

**Using Confidence Interval Based Estimation of Relevance (CIBER) to Determine Women's Emotion and Perception  
on Malaysia Road Environment during Covid-19**

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**Abstract** Road environment has been one of the factors contributing to road accidents. Research on the diversity of road users, condition and environment was discussed widely but in general. In Malaysia road environment is consider as one of the important factors in national agendas of Critical National Information Infrastructure (CNII). As women play a greater role in the population growth of a country, therefore, it is considered that women hold a great responsibility for nation sustainability. This paper focuses on road environment that centered on women's perception with the role of emotion as a predictor. This research also entails that emotions craft escapism which gives soothing sensation and relaxation on driving. Data collected via online google form and specifically targeted for female drivers. 93 respondents were able to participate in the survey. Results indicate that  $R^2$  equals to 0.27 from 99% confidence interval. The results predicted that emotions explained a moderate part in determining women's perception on-road environment. Meanwhile, respondents with negative emotions can separate their cognitive process, and does not affect their perception. The findings speculate that positive emotions have association towards perception, meaning that cognitive is relatively influenced by emotions, which in turn may affect on one's judgment. This paper contributes to women's sentiments on the Malaysian road environment research using Confidence Interval Based Estimation of Relevance (CIBER). Current research highlights that CIBER technique is efficient in predicting the behavior and use for behavior modification in the future, and it is significant for policy revision and recommendation. This research contributes to the body of knowledge on escapism as means to perceive the road environment. limitation of this research is that it is focal to women and data collected during the pandemic may disparate from other events or situations. Finally, this research suggests that future behavior interventions among road users at the national level were appropriate to establish.

**Keywords** Escapism, emotion, women perception, road environment, CIBER, COVID-19

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## 1. Introduction

World Health Organization (2018) has highlighted death occur across the globe happen for every 80 seconds, mainly were related to road user behavior. Narrow down the scope, statistic on road traffic injuries or death recorded by Malaysia is increasing approximately 44%. In addition, past research also proves that accident trends and severity of it caused by the diversity of road users (Musa et al., 2020) reflected that both combinations of road conditions and user's behavior are among the contributors to the accidents. However, those data reflect as a general view and inclusive of all road user categories.

Although road accidents are inevitable, silver lining on having pandemic creates less room for accidents to happen because various precaution regarding movement of people were introduced (Hijazi and Attiah, 2021). However, media reported that Malaysian statistic on road accident shows an increasing number since 2010 to the year of 2020. In which 2020, Malaysia just had been struck by COVID-19 virus, but the cases of accident increase at 14.6% in 2020 compared to 2019 (MIROS Reports 2020). This situation reflects that with or without pandemic, chances for road accidents to happen is still there.

Although statistic on road accident have slightly lesser than before the pandemic, somehow the universe has its own way to balance the scale. Data recorded that numbers of depressions keeps on increasing among Malaysian citizen. In 2020, data showed almost half a million people are having depression due to COVID-19. Nevertheless, in 2021, Malaysian cases on COVID-19 has spike to the unexpected numbers a day ("Home | COVID-19 MALAYSIA," n.d.) No doubt that this situation happened to Malaysian citizen make them depressed as they are trying to cope with the new norms. Indeed, recent data on second quarter of the year shows covid spike cases in Malaysia reaching almost in average 10,000 cases per day [6]. Hence, the scenario shrinking people's hope to coming back to normal activities are getting crushed.

Referring to the current situation, Malaysia government has launched the first phase of movement control order (MCO) again. First phase of MCO outlines unwavering rules. The activities become limited, people can't drive more than six miles from their home, only one person were allowed to go outside and drive to get the necessities, and children were not allowed to go out. Undoubtedly, the present episodes create tension among the community. Hence it created a chain of reaction of people having depression and anxiety. A proof of short survey done by previous research in early phase of movement control order shows that women suffer more from depression and anxiety (Rodríguez-Hidalgo et al., 2020).

