodetabek

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## Introduction

The number of traffic accidents in Indonesia is increasing every year, with an average of 4.87% (Badan Pusat Statistik, 2020). According to Minister of Transportation Budi Karya Sumadi, 72% of traffic accidents are dominated by Motorcyclists (Alamsyah, 2018), and 57% of victims are in the productive age range of 15-38 years (Kurniawan, 2019). Furthermore, this accident is partly attributed to the high number of motorcycles on the road. As shown in the data from the Badan Pusat Statistik (2020), the total number of motorized vehicles reached 133.62 million units, with motorcycles accounting for 81.8%. The high number of motorized vehicles and heavy traffic congestion can increase the risk of traffic accidents (Kurniawati, 2017).

Violation of traffic signs is one of the main causes of traffic accidents, including motorcyclists (Rolison et al., 2018; Tribratanews, 2021). Traffic signs are the most widely used visual tools to regulate, warn, and guide road users, especially drivers (Gregory et al., 2016). According to Gregory et al. (2016), traffic signs are effective tools when they can attract drivers' attention, have clear messages, and provide sufficient time for drivers to respond appropriately. Violations are related to drivers' knowledge of traffic rules, particularly the meaning of traffic signs. Insufficient comprehension of traffic signs among motorists may lead to a diminished grasp of their intended messages, consequently elevating the probability of collisions. A proficient comprehension indicates the efficacy of mitigating hazards associated with driving (Zhang & Chan, 2013).

There are four types of traffic signs in Indonesia, namely warning, command, guide, and prohibition signs (Wulandari, 2015). The differences are in their respective meanings. Warning signs serve the purpose of notifying road users of potential hazards that they may encounter during their journeys. Regulatory signs provide explicit instructions regarding the actions that road users are obligated to undertake. Meanwhile, guide signs play a pivotal role in directing people toward their intended destinations. Prohibition signs elucidate the specific behaviors people are strictly prohibited from practicing (Regulation of the Minister of Transportation of Indonesia, 2014).

Understanding the meaning of traffic signs is crucial for every motorcyclists. Several factors affect signs comprehension, related to the drivers themselves and the characteristics of the traffic signs. From the driver's perspective, factors affecting level of signs comprehension include age, educational background, driving experience, and the driver's gender (Zhang & Chan, 2013). Considering age, drivers aged 40 and above tend to have slower and less accurate comprehension of traffic signs compared to those under 32 years old. This is due to the decline in flexibility and cognitive inhibition associated with age (Ben-Bassat & Shinar, 2015; Schulz et al., 2020). Based on educational background, several research have found that drivers with higher education have significantly better comprehension compared to those with lower educational attainment (Al-Rousan & Umar, 2021; Choocharukul & Sriroongvikrai, 2017). Furthermore, Abduljabbar et al. (2020) reported that the higher the driving experience, the better the ability to understand traffic signs. Another factor that affects signs comprehension is gender, where male drivers have a better level of signs comprehension compared to their female counterparts (Taamneh, 2018). Female drivers have shorter distances traveled compared to male drivers. In instances where traffic signs exhibit ambiguous or unclear characteristics, drivers may mistakenly perceive they are permitted to engage in actions that pose risks to their safety and others (Al-Rousan & Umar, 2021).

Multiple factors can influence the comprehension of signs among motorists when examining the characteristics of traffic signs. These factors include familiarity, concreteness, complexity, meaningfulness, and semantic distance of signs (Zhang & Chan, 2013). Familiarity refers to the frequency with which drivers encounter signs, while concreteness pertains to the similarity between the symbol displayed on signs and the actual object. Complexity reflects level of detail present on signs, while meaningfulness assesses the ability to understand sign's intended meaning. Semantic distance considers the relationship between the symbols used on signs and the real objects represented. Numerous research showed that meaningfulness is a crucial characteristic enabling drivers to effectively comprehend signs (Ahmadi et al., 2021; Choocharukul & Sriroongvikrai, 2017; Wang, 2021).

In the effort to enhance the meaningfulness of traffic signs, the designs is crucial to ensure that they can be easily and quickly understood by drivers. Ahmadi et al. (2021) found that drivers can more easily comprehend the meaning of familiar, concrete, simple, and meaningful signs. This is related to the principles of ergonomic traffic signs design. According to Ben-Bassat et al. (2021), three ergonomic designs principles need to be considered in designing traffic signs to facilitate driver comprehension. These include (1) physical and conceptual congruence, where signs have symbols and codes that align with the concepts held by most people, (2) standardization, how well the printed codes on signs can be used across different dimensions, and (3) familiarity, how well drivers recognize signs.

