

# Confidence Interval-Based Estimation of Relevance on Women's Driving Ability and Its Association towards Road Environment

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**ABSTRACT** – *The perception of the road environment is depending on the people, system, structure, and activities. A good perception of the road environment is important because it would be a symbol that our country possesses a good infrastructure. Meanwhile, apart from making the road environment sustainable, road users also play a greater role in determining the perception of the road environment. Women's ability plays a part in determining a sustainable road environment because the consequences, actions, and interventions outcome based on women's events may lead to the formulation of road systems and regulations. Therefore, determining women's ability towards the perception of road environment is very important. CIBER techniques were used to determine the behavior and the predicted outcome of the perception of the road environment. Results indicate that the association of the left and right panels showed that 33% of the variance in road environment was explained by the women's ability ( $R^2 = 0.33$ ). Each ability depicted in the visual plot explains differently women's reactions towards the road environment. This research highlighted the impact of understanding women's ability and their responses in handling the situation on the road environment.*

**KEYWORDS:** Women's ability, road environment, Confidence Interval-Based Estimation of Relevance (CIBER), women's behavior

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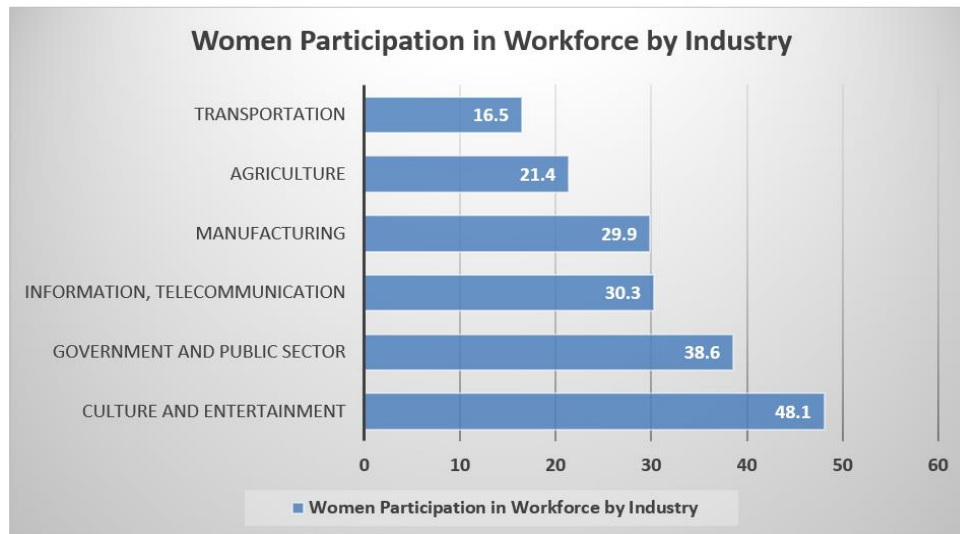
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## 1. INTRODUCTION

Women are important for national agendas, especially for sustainability in the demographic of a country. The success of all generations was mainly depending on women as a pillar of institutions (Yadav, 2021). However, the World Gender Gaps Index 2021 showed that women are still far behind in many aspects, especially in economic participation, educational attainment, health and survival, and political empowerment. Current research highlighted that the index on education, health, and survival estimates that on its current trajectory, it will take another 14.2 years to completely close this gap. Meaning that, stills women are left behind to reach parity. Lacking focus on women may have an influence on the country's policy and regulations, and that too will impact how society perceived women and their value to the country. Apart from that, women involved in occupational related to transportation are still low. Figure 1 depicted the ranking of women's employment based on industries.

This data speaks to those women who are involved in occupations that are related to transportation are still lacking, which only recorded 16.5% of the total global population. Therefore, any initiatives to improve transportation may have overlooked on women aspect as opinions and insight gathered from this group were lacking. Since global has announced the deficiencies in women's participation in transportation professionals, therefore current research focuses on women's ability and their perception

towards the road environment. This research highlighted the impact of understanding women's abilities and how they can handle the situation on the road environment.



