

# A Partial Least Square Approach to Predict Direct and Indirect Effects of Personality Traits, Aggressive Driving and Accident Proneness: An Integrated Safety and Logistics Framework

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**Abstract-** Accident Proneness is still a new concept in road safety studies in Malaysia. The study aims to examine the measurement model of personality traits, aggressive driving and accident proneness in a large sample of Malaysian licensed drivers. A further aim is to investigate both direct and indirect effects of personality traits and direct effects of aggressive driving on accident proneness. Data were collected using by-hand survey. Participants were 732 fully licensed motor vehicle drivers, including 490 males and 242 females who completed a questionnaire including the Five Factor Personality Traits, Aggressive Driving, items related to drivers' accident records and demographic characteristics. The result of PLS-SEM analysis revealed satisfactory measurement model of five factor personality traits, aggressive driving and accident proneness with acceptable convergent and discriminant validity. The results further show that the personality traits of conscientiousness negatively relate to accident proneness and aggressive driving. Openness to experience and aggressive driving are positively related to accident proneness while agreeableness is negatively related to aggressive driving and neuroticism is positively related to aggressive driving. In addition, the results show that agreeableness, conscientiousness and neuroticism have indirect effects on accident proneness through aggressive driving.

**Keywords-** Personality Traits; Aggressive driving; Accident proneness; Road safety; Road accident

## 1. Introduction

Road accident has consistently remained as a serious issue in Malaysia. Malaysia has recorded huge numbers of road accident fatalities compared to high income countries (7129 as of 2016; WHO, 2018). Besides, the proportion of fatalities due to road accidents in Malaysia is doubled compared to developed countries (23.0 in contrast to 9.2; WHO, 2018). This problem triggers the researchers and policy makers to reconsider the strategies of road safety counter measures to prevent road accidents in Malaysia.

This effort is in line to achieve the 2020 Sustainable Development Goal's (SDG's) target of 50% reduction in the road accident fatalities in Malaysia. It is widely known that 85% of the road accidents worldwide are caused by human behavioural related factors [1-2]. The literature on human behavioural factors has identified two primary contributing factors to road accidents such as driver's personality traits and aggressive driving [3].

### 1.1 Personality traits

The Five Factor model appeared as the most comprehensive paradigm of personality. The findings of previous studies have defined typical personality traits that describe variation across a broad range of human behaviours [4]. Some studies have looked at the empirical relations between the five factors and accident proneness, however the findings are diversified, with few findings have significant relationships [3], [5-6] and others not [7-9]. The crucial deficiency that could be discovered from previous studies is the five-factor model was measured as the distal predictors of accident proneness. Instead of considering the complexity of the driving situation, there are other variables that might have influence on accident proneness and could blunt the predictive validity of more distal predictors.

## 1.2 Aggressive driving

The behaviour and number of road accidents are primarily dictated by the style of the driver wants to drive or always drives. Aggressive driving continues to be the most common means that contributes to road accidents [2] and [10]. Definitions of aggressive driving has been argued based on observational behaviours and intentional behaviours [11]. Some studies that focused on observational behaviours have described aggressive driving as any reckless driving neglecting the safety of other road users by exposing them in unwanted danger [12-13]. Other researchers that focused on the intentional behaviours described aggressive driving as any type of driving style that is intended to physically or psychologically damage or injure other road users [14-16]. The present study will be using the second definition considering intention as the main factor and in line with the universal description of aggressive behaviour derived from the past studies. Thus, aggressive driving is defined as any unsafe driving actions that is carried out to cause harm intentionally to other road users. The constitution of aggressive driving with intention, for instance, drivers speed up to overtake and trying to annoy other drivers.

## 1.3 The contribution of present study

Accident proneness is still a new concept in road safety studies in Malaysia [17-18]. Accident proneness refers to drivers who have a higher tendency to involve in road accidents comparing with others when they are exposed to an equal hazard while driving on the road. Drivers are exposed to the same hazard when they are on the road, however, each of them has different perceptions and behaviour while driving that may influence drivers' affective demands, cognitive and emotional state while driving. Although, the concept of accident proneness leads the debates on developing preventive measures to combat road accidents globally [19-20], little attention has been paid to the effect and significance of drivers' personality traits, aggressive driving and accident proneness. As the consequence, the scientific studies on accident proneness concept are very limited in the available literature including Malaysia [17-18]. Therefore, in order to enhance sustainable countermeasures to reduce road accidents, it is therefore necessary to conceptualize and conduct research on accident proneness.