In addition to ergonomic principles, the way traffic signs are represented also affects understanding of signs among drivers. Various types and forms of signs are used to regulate traffic by providing information through symbols, colors, and in the form of text (Ben-Bassat et al., 2021). Traffic signs can be represented in different forms, such as symbols, text, or a combination of symbols and text.

Several research have found that the representation of signs can lead to different understandings among drivers (Gregory et al., 2016; Shinar & Vogelzang, 2013). However, consistent findings regarding signs types that results in the best understanding among drivers have not been established. For instance, Koyuncu and Amado (2008) found that the symbol had the fastest reaction time when presented twice, both before and when the actual road condition was displayed. On the other hand, text signs presented under similar conditions had a longer reaction time. This is because text requires more time to comprehend and involves more cognitive processes compared to symbol signs. Additionally, symbols on signs provide the necessary information directly to drivers without other distractions (Koyuncu & Amado, 2008). The addition of written information on traffic signs along with symbols can assist drivers in better understanding the road conditions ahead.

Contrary to Koyuncu and Amado (2008), Shinar and Vogelzang (2013) found that drivers often misinterpret symbol signs, especially when they are not familiar with the concept. Furthermore, level of signs comprehension improves when accompanied by text. The reaction time to symbol signs is also longer compared to text. Based on the research by Koyuncu and Amado (2008) as well as Shinar and Vogelzang (2013), it can be concluded that symbol signs can be well understood when signs are already known to the drivers. Additionally, signs in the form of symbol + text combination result in the highest level of comprehension compared to other types. The combination of symbols and text is beneficial, especially for signs with unfamiliar symbols. It helps drivers learn the relationship between the symbols and text, facilitating a better understanding of signs.

In Regulation of the Minister of Transportation Number 13 of 2014 Article 3 concerning Traffic Signs, it is stated that warning, command, guide, and prohibition signs can be displayed in conventional and electronic forms. Currently, traffic signs are mostly

shown in the form of symbols (pictograms) without text (Regulation of the Minister of Transportation of Indonesia, 2014). There are very few traffic signs that use text, for example, warning and prohibition signs "PRODUCTED TO ACCIDENT" and "No boarding and disembarking of passengers is permitted." Indonesia also has signs with symbols and text, such as prohibition signs namely "STOP" and "TOLL GATES," as well as three command signs namely "Turn Left Directly," "Buses and Trucks Use the Left Lane," and direction signs indicating direction and territory.

According to Lu and Hou (2020), level of understanding of traffic signs displayed in symbol form varies among signs, countries, and driver populations. Furthermore, standards and regulations for traffic signs designs also vary across different countries. Even though there are international standards for traffic signs, each country has its unique needs and situations (Shinar & Vogelzang, 2013). Research on the most effective signs types for understanding traffic signs are still needed, especially for motorcyclists. The inconsistency of previous research findings (Gregory et al., 2016; Koyuncu & Armando, 2007; Shinar & Vogelzang, 2013) motivates this analysis to reexamine the impact of signs types (symbols, text, and symbol + text) on understanding of traffic signs among motorcyclists.

There are several differences in this research compared to most previous results. First, previous analysis was conducted on car drivers who were undergraduate students (Choocharukul & Sriroongvikrai, 2017; Hou & Yang, 2021; Shinar & Vogelzang, 2013; Vilchez, 2019; 2021), while this research was performed on motorcyclists, who represent the group with the highest number of traffic accidents (Alamsyah, 2018). Second, this research used unfamiliar traffic signs, unlike most others that employed familiar traffic signs (e.g., Ben-Bassat, 2013; Choocharukul & Sriroongvikrai, 2017; Lu & Hou, 2020; Shinar & Vogelzang, 2013). Third, the target participants are young drivers aged 17-25 years old. The age group restriction is related to the high accident rates among young individuals (Azka, 2018). Fourth, the instrument employs open-ended questions, unlike most previous research that used multiple-choice questions (e.g., Al-Rousan & Umar, 2021; Makinde & Oluwasegunfunmi, 2014; Yang et al., 2014; Zhang et al., 2014). Therefore, this research can contribute to a better understanding of effect of different signs types on comprehension among motorcyclists, particularly regarding unfamiliar signs. The results are expected to provide recommendations to the government in creating traffic signs easily understood by Indonesian drivers, hence, reducing traffic violations and accidents involving motorcyclists.