There are many reasons caused this depression and anxiety, and nowadays many women in developing countries are holding the responsibility of family breadwinners during the pandemic (Sari and Fikri Zufar, 2021; Ziyae et al., 2021). The depression among women in pandemic may due to increase in domestic violence, change of routine, and job losses (Kim, 2020). As breadwinner fail to fulfill the family demand the tension becomes elevated. Meaning that, little movement caused anxiety, and previous study had proven that simple solution like having a short escape may reduce the stress level and improves well-being (Blank et al., 2018). In other words, short escape in distance and miles can help people to reduce stress. Ever since people were restrained from going outside of their house, in which most of their life activities are driving, it has elevated stress and anxiety. Therefore, this study focuses on women's emotion and its association towards the road environment.

## 2. Literature Review

Road environment in every country is different in layout, scenery, conditions and of course the users are also stands for different norms and cultures. The perception of road environment in every country is very important for the authorities and regulators to understands the problems and issue that may rise. Meanwhile, there are several factors that can influence people perception on the road environment, and mostly it related to one's cognitive, ability and emotions.

Driving associates with the perception on the road environment, at this context, the role of emotions in developing positive and negative perception on road environment play a crucial determinant. In this research, positive perception entails they are looking at Malaysian road environment as a safer road and convincing to drive alone, while the negative perception explains in contrast, such as danger to drive alone and the road conditions are not safe for them. Being alone while out there for women may trigger excessive anxiety or monophobia (Reddy, 2020). Indeed, anxiety is associated with perceived risk (Mesken et al., 2007), which it explains the tendency for individual to have a negative perception on the surrounding environment (Zadra and Clore, 2011)

Women are known as graceful characters, thus making them vulnerable to the road environment. It has been said that women tend to have a more careful driving behavior while men have slightly higher intention to speed than women

(Cestac et al., 2011).

Moreover, previous researches were focused on data gathering and analysis on the factors contribute towards driving behavior (Al-Balbissi, 2003; Bowen et al., 2020; Jawi et al., 2013; Vecino-Ortiz et al., 2014), however, seldom researches were found on the behavior interventions pertaining to driving especially women in Malaysia. Even though, women are tended to pick for safety driving behavior however, still they are exposed to a danger situation because there are other same road users may have higher intention to speed (Cestac et al., 2011).

Women and their femininity score positively predicted safety skills while driving (Özkan and Lajunen, 2006). Women, regardless of age, do not prefer to use a mobile phone while driving as compared to male drivers (Lipovac et al., 2017), which indicates women are more cautious, civil, vigilant, and complying with rules and regulations (Degraeve et al., 2015). These positive vibes of women driving behavior is good example and role model for society. In addition, women are better at regulating driving behavior for health reasons (Dykstra et al., 2020). This could bring meaning that driving becomes one of the habits to elevate psychological health. In addition, a good personality manifested excellent emotion, thus perceiving positive surroundings. Furthermore, past research supports those emotions influence individual perception, decision-making, learning, and improves memory (Brosch et al., 2013; Tyng et al., 2017). With such explanations, this research concludes that emotions may positively influence women's perception on the road environment. However, sadly, most female drivers are unintentionally involved in road accidents caused by other factors, primarily by other drivers and road conditions. The unfortunate events happen to female drivers because they lack of knowledge and sometimes tend to deliberate deviations from those practices believed necessary to maintain the safe operation (Bener and Crundall, 2008). Therefore, safer practices, alertness, and positive emotions are elements contributing to safer driving practices. Previous study mentioned, emotion is a psychological reaction to environmental stimulus, making the driver's emotions strongly influence behavioral intentions (Wang et al., 2020), therefore it postulates that emotions may trigger perception on the road environment, whether positive or negative, it resorting to the actions taken (behavior). It is supported by Zadra and Chore (2011) mentioned that Emotions provide a strong motivating influence on how the environment is perceived.