Furthermore, most studies on personality traits and aggressive driving have been conducted in countries with low road accidents rate such as the United Kingdom [20]; Israel [21]; United States [4]; Serbia [22]; Romania [16]; Norway [23]. Very few, if any, studies have examined the relationship of personality traits, aggressive driving and accident proneness in emerging country, particularly Malaysia as this may shed more light on the cultural generality about the conceptualization of accident proneness and the relation of personality traits and aggressive driving. An interesting research gap in current researches on personality traits and aggressive driving in Malaysia is that, the literatures mainly investigating only one sample from the driving population, generally motorcyclists and young generations [24-26]. Instead, studies in more developed countries have focused on a

combination of samples consists of young, adult and senior citizens, especially licensed drivers [2], [6] and [20]. There is a dire need investigation to be done among licensed drivers in Malaysia as a result to fill the gap in Malaysian literatures.

In addition, majority studies examined only the direct effects of personality traits and aggressive driving on the accident proneness, without considering possible indirect effects. Many studies that have studied complex relationships are not familiar with the current research, integrating all the direct and indirect effects between variables when predicting accident proneness among licensed drivers. More precisely, in addition to the direct relationship between personality traits and accident proneness, the present study aimed to further examine the possible mediating role of aggressive driving on accident proneness.

## 1.4 Aims of the present study

The present study was conducted to achieve the main aims as follows:

- (1) To examine the measurement model of personality traits, aggressive driving and accident proneness in a large sample of Malaysian licensed drivers.
- (2) To examine both direct and indirect effects of personality traits and direct effects of aggressive driving on accident proneness among Malaysian licensed drivers (see **Figure 1**).

It was hypothesized that that drivers with different personality traits may have practised different aggressive driving styles which, in effect, would them more prone to road accidents (see **Figure 1**). In such direct relationships, personality traits (e.g. agreeableness, conscientiousness, extraversion, neuroticism and openness to experience) were believed to affect mediating factors (aggressive driving). For example, driver with low agreeableness are more likely to drive aggressively and more prone to road accidents. It was also assumed that personality traits may have indirect effects on accident proneness with the role of aggressive driving as a mediator. The present empirical study also is interested to investigate the direct effects of five factor personality traits (e.g. (e.g. agreeableness, conscientiousness, extraversion, neuroticism and openness to experience) on accident proneness. In conclusion, this empirical study the relationships between the five factor personality traits and accident proneness both directly and indirectly (e.g. via aggressive driving; the mediating latent construct), in a dynamic structural framework (see **Figure 1**).

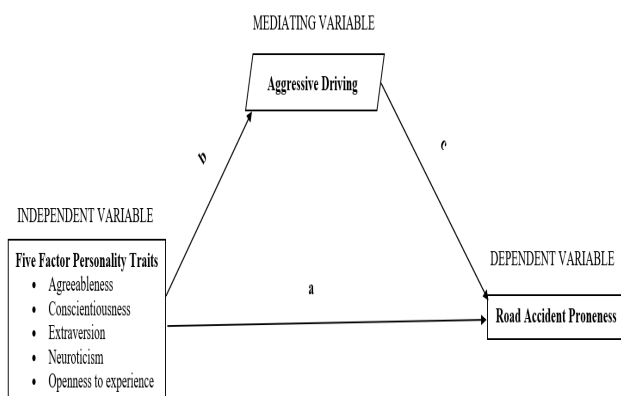


Figure 1. The Mediation Model

## 2. Methods

### 2.1 Procedure and participants

This cross-sectional study was conducted during April to July 2019. A self-administered questionnaire was given to the drivers selected from auto-services companies in Northern Malaysia. Taking into considerations on the number of drivers, the volume of vehicles on the roads in the states, the rate of fatalities and road accidents in different roads in all states in Northern Malaysia, 18 auto-service companies were selected for data collection. The random sampling procedure technique was used to select 18 auto-service companies covering four states in Northern Malaysia. The 18 auto-services companies were selected from all states in Northern Malaysia to ensure that all states were covered in terms of the homogenous characteristics. Data collection was conducted in the selected auto-service companies through a convenience sampling method in all four states in Northern Malaysia. All respondents participated in this study anonymously and voluntarily. No monetary or other kind of reward was offered for the participation in this study. A pilot study was conducted among 50 car drivers in Kedah before the actual data collection to ensure the survey instruments are valid and reliable. Outcomes from the pilot study contributes to several amendments in the questionnaire, such as some of the sentences of personality traits and aggressive driving were restructured. About 1200 questionnaires were distributed and 753 responses were received, giving a response rate of 63%. After excluding data with missing values and misleading answers, the final sample was 732 drivers (67% males) with an average age of 37.25 (SD = 8.35, range 23 – 68). The mean year of driving experience was 23.61 (SD = 7.58, range 5 – 35 years) with a mean total number of major road accidents of 1.24 (SD = 1.07), mean total number of minor accidents of 3.43 (SD = 1.97), mean total number of near misses of 5.38 (SD = 3.11) and mean total number of traffic summons of 4.46 (SD = 3.07).