Concerning the phenomenon of high accident rates on the roads, this research focuses on the use of warning signs. As stated in Regulation of the Minister of Transportation Number 13 of 2014, warning signs aim to make drivers cautious of potential hazards in traffic to prevent accidents. According to Chand and Bhasi (2019) and Bucsuházy et al. (2020), the lack of attention to warning signs and failure to recognize them are estimated to contribute to 25-50% of traffic accidents. This research examines the influence of signs types on level of comprehension of warning signs among motorcyclists. The hypothesis is that there is a difference in comprehension level between symbol-only signs, text-only signs, and signs with both symbols and text among motorcyclists.

## Methods

### Research Design

This research was conducted using a between-subjects, randomized multi-group design. Signs types were manipulated into three categories, namely symbol-only signs, text-only signs, and signs with both symbols and text. The comprehension of signs was measured by the comprehension level, which assessed the accuracy of participants' answers regarding the meaning of each signs. The extraneous variable controlled was the research environment. During the research, participants were situated in the same controlled room with a consistent atmosphere.

### Participant

Initially, 102 participants were involved in the research, but only 80 were included in the analysis due to the failure to complete the manipulation check or not meeting the participant criteria. The participants were motorcyclists residing in the Jakarta, Bogor, Depok, Tangerang, and Bekasi areas (commonly known as Jabodetabek) with an age range of 17-25 years (M = 19.74, SD = 1.16). Furthermore, female participants (53.7%) were slightly more represented than males (46.3%). On average, participants had a minimum of 6 months of riding experience (M = 5.1, SD = 2.16) with a frequency of three days of riding per week. Approximately three-quarters of the participants (78%) held a Class C driver's license (SIM C), while the remainder did not possess a license. A convenience sampling technique was used to recruit participants, and an online questionnaire was distributed through social media platforms such as Line, Instagram, WhatsApp, Twitter, and Facebook.

### Research Instruments

#### *Warning Signs*

A total of ten warning signs were used in this research. According to the Regulation of the Minister of Transportation of Indonesia (2014), warning signs

were used to provide notifications concerning potential dangers or hazardous areas on the road and to impart information regarding the nature of the peril. Furthermore, the presence of danger necessitated caution. Unfamiliar warning signs were employed to regulate the participants' prior familiarity. Furthermore, the utilization of unfamiliar warning signs educated the participants about their significance. The participants will acquire new knowledge regarding signs of making prompt decisions after encountering them on the highway. There were three codes designated to denote types of warning signs, namely codes A, B, and C for symbol-shaped, text-based, and combined symbols and text signs (Figure 1).

***Understanding Signs***

Level of signs comprehension was assessed according to Maulina et al. (2023), employing open-ended questions: "What is significance of the provided sign?" The responses were classified into four scoring categories, namely -2, 0, 1, and 2. A correct and partially correct response, such as "strong wind" and "wind blowing," received a score of 2 and 1, respectively. An incorrect answer unrelated to signs was awarded a score of 0, while those contradicting the actual meaning, such as "weak wind/no wind blowing," was assigned a score of -2. This scoring system was developed based on Shinar and Vogelzang (2013) as well as Zhang and Chan (2013). Scores were determined by identifying specific keywords that corresponded to the meaning of signs. Each response was evaluated based on its comprehensiveness and alignment with the keywords in the answer key. A higher score indicated a greater level of signs comprehension among the participants.

**Research Procedure**

***Preparation Phase***

In this stage, ten unfamiliar warning signs were selected to be used as signs. A total of five signs were obtained from Maulina et al. (2023), namely a warning of a lane reduction on the right, many hazardous and toxic goods vehicles, a cliff, a wide clearance, and a right turn bend. Additionally, five other warning signs were taken from the Regulation of the Minister of Transportation of Indonesia Number 13 of 2014, namely warning of the addition of a left lane, a steep descent, construction separating traffic lanes, strong wind gusts, and a left-side double three-way intersection. These five signs were selected to represent different warning categories from the previous five selected signs (Maulina et al., 2023) and have a relatively high potential for danger. The research also determined one warning signs to be used in the training phase, which was the warning of a right-side three-way intersection.