On the other hand, in the context of driving, there are many reasons as to why people are driving. People drive because it is a routine activity that complement's people action to entertain the world's demand in order to make living. However, along with those reasons, some added elements help spices on people's daily routine, and it is called emotion. Emotions help to create the arousal, spiritual and soul to activities. Thus, emotions create people's imaginations (Ravenscroft, 2015) and steer people's direction and life. There are many imaginations and terms created based on emotions, and one of them is escapism. Escapism is self-deception (Irimiás et al., 2021) or, in modern-day escapism, individuals are trying to avoid and take a break from their reality.

### ***Escapism with driving behavior***

Escapism was mainly associated with traveling, and it is good therapy that most people used to heal themselves. However, during this pandemic of Covid -19, the government and authorities are banning traveling activities due to safety reasons. It includes restrictions from tourism, vacation, cross border, and any long driving activity. The circumstances had leaving people whose love to drive lack of options to pursue their passion and need.

Although previous researches claim that long driving related to fatigue and tiredness (Irimiás et al., 2021; Phillips and Sagberg, 2013), however there are studies shows that driving may appear as a form to channel their emotions on the road (Kadoya et al., 2021; Steinhauser et al., 2018a) This can be proved by our world before COVID-19, in which people driving as an escapism and stress coping mechanism. It simply means that after a hectic day at work, juggling kids at home, sometimes people take a long drive as therapy and to recharge. However, it depends on the location of urban, and sub urban. Most in the major city, public transportation is accessible to the workplace and become the primary vehicle.

Nevertheless, past research focused on mobility and escapism, meaning people travel to escape the world's reality, give

pauses to life, or even taking a vacation. Driving plays a role as escapism, and study shows that emotions do influence on driving's behavior (Pecher et al., 2011), thus negative emotions create perception and feeling. This research mentions the role of emotions in creating perceptions; hence, the current context focuses on emotions and how it perceives the environment are vital for women's health and wellbeing. Furthermore, women have an essential role in the nation as it impacts the national population growth. As Malaysia is approaching an aging country, it is vital to give more attention to this group.

Escapism in the context explaining the positive and negative emotions that occur while driving. Some people driving because it makes them happy, and others use driving as an emotional distraction. Indeed, previous study proves that emotions alter driving behavior, directly and indirectly, and affect driving attention (Steinhauser et al., 2018b). Therefore, this research highlighted those emotions could create later situations depending on the positive or negative state. Hence the perception of women on Malaysia road environment will differ depending on their emotional state.

### 3. Materials and Methods

The purpose of this study to determine the role of emotion in explaining women's perception towards road environment. Self-administered questionnaires were distributed among female drivers using google forms. They are two domains that were asked, first is the emotions contains six items, and second domain is the perception on the road environment contains five questions. Meanwhile, social media becomes a platform and distributing channel for data collection and people who volunteer to participate in the study. The data collections took part across west Malaysia. The actual population for women drivers in Malaysia is indefinite; therefore, this research used convenient sampling for three months. The questionnaires used in this section were adapted from the Women's Perceptions on Road Environment (WPRE). WPRE has done a series of validation from experts and registered for copyright. WPRE consists of seven dimensions. For the purpose of this study, researchers took for only two dimensions which are emotion and road environment. Those two domains, becomes the variables of the study. Emotions is the predictor and road environment are the outcome variable. Table 1 are the list of items used in this study.

**Table 1:** List of Item for WPRE

Item	Factor loading
<b>E1: Driving helps to soothe my sadness</b>	0.656
E2: I sometimes cry while driving.	0.517
<b>E3: Driving helps me to forget all of my problems for a while.</b>	0.803
<b>E4: when I'm feeling happy, I would love to drive on a long journey</b>	0.813
<b>E5: When I'm in a good mood, I consider myself as highly tolerable with other drivers.</b>	0.718
<b>RE3: I have no doubt in driving alone outside of my hometown</b>	0.789
<b>RE4: I feel secure while driving alone at night</b>	0.725
<b>RE5: Driving alone at midnight does not scare me.</b>	0.832
<b>RE6: I never doubt that Malaysia road conditions are the best</b>	0.608
<b>RE8: As an overall, I feel safe to drive here in Malaysia</b>	0.569