**FIGURE 1:** Women's participation in the workforce by industry (Global Gender Gap Report, 2021)

Handling road situations requires attention and the power of prediction. People can predict and forecast, and the results might not be 100% accurate however, the basis of the answers is still there. Talking about human ability in prediction is related to every individual cognitive process. The individual cognitive process may differ according to demographic profile. Studies have shown the responses of drivers in different age categories responded differently (Chuang et al., 2014). Moreover, everyone is unique, and when it comes to mental processes from different gender, they learned differently (Amin, 2018). On the other hand, the study also claimed that older women driving were only meant for having luxury cars (Siren & Hakamies-Blomqvist, 2005). Other than that, studies associated with women and driving were mostly related to women's incompetence and lack of self-control due to age factors (Aksan et al., 2013; Degraeve et al., 2015). Meanwhile, studies highlighted on women's ability in driving and its association with the road environment were still lacking, this could be one of the reasons as marked in the Global Gender Report Gap, the participation of women in the transportation industry globally are still scarce. Regarding this, the formulation of policy could miss some of the important elements that are pertinent for women in the road environment. Moreover, research on women and transportation is still far behind developing countries compared to developed countries (ITF, 2011). Therefore, current research is determined to highlight the impact of understanding women's ability and their responses in handling the situation on the road environment.

The road environment is free for everyone, it is one of the symbols of infrastructure in a country. Having good road conditions will foster positive vibes for mood, feelings, perception, and judgment. Having a good impression of the road environment is pertinent because bad road conditions can be one of the factors that lead to increasing the potential risks of accidents (Prueksakorn et al., 2019). However, no matter what the conditions are, the power of self-control is very important. Self-control includes making a fast response toward the environment, and it is pertinent for survival. However, the previous study mentioned that women are associated with incompetence and lack of self-control (Aksan et al., 2013; Degraeve et al., 2015). Hence, looking at women's perception of the road environment may help to determine their reaction to the incidents that happen on the road such as avoiding the domino effect of accidents that happened in front of them, or maybe calculating the risks of overtaking a car. Knowing women's ability in handling a situation is very important. Some studies conclude that women are far better at handling stressful events (Beard, 2017). Meanwhile, women also have great instincts and are very good at development and cooperation (Ghebremichael, 2013; Gold & Revill, 2020). Dealing with other road users' behavior requires tolerance, which this characteristic is familiar among women. Hence the act of anticipation of a future event may be imbued with tolerance for women to feel safe on the road. Despite this honorable characteristic, the element of ability that current research tries to convey is the courage to drive alone on various kinds of roads, their competency, focus, and either abiding or bending the road rules and regulations.

## 2. METHODOLOGY

The current research used analysis from Jamovi. This tool can produce a visual plot of Confidence interval-based estimation of relevance (CIBER). The advantage of using CIBER is it explains the mean association of every item towards the intended psychological domain (behavior/cognitive/affective). CIBER used two panels that explained the association between the left and the right panel.

The left panel depicted the determinant of the study (ability) and the right panel is the dependent variable (Road environment). Visual from Plot 1 illustrate the analysis of Confidence Interval-Based Estimation of Relevant (CIBER) plot for determinants 'A1', 'A2', 'A3', 'A4', 'A5', 'A6', 'A7', 'A8', 'A9', 'A10', 'A11' and targets 'Road Environment' based on a dataset with 119 rows, 119 of which have complete data. It explained women's ability in driving especially highlighting the competencies and confidence. Most of the diamond shows blue to a greenish color means all the diamonds indicate moderate to positive means in the ability. Figure 1 depicted a plot of Confidence Interval-Based Estimation of Relevant (CIBER) for determinants of ability and target road environment. The association left panel and right panel show  $R^2=0.33$ , meaning 33% of the variance in the road environment was explained by the determinant (ability). CIBER plot visualizes the item means (ability) and the association towards road environment is a prediction towards their cognitive (perception) on the right panel (road environment).

### 2.1 Plot CIBER

The diamonds in the left-hand panel show the item means with 99.99% confidence intervals. All diamonds indicate blue and greenish color. The further the diamonds move towards the right side means that respondents recorded higher item means. Overall, the left panel explains that most respondents score medium to high at every determinant from A1 to A11. The dot surrounding the diamonds explains the dispersion from the center of the diamond. Therefore, the left panel concludes that ability plays moderate and positively high in perceiving road environment.