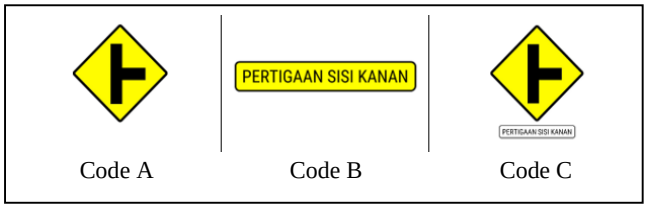


*Figure 1*. Examples of signs in research instruments (Code A: signs with symbols; Code B: signs with text; Code C: signs with symbols and text)

A total of ten warning signs for the experimental phase were designed into symbol-shaped, text-based, and symbol + text signs. Signs designs were adjusted according to the provisions in the Regulation of the Minister of Transportation of the Republic of Indonesia Number 13 of 2014, such as having the same types and size, as well as conveying the same meaning when shown in symbols or other forms. Additionally, adjustments were made to comply with the colors of signs specified in the regulation. The yellow and white color was used as the background for text-based signs and the text portion of the symbol + text signs.

The warning signs were presented using Microsoft PowerPoint and divided into three sets of questions, each assigned a code, which was given to different groups. The groups were as follows: code A (consisting of warning signs with symbol variations), code B (consisting of warning signs with text variations), and code C (consisting of warning signs with symbol and text variations). The PowerPoint was created as a slideshow with each signs shown for five seconds, ensuring that all participants received the same treatment despite being in different groups.

***Pilot Research Stage***

A pilot research was conducted on five undergraduate students to obtain feedback regarding the instruments and manipulations. Based on the results, several revisions were made to the instruments and instructions. Subsequently, a Google Form questionnaire was created and distributed through social media platforms such as Line, Instagram, WhatsApp, Twitter, and Facebook to recruit participants.

***Experiment Implementation Stage***

First, a brief explanation about the research implementation was given to the participants, followed by filling out an attendance list. Each participant was provided with a booklet containing an informed consent form, a practice sheet (trial), an answer sheet, demographic data (name, age, gender, region, driving experience, possession of a driver's license), and a manipulation check sheet. Participants were randomly assigned to one of three manipulation groups using the fishbowl method, resulting in three experimental

groups, namely symbol-shaped (n = 27), text-shaped (n = 26), and symbol and text-shaped signs (n = 27). Subsequently, participants were asked to fill out the informed consent form.

The experiment was started using a computer through a Microsoft PowerPoint slideshow. The first slide was the participant group code, and the next contained a brief explanation of the research. Moreover, the participants embarked upon the training phase to acquaint themselves with the cadence of the slide show comprising signs and inquiries on their meanings, before commencing the actual experiment. Within the training phase, they were presented with a slide containing the directive "Please direct your attention to the following signs," followed by a succession of signs, accompanied by the query "What is significance of the given sign?" Participants were allotted 20 seconds to inscribe their responses on the designated answer sheet. After the participants comprehended the assigned task, they proceeded to enter the experimental phase. The transition between the training and the experiment phase was demarcated by slides bearing the phrases "Practice" and "Research will commence," which were displayed before the appearance of signs. During the experimental phase, participants adhered to identical procedures as in the training phase, including the duration of signs display and the time allocated for recording answers. After completion of the final question, participants were requested to provide demographic data and complete a manipulation check sheet. Finally, they were awarded snacks and beverages as tokens of appreciation, and a debriefing session was conducted, encompassing an explanation of the research objectives.

### Analysis Techniques

Experimental data were processed by statistical analysis using IBM SPSS 20 software. The statistical technique used was one-way ANOVA and posthoc test using the Tukey HSD method.

## Results and Discussion

The results of the descriptive analysis showed that the lowest level of understanding was found in the symbol-shaped signs group (M = 7.79, SD = 3.72), while the highest was in the text-types signs group (M = 13.31, SD = 3.07 ). The results of the one-way ANOVA analysis showed that there was significant effect of signs types on level of understanding of signs, namely: $F(2, 77) = 18{,}887$, $p < .001$, $\eta 2 = .33$.

The post hoc test using the Tukey HSD (Honestly Significant Difference) method showed that there was significant difference between signs types group in the form of a symbol and text (Mdiff = 5.53, $p < .001$). Signs was in the form of text (M = 13.31, SD = 3.07) resulting in a higher level of understanding (M = 7.79, SD = 3.72). In addition, significant differences were also reported in level of understanding of signs between the symbol-shaped and the symbol-text signs group (Mdiff = 4.67, $p < .001$), where signs in the form of symbols + text (M = 12.44, SD = 3.77) yielded an understanding level of signs higher than symbolic signs (M = 7.79, SD = 3.72). However, there was no significant difference in level of signs understanding between the text and the symbol + text signs groups (Mdiff = .86, p = .65). The hypothesis was supported by the data, and signs types in the form of text and the form of symbols + text produce significantly higher level of understanding compared to signs in the form of symbols (see Figure 2).