*Total item Emotion value of Cronbach alpha is 0.784, AVE>0.5*  
*Total item Road Environment value of Cronbach alpha is 0.775, AVE>0.5*

Coding of E, stand for emotion and RE is road environment. Table 1: Items from WPRE with factor loading and total Cronbach Alpha for emotion variable is 0.78. The test of validity and reliability were done by previous research [36]. The value of factor loading is to determine the items is belong to the construct. If the factor loading is 0.5, the item can

be retained as long as the value of average variant extracted (AVE) is more than 0.5. item E2, was remain in the study as to see the differences based on different respondents and group of people, and the value of AVE is not violated the rules. Timeline for data collection were 3 months, however, the response rate retrieved at the first month was around 50 respondents and the rest were gathered in the rest of months. T-test was measured to see the differences of the data, and it shows that the first 50 respondents is no different with the rest of respondents (43) in the study ( $p > 0.05$ ) measuring the dependent variables (road environment). Group 1 (early) equal to Group 2 (late) test for normality of Shapiro-Wilks is  $p = 0.614$ . To run T-test analysis, both assumptions of normality and homogeneity of the variance must not be violated. Result from the test shows that there are no violations of the assumptions of normality and equal variances. Therefore, all 93 respondents can be analyzed together without biases.

**Table 2:** Independent sample t-test for group 1 and group 2 on road environment

	<i>Statistic</i>	<i>Df</i>	<i>p-value</i>	<i>f-value</i>
<b>Road Environment</b>	1.65	91	0.10	0.07

Significant level at 0.05

F-value is for Levene’s test more than 0.05 shows no violation of homogeneity of variance.

Table 2 indicates an independent-samples t-test to compare the perception on road environment on group 1 (early) and group 2 (late). There was no significant difference in the scores for group 1 (M=3.33, SD=0.51) and group 2 (M=3.13, SD=0.68) conditions;  $t(91) = 1.65, p = 0.1$ . These results suggest that group 1 (early) and group 2 (late) are no differences. Hence, data collected may represent the population sampling and the results and discussion made are reflected to the group.

After data has been collected, Jamovi was used to analyze the behavior change pattern. In Jamovi, test of Confidence Interval-Based Estimation of Relevant (CIBER) plot was used to determine women's emotions on perceiving the road environment. CIBER technique was appropriate to explain the means of a predictor concerning the road environment. Furthermore, CIBER explains better influences of the predictor (emotion) on environmental, genetic, and psychological variables. Psychological variables use to develop an intervention aimed at behavior change (Crutzen et al., 2017). This study is focuses on emotions that explain it influences on perception, and later trigger the behavior, hence, CIBER is the appropriate tool determine the emotions and predicted behavior upon the score of perception on the road environment.

The result in this study articulated to develop behavior intervention on women driving behavior at the national level. Even though the rate of accidents is considered small among women, however its fatality is hard to anticipate.

#### 4. Findings

Analysis using Jamovi produces a visual plot that explained in detail its association of the left and the right panel. Left panel depicted determinant of the study (emotion) and right panel is the dependent variable. Visual from Plot 1 illustrate the analysis of Confidence Interval-Based Estimation of Relevant (CIBER) plot for determinants 'E1', 'E2', 'E3', 'E4' & 'E5' and targets 'Road Environment' based on a dataset with 93 rows, 93 of which have complete data.