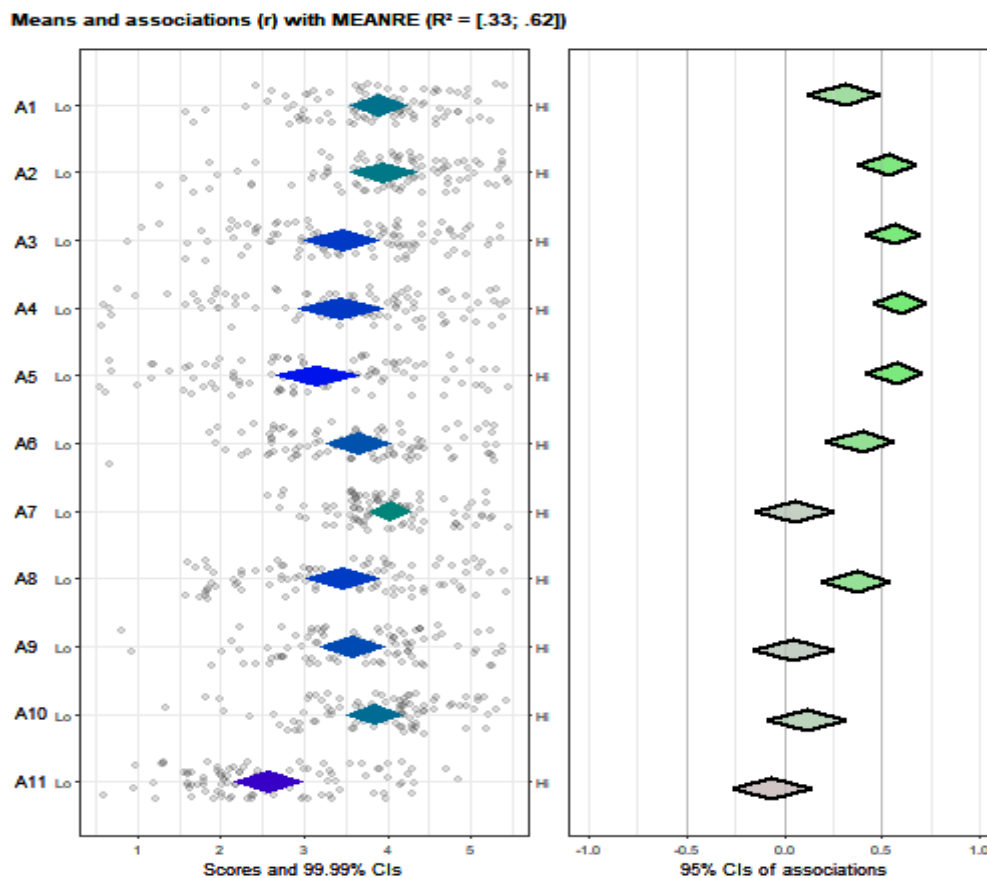


FIGURE 2: Plotting on left and right panel

Meanwhile, the diamonds on the right-hand panel show the association strengths (i.e., correlation coefficients with 95% confidence intervals) between individual emotions while driving and the direct measure of perception of the road environment. The fill color of the diamonds is indicative of the association's strengths and direction. The redder the diamonds are, the stronger and more negative the associations are. Meanwhile, the greener the diamonds are, the stronger and more positive the associations are. However, grey diamonds indicate weaker associations. The confidence intervals of the explained variance (R<sup>2</sup>) of the outcome (in this case the direct measurement of perceiving road environment) are depicted at the top of the figure and based on all (sub-)determinants that are included (in this case ability).

### 3. RESULTS AND DISCUSSION

Discussion on the visual plot of CIBER is displayed in Table 1. The total number of respondents in this study is 119 across Malaysia. The types of instrumentation for item ability and road environment were derived from WPRE Questionnaire (Abu Samah et al., 2021). The usage of the left panel with the jittering of the dot is to determine whether most respondents are prone toward strong or weak item means. The right panel tells the association of ability and road environment meaning to predict the behavior that they intend to.