The findings showed a substantial impact of signs types on the comprehension level of the participants. Specifically, signs presented in the format of both text and symbols exhibited a notably superior level of comprehension compared to textual form. These outcomes aligned with prior investigations, affirming that signs incorporating both textual and symbolic elements were more effective in promoting signs comprehension. This superiority was evident in terms of accuracy and reaction speed (Choochararul & Sriroongvikrai, 2017; Koyuncu & Amado, 2008; Maulina et al., 2022a; Shinar & Vogelzang, 2013).

Table 1
*Mean and Standard Deviation of Understanding Signs for each Group (N = 80)*

| Signs Types | *N* | *M* | *SD* |
|---|---|---|---|
| Symbol | 27 | 7.79 | 3.72 |
| Text | 26 | 13.31 | 3.07 |
| Symbol + Text | 27 | 12.44 | 3.77 |
| Total | 80 | 11.15 | 4.27 |

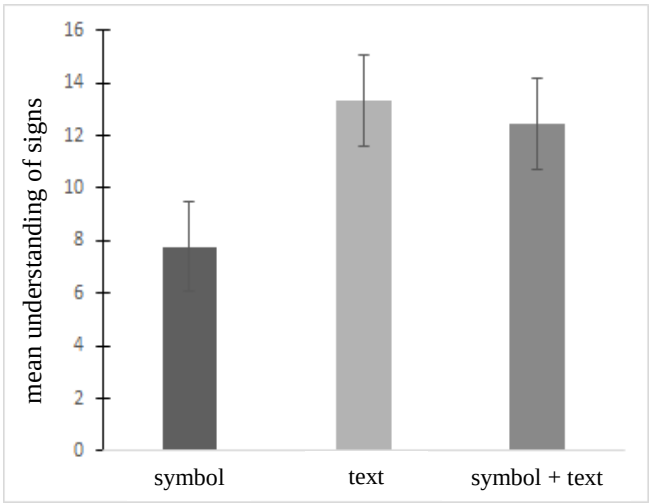


*Figure 2*. Comparison of mean understanding of signs for each group (N = 80). Error bars indicate the standard error (95% level of confidence).

The existence of differences in level of understanding between signs in the form of symbols, text, and symbols + text was related to types and familiarity of signs. This research employed warning signs as stimuli concerning the different types. The information provided was characterized by greater abstraction and lesser familiarity compared to command and prohibition signs. Consequently, understanding warning signs required more cognitive effort and posed greater difficulty (Maulina et al., 2022b; Yuan et al., 2015). This finding aligned with cognitive theory, where the process of recognizing and understanding abstract information was typically more challenging than comprehending concrete information (Leavell & Bernal, 2019). Therefore, signs shown in the form of abstract symbols became more difficult to understand. Previous research found that errors in understanding warning signs were more common in ambiguous signs and did not accurately represent the intended meaning (Vilchez, 2019).

Symbols or images were capable of providing clear information in terms of the shape, color, and size of the symbol. However, symbols did not always follow the same principles as writing, which clearly stated the contents of the message. It could lead to different interpretations compared to words that explicitly conveyed specific commands or instructions (Hou & Yang, 2021). Even though signs in the form of text took longer to comprehend their meaning and involved more mental processes, text-shaped signs helped motorists better understand significance of signs (Koyuncu & Amado, 2008).

Moreover, the combination of symbols and text on signs has several advantages in enhancing motorists' comprehension, particularly when the presented symbols are classified as abstract. Concerning information processing, the integration of symbols and text reinforces the conveyed meaning, making it easier for individuals to remember the information (Hou et al., 2017). In the context of signs comprehension, when drivers understand these signs, they can recognize the symbols from a distance. The combination of symbols and text does not require more time for motorists to understand signs, hence, it is considered effective approach for enhancing motorists' understanding of signs (Shinar & Vogelzang, 2013). Consequently, level of comprehension of signs presented in the form of text and symbols or text surpasses symbols alone. The drivers' knowledge becomes more comprehensive and increases when traffic signs provide more informative content, as seen in signs with text or symbols and text (Babić et al., 2020).