*CIBER Plot R<sup>2</sup> equals to 0.27 from 99% confidence interval*

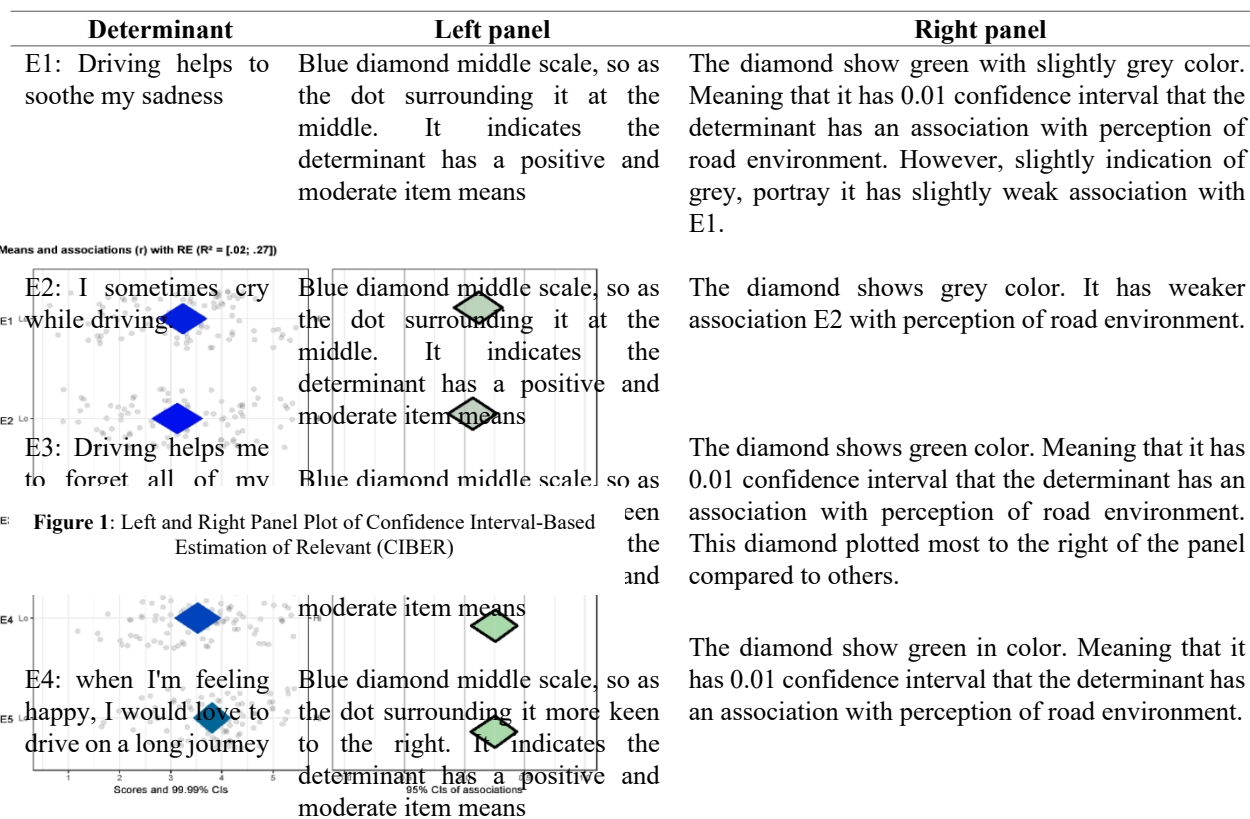


Figure 1: Left and Right Panel Plot of Confidence Interval-Based Estimation of Relevant (CIBER)

Darker blue toward dark green The diamond show green in color. Meaning that it has 0.01 confidence interval that the determinant has an association with perception of road environment. The diamonds in the left-hand panel show the item means with 99.99% confidence intervals. The fill color of the diamonds is indicative of the item means. The redder the diamonds are, the lower the item means, the greener the diamonds are, the higher the item means. In the middle of the scale, the higher the item means, the more respondents believe that they are tolerable drivers. Furthermore, the dots surrounding the diamonds show the item scores of all participants to prevent overplotting. 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 on the road environment. The fill color of the diamonds is indicative of the association strengths and their 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 ( $R^2$ ) of the outcome (in this case the direct measurement of perceiving road environment) is depicted at the top of the figure and based on all (sub-)determinants that are included (in this case emotions).

The panel also explain that majority of respondents have moderate emotions both in feeling happy and sad. However, the E5 in the left panel explains slightly positive emotion, in which it portrays a diamond of blue toward greenish color. In E5, the dot that surrounding the diamond also were keen to the right side of the panel. Meaning majority of the respondents agree that when they are feeling happy, they consider their self as good tolerable driver. The results of the left panel may have an association with the right panel.