### 2.2 Measures

#### 2.2.1 Five factor personality traits

The five factor personality traits which have been used in this study consist of 25 items assessed from International personality item pool adapted from [27]. Each personality

factor contains 5 items. This scale describes the driver's personality traits such as agreeableness, conscientiousness, extraversion, neuroticism and openness to experience. The drivers were asked to state their level of agreement about their personality traits while driving. Each item was evaluated in 5-point Likert-type scale (Very low = 1 to Very high = 5).

#### 2.2.2 Aggressive driving

The revised version of the aggressive driving test (AVIS) [28] was used to measure the driver's driving aggression in this study. The revised AVIS composed of 15 items with statements that represent different aspects of aggressive driving styles. The participants were asked to specify their level of agreement about their aggressive driving with each of the items was evaluated in 5-point Likert-type scale (Very low = 1 to Very high = 5).

#### 2.2.3 Accident proneness and demographic profiles

The participant was asked to indicate total number of accidents, near misses and traffic summons collected since getting a license. The number of road accidents, drivers involved was divided into two categories such as major and minor accidents. Participants were also asked to state their sex, age and driving experience.

### 2.3 Statistical analysis

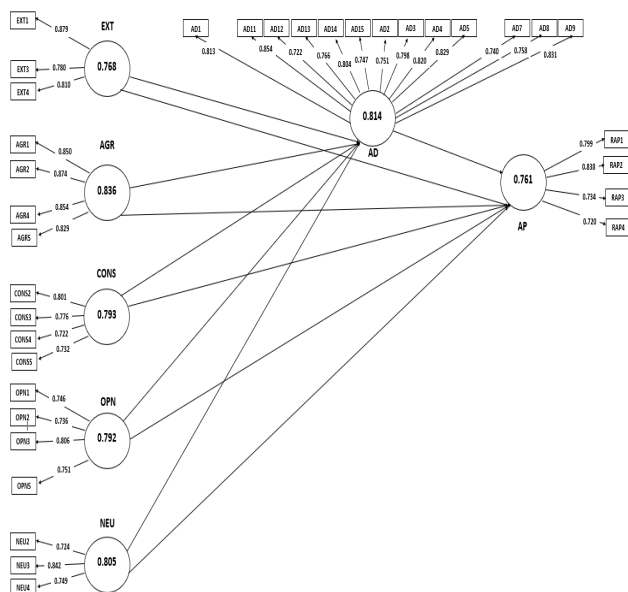
The SPSS version 24 and SMARTPLS 3.0 software were used to analyse the valid data of this study. Firstly, the demographic characteristics of the respondents were analysed using the descriptive statistics. Measurement model analysis was conducted to ensure that the constructs of five factor personality traits, aggressive driving and accident proneness fit for this study. The indicator loadings analysis followed by composite reliability of each construct was calculated in order to assess the internal consistency of the constructs. Convergent validity analysis to determine the average variance extracted (AVE) was examined to make sure the reliability of the items is acceptable. The AVE cut-off values for each item was set at 0.50. The convergent validity of each construct was analysed using the traditional metric technique. Next, to examine the direct and indirect effects of each construct, path modelling method was used with accident proneness as the dependent variable, aggressive driving as the mediating variable and five factor personality traits as the independent variables.

## 3. Results

### 3.1 Assessment of measurement model

The initial step in the measurement model assessment is examining the indicator loadings. Loadings more than 0.70 are recommended as they indicate acceptable item reliability [29]. There are several items were removed (e.g. EXT2, EXT5, AGR3, CONS1, OPN4, NEU1, NEU5, AD6 and AD10) because the loadings are less than 0.70 (see **Figure 2 and Table 1**). Figure 2 displays seven latent constructs such as EXT, AGR, CONS, OPN and

NEU as independent variables, AD as the mediating variable and AP as the dependent variable. The values directed to the items in the box represent the item loadings and the value inside the circle represent the average variance extracted (AVE).



**Figure 2.** Measurement model

Note: EXT = Extraversion, AGR = Agreeableness, CONS = Conscientiousness, OPN = Openness to experience, NEU = Neuroticism, AD = Aggressive driving and AP = Accident proneness

**Table 1.** Result of the measurement model

Constructs	Items	Outer Loadings	CR	AVE
<b>AGR</b>	AGR1	0.850	0.757	0.836
	AGR2	0.874		
	AGR4	0.854		
	AGR5	0.829		
<b>AD</b>	AD1	0.813	0.853	0.814
	AD11	0.854		
	AD12	0.722		
	AD13	0.766		
	AD14	0.804		
	AD15	0.747		
	AD2	0.751		
	AD3	0.798		
	AD4	0.820		
	AD5	0.829		
<b>CONS</b>	CONS2	0.801	0.827	0.793
	CONS3	0.776		
	CONS4	0.722		
	CONS5	0.732		
<b>EXT</b>	EXT1	0.879	0.835	0.768
	EXT3	0.780		
	EXT4	0.810		
<b>NEU</b>	NEU2	0.768	0.871	0.805
	NEU3	0.763		
	NEU4	0.738		