Symbols serve as a more effective means of comprehension for motorists when signs are associated with familiarity. In traffic conditions characterized by limited time for motorists to perceive road signs, symbol-shaped signs prove to be more advantageous for understanding, compared to text-shaped signs. This advantage arises from symbols directly conveying the necessary information to motorists without introducing any other distractions (Koyuncu & Amado, 2008). Therefore, signs in the form of symbols facilitate quicker comprehension, particularly when these signs are familiar to motorists (Shinar & Vogelzang, 2013). This perspective on the impact of symbol-based signs aligns with one of the fundamental ergonomic principles of signage, namely, familiarity (Ben-Bassat et al., 2021).

Text signs play a crucial role in facilitating accurate comprehension of new and unfamiliar road signs. Unlike symbols, which can be challenging to decipher without prior familiarity, the text provides unaffected information. Consequently, relying solely on symbols to convey meaning on unfamiliar signs can pose difficulties for motorists in accurately comprehending the intended message. The absence of associations between symbols and the corresponding road conditions exacerbates the challenge. Lemercier et al. (2014) highlighted that symbols become progressively more challenging to interpret when they lack support from prior knowledge or fail to evoke semantic connections. To address this issue, incorporating text alongside unfamiliar symbols on signs offers more practical instructions on encountered road conditions. This assists motorists in better-comprehending signs and making informed driving decisions (Koyuncu & Amado, 2008). However, it is essential to consider the length of the text on signs to ensure optimal effectiveness. Insufficiently brief text can potentially confuse motorists (Cristea & Delhomme, 2015), while excessively long text can hamper accurate signs comprehension (Feng et al., 2018). The present finding aligned with previous research, employing unfamiliar signs, yielding results consistent with the notion that the presence of text or a combination of symbols and text enhances motorists' understanding. By incorporating text on signs, both comprehension and interpretation of their meanings are improved, ultimately benefiting drivers (Lemercier et al., 2014; Koyuncu & Amado, 2008).

One factor that also contributes to these results is the readability of the text on signs. Koyuncu and Amado (2008) and Shinar and Vogelzang (2013) stated this relationship by placing all three signs types at an equal distance from the participants through a computer screen. There is no hindrance in reading the text on signs when they are displayed at the same distance. Consequently, text signs are comprehended more rapidly and accurately compared to symbols (Shinar & Vogelzang, 2013). This underscores the impact of the participant's viewing environment on

signs comprehension (Ben-Bassat et al., 2021; Kaplan et al., 2018; Lu & Hou, 2020).

The influence of signs types is contingent on the method used to measure comprehension. For instance, Koyuncu and Amado (2008) assessed signs comprehension based on how quickly they are recognized. For signs displayed twice (repetitive priming), symbols result in faster reaction times. Conversely, text-based signs lead to faster reaction times for signs shown only once (semantic priming). These results differ from the outcomes of the research conducted by Koyuncu and Amado (2008), where text-based signs and signs combining symbols and text yielded higher comprehension accuracy. Signs comprehension was measured based on understanding signs meaning, where signs were presented only once. Therefore, types that can attain high comprehension level is also determined by the method employed to assess signs comprehension.

Concerning the limitations, signs comprehension was measured in a laboratory using a computer, limiting the external validity for generalization to real-world road situations. Furthermore, this research only focused on warning signs. Further analysis is needed to examine other types of traffic signs, such as regulatory, directional, and prohibitory signs, to determine the consistency regarding the impact of signs types. Signs comprehension measurement should also consider comprehension time. Therefore, further research that combines measurements of signs comprehension level and time is needed to observe differences in processing speed and comprehension accuracy. The importance of signs familiarity in comprehension level necessitates future research to assess the impact on signs comprehension among drivers. Through the amalgamation of these two variables, it becomes feasible to assess level of comprehension in instances where signs are presented in the form of symbols and text, encompassing both familiar and unfamiliar signs and text. This gathered information can function as a fundamental groundwork for enhancing the efficacy of signs education provided to drivers.

## Conclusion

In conclusion, signs types was found to have a significant impact on level of comprehension among motorcyclists. Signs in the form of text, as well as those that incorporated both symbols and text, yielded enhanced level of comprehension among drivers. Therefore, signs should predominantly employ text or a combination of symbols and text, particularly for warning signs unfamiliar to drivers. For an unfamiliar signs to effectively facilitate the comprehension of traffic signs, greater attention should be dedicated to the characteristics, especially when symbols and text are utilized. The implications of this research suggested the need to provide recommendations to the government for establishing effective traffic signs designs easily understood by the public, to reduce traffic violations and accidents.

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