Figure 1 depicted plot of Confidence Interval-Based Estimation of Relevant (CIBER) for determinants of emotions and target road environment. The association left panel and right panel show  $R^2=0.27$ , meaning 27% of the variance in road environment were explained by the determinant (emotions). Further elaboration on the associations by each determinant portray in Table 3.

**Table 3.** Association of left panel and right panel

Determinant	Left panel	Right panel
E1: Driving helps to soothe my sadness	Blue diamond middle scale, so as the dot surrounding it at the middle. It indicates the determinant has a positive and moderate item means	The diamond show green with slightly grey color. Meaning that it has 0.01 confidence interval that the determinant has an association with perception of road environment. However, slightly indication of grey, portray it has slightly weak association with E1.
E2: I sometimes cry while driving.	Blue diamond middle scale, so as the dot surrounding it at the middle. It indicates the determinant has a positive and moderate item means	The diamond shows grey color. It has weaker association E2 with perception of road environment.
E3: Driving helps me to forget all of my problems for a while.	Blue diamond middle scale, so as the dot surrounding it more keen to the right. It indicates the determinant has a positive and moderate item means	The diamond shows green color. Meaning that it has 0.01 confidence interval that the determinant has an association with perception of road environment. This diamond plotted most to the right of the panel compared to others.
E4: when I'm feeling happy, I would love to drive on a long journey	Blue diamond middle scale, so as the dot surrounding it more keen to the right. It indicates the determinant has a positive and moderate item means	The diamond show green in color. Meaning that it has 0.01 confidence interval that the determinant has an association with perception of road environment.
E5: When I'm in a good mood, I consider myself as highly tolerable with other drivers.	Darker blue toward dark green diamond indicates that higher item means meaning that respondents believe that they are tolerable drivers. Furthermore, the dot surrounding the diamond keener to the right side.	The diamond show green in color. Meaning that it has 0.01 confidence interval that the determinant has an association with perception of road environment.

Table 3 interpret results from the plot. Result for E1 indicates that it has positive and slightly weak association with road environment. The findings can be interpreted as negative feeling, or sad feeling does help most women drivers feel at ease and driving helps them forget problem and sadness a little while. In addition, the interpretation of negative feeling in E2 indicates that most respondents believe that driving is a medium for them to relief their sadness. However, in the right panel show a slightly weak association for E1 and E2 no association with the determinants, meaning that when they are feeling sad, the perception of road environment has nothing to do with it. As a saying goes don't let feelings cloud our judgment, meaning that, respondents try not to mix sad feeling with their cognitive processes. Therefore, feeling sadness (E1 and E2) are determinants that future research may want to consider as intervening items.

In E3, majority agree that driving helps them to forget a while of their problems. This indicate that, while driving, people need to put attention on the road thus, their mind were less thinking about the problems they have. It reveals that, driving also as a means for escapism in a small scale. Meanwhile, short escapism is a good therapy thus, it has a positive association with the road environment. same goes with E4, long driving is a short of emotional therapy or escapism, and the majority of respondents agree to that. E4 has a positive association with road environment. The result of E3 and E4 represent that the respondents believe that driving may elevated the feeling of happy and forget all problems and worries. This is crucial at this moment of pandemic in which people need to get some back routine activity like before the pandemic, and driving is actually one of the activities that exist both before and during the pandemic. The routine actually helps them kinetically remember the good moments of life before pandemic. Although the situation is different, but the routine of driving is similar.

Result for E5 interpret women who believe that they are tolerable drivers will have positive perception on the road environment. The result supported by previous finding whereby personality and cognitive have association towards driving behavior (Al-Balbissi, 2003; Bener and Crundall, 2008). Therefore, more positive inducements are needed from the authority to instill positive perception and developing self-esteem among women drivers so that they are more confidence, less anxiety and worry while on the road. Feeling of confidence is needed for people to complete the task and being present at the moment, in which very much needed while they are on the wheels.