<b>OPN</b>	OPN1	0.746	0.815	0.792
	OPN2	0.736		
	OPN3	0.806		
	OPN5	0.751		
<b>AP</b>	RAP1	0.799	0.743	0.761
	RAP2	0.838		
	RAP3	0.734		
	RAP4	0.720		

Note: EXT = Extraversion, AGR = Agreeableness, CONS = Conscientiousness, OPN = Openness to experience, NEU = Neuroticism, AD = Aggressive driving and AP = Accident proneness

The second step is calculating the internal consistency reliability by using [30] composite reliability. [29] indicated that reliability values between 0.60 and 0.70 are considered acceptable and values between 0.70 and 0.90 are good. The composite reliability of this study is between the range 0.743 to 0.871 which are considered good (see **Table 1**).

The next step is examining the convergent validity. Convergent validity is to what degree the construct converges in order to describe the variance of its items. The metric used to determine the convergent validity of a construct is the average variance extracted (AVE) for all things on each construct. The acceptable value of AVE is 0.50 or higher [29]. The AVE of all constructs in this study are between 0.761 to 0.836 and are acceptable (see **Figure 2** and **Table 1**).

The final step in assessing the measurement model is investigating the discriminant validity. The discriminant validity in this study was assessed using traditional metric by [31]. The discriminant validity of this study is presented in Table 2.

**Table 2.** Result of Discriminant Validity (Fornell and Lacker criterion)

	AGR	AD	CONS	EXT	NEU	OPN	RAP
<b>AGR</b>	<b>0.914</b>						
<b>AD</b>	0.724	<b>0.902</b>					
<b>CONS</b>	0.647	0.678	<b>0.891</b>				
<b>EXT</b>	0.759	0.676	0.624	<b>0.876</b>			
<b>NEU</b>	0.713	0.649	0.667	0.755	<b>0.897</b>		
<b>OPN</b>	0.659	0.772	0.614	0.719	0.786	<b>0.890</b>	
<b>AP</b>	0.662	0.784	0.735	0.774	0.659	0.769	<b>0.872</b>

Note: EXT = Extraversion, AGR = Agreeableness, CONS = Conscientiousness, OPN = Openness to experience, NEU = Neuroticism, AD = Aggressive driving and AP = Accident proneness

Table 2 presented the result of discriminant validity through [31] criterion. In order to assess discriminant validity, each construct's AVE should be compared to the squared inter-construct correlation of that same constructs and all other measured construct in the structural model. The shared variance of all model constructs should not be larger than their AVEs [29]. In this study, the latent variables had explained better the variance on its own indicators than the variance of other latent variables, therefore the discriminant validity requirement for this measurement model had been fulfilled. In summary, the results of convergent validity and discriminant validity indicated that the measurement

model of this study is satisfactory and can proceed to the next step in evaluating PLS-SEM results.

### 3.2 Assessment of structural model

The assessment of structural model in this study is assessed based on the standard assessment recommended by [29] including the coefficient of determination ( $R^2$ ), the blindfolding-based cross-validated redundancy measure  $Q^2$ , and the statistical significant and relevance of the path coefficient.

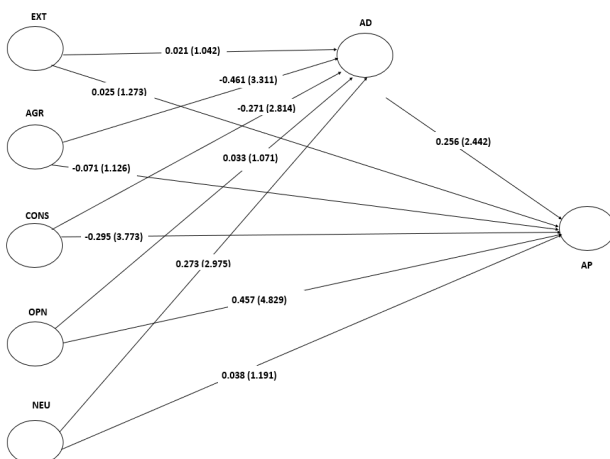
Before assessing the direct and indirect relationships, collinearity test was conducted to make sure the structural relationships do not bias the regression results. The VIF values are calculated in order to examine the collinearity. The VIF values of each construct are as followed (see **Table 3**). Table 3 indicates that