**TABLE 1:** Interpretation of Left-Right Panel

Determinant (Left Panel)	Right Panel
<p><b>A1: I consider myself an experienced driver</b> (65.7% - agree) (5.6% - disagree) <i>The rest - no comment</i></p>	<p>In the left panel, the diamond indicates a blue to a greenish color, which means that most respondents consider themselves experienced drivers. Meanwhile, the right panel shows a green color, meaning that it has a positive association with the road environment. Individuals with confidence may have a positive perception of the road environment.</p>
<p><b>A2: I can drive alone on the highway without any fear</b> (70% - agree) (12.1% - disagree) <i>The rest - no comment</i></p>	<p>Most of the respondents believe that they can drive on the highway without any fear, thus making them feel confident and have a good perception of Malaysia's road environment.</p>
<p><b>A3: I can drive alone in a rural area without any fear</b> (46.7% - agree) (19.4% - disagree) <i>The rest - no comment</i></p>	<p>A moderate mean is indicated in A3; however, it has a positive association with the road environment. Meaning driving alone was never a problem to them, which in turn developed self-confidence and created a good perception.</p>
<p><b>A4: I can drive alone on the busiest road without any fear</b> (52.4% - agree) (20.2% - disagree) <i>The rest - no comment</i></p>	<p>A moderate mean is indicated in A4; however, it has a positive association with the road environment. Meaning driving alone on the busiest road was never a problem for them, which in turn developed self-confidence and created a good perception.</p>
<p><b>A5: I can drive alone on any unfamiliar road without any fear</b> (37.1% - agree) (22.6% - disagree) <i>The rest - no comment</i></p>	<p>Moderate mean indicated in A5; however, it has a positive association with the road environment. Meaning driving alone was never a problem to them, which in turn developed self-confidence and creates a good perception.</p>
<p><b>A6: I consider myself a competent driver</b> (55.6% - agree) (35.5% - disagree) <i>The rest - no comment</i></p>	<p>A moderate mean is indicated in A6; however, it has a positive association with the road environment. Meaning self-confidence is creating a good perception.</p>

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**A7: I consider myself focused on the road while driving**

(73% - agree)  
(0.8% - disagree)  
*The rest - no comment*

The greenest diamond in the left panel implies that most respondents are focused while driving. And, they have a positive perception on the right side of the panel, meaning they have a good perception of Malaysia's road environment.

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**A8: Accident on the other side of the road does not distract my driving**

(39.1% - agree)  
(18.5% - disagree)  
*The rest - no comment*

They believe moderately that road accidents happening on the other side of the road do not distract them, and thus, they believe that with this kind of attitude, they perceive the Malaysian road environment are safe for them.

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**A9: Slow reaction drivers can trigger my anger**

(54% - agree)  
(18.5% - disagree)  
*The rest - no comment*

In the left panel, the diamond indicates a blue to a greenish color, which means that most respondents consider slow driving can cause anger. Meanwhile, the right panel shows a green color, meaning that it has a positive association with the road environment. Even though it causes anger, perhaps it creates a safer place for road users

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**A10: I abide by all the rules and regulations on the road**

(67.7% - agree)  
(6.5% - disagree)  
*The rest - no comment*

In the left panel, the diamond indicates a blue to a greenish color, which means that most respondents are abiding by the rules and regulations. Meanwhile, the right panel, shows a green color, indicating a positive association with the road environment.

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**A11: Sometimes I ignore the rules and regulations on the road**

(21% - agree)  
(46% - disagree)  
*The rest - no comment*

Blue toward purple color shows a low item means, meaning that the majority does not agree with the statement. Therefore, in the right panel, it has no association.

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In conclusion, women with confidence may have a positive perception of the road environment and hence may develop self-confidence and create a good perception, and it works like a cycle. Positive vibes (emotion, mood, feeling perception) all can have a positive impact on someone's actions. Meanwhile, regarding controlling behavior or action, results also showed that women believe moderately that accidents happening on the other side of the road do not distract them, and thus, they believed that with this kind of attitude, they perceived the Malaysian road environment are considered safe for them. The results also support half true on the previous research evidence (Aksan et al., 2013; Degraeve et al., 2015), which says women lack self-control. Current research proves that women can control themselves even if there are emergency cases that happen on the road. Meanwhile, despite saying that women are very good and motherly (Gold & Revill, 2020), they also have a temper in some situations but can control their anger toward slow drivers, however, the relationship with the road environment was positive even though it causes anger, somehow it creates a safer place for road users.

#### 4. CONCLUSION

Women are human resources to a country that provide sustainable demographic of a country. Hence, authorities need to put more attention to a group of society that has different interests and backgrounds. This research provides evidence that women are important and able to drive, and with that, they have self-control that could lead to a better perception of the road environment. The implication is that having more women have a good perception of our road and transportation system, it good be a good sign for tourists to travel, use, and drive on our road. The positive perception could enhance the image of our infrastructure system. Having a good and competent road user will help to minimize the potential of road accidents.

The limitation of this research is it involved women of various ages and experiences, and thus may affect the result of "abiding by the rules and regulations" and "anger issue". Age categories may have some effect on people's patients; therefore, age categories of women may result differently on that. Therefore, future research may want to look at different age categories and how it affects anger

management issues on the road. This research may help authorities in road transportation areas to improve road conditions, and perhaps put some intervention for road users. Since this research uses CIBER techniques it is a useful approach to select the most relevant social-cognitive determinants, which can be applied across behavioral domains (Crutzen et al., 2017).

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