The results conclude that negative emotion may lead to no association with perception on road environment, while positive emotion shows a positive association with road environment. Emotions play both positive and negative effect towards the perception on road environment. Furthermore, current study also reveals that women with negative emotions can separate their cognitive process, in which in turn do not affect their perception. At this point, researchers want to point out that women may have lots of emotional state, but when it comes to judgement women know how to separate facts and information from the bias perception. This is crucial because when they aware on the differences it helps to anticipate the prevention in road accidents.

## 5. Conclusions and Suggestions

Analysis using Confidence Interval-Based Estimation of Relevant (CIBER) is suitable for behavior intervention by looking at the result of the right panel (association for each item). If there is no association of the left panel with the right panel, it concludes that the item is not suitable for behavior modification in practical. Each result indicates item's worth in determining the associations so that, future intervention may want to refer based on current result. Intervention such as self-help and learning cognitive resources may help to manage stress and knows how to control intrusive thought (García-Almeida et al., 2015; Tice et al., 2007). Authorities related to women, road and transportation may want to consider this result as an intervention program especially with the determinants that have self an association with the perception of road environment on Malaysia. As stresses rise up during the pandemic, and movement control order (MCO) restricting driving activity (Hijazi and Attiah, 2021), women need an alternative to reduce daily stress. Current research concludes that driving as a stress-coping mechanism among women. Furthermore, elaboration from the findings show that driving can be an emotional therapy form of escapism, therefore authorities may want to consider encouraging them to be on the road by revisit laws and regulations especially during the MCO phases. Meaning by allowing women to drive more than 6 miles but not more than 2 hours of driving, for the purpose of short escapism. The solutions may help to reduces daily stress and life struggling during MCO. Simple step and actions from the authorities may help reducing the rising number of depressions among women in Malaysia.

Limitation of this research is that the emotional factor of women on escapism is related to the people taking a long drive. Thus, this research mostly covers respondents who have high mobility such as driving a long distance from home to the workplace. Furthermore, this research is concerns on women perception on the road environment as a general, in which age group categories were not consider in this study. Hence result from this study was only applicable to explain the respondents. However, this study is a platform for researcher in Malaysia to study the behavioral insight on women using CIBER techniques in which studies regarding CIBER technique and women emotions and behavior in the area of road environment were scarce. Future research may want to look at differentiation between age category as they exhibit different driving behavior, and younger generation regardless of gender may have engage more risky driving behavior [39]. Meanwhile, different locality also imposes different behavior because women drive in cities may have different result from the one that driving in rural area. Therefore, as this study collected respondents across west Malaysia in both city and rural area, therefore, the results of motions depicted all blues scale in the left panel of plot CIBER, (denotes in the middle) therefore, future research may want to segregate and test the differences of women's emotion between driving in the cities and in the rural area.

In literature contribution in this research presents result on positive emotions have influence on driver's perception on road environment, which the perception is important to steer the driving behavior. Meanwhile, study from Steinhauser et al (2018) mentioned that nothing is clear on the influence of positive emotions on driving behavior because it may appear directly or indirectly, therefore, this research contributes to the field of the study and warrants future research.

Apart from that, findings in this research also give significant contribution towards CNII in Malaysia of National Transport Policy 2019-2030. The results do helps give information on trends of growing and ageing population; as women become part of the national agenda in sustaining of nation population, hence this result may help adding value to the policy, concerning the mortality rate of a women in the road environment. In addition, this research also highlights those results of this study would be beneficial for New Car Assessment Program for Southeast Asian Countries (ASEAN NCAP) especially in providing data for ASEAN NCAP roadmap 2021-2025, Malaysian Institute Road Safety Research (MIROS), Ministry of Health (MOH) for helping women in Malaysia facing this pandemic and in anticipation of preventing more women involving in road accidents. Hence, future research should embark on quantitative survey at larger scale using current determinants. As this research was done in the midst of a pandemic, future research may consider looking at the post-pandemic situations as the results may vary because of changing the enforcement of rules and regulations such as lifting the MCO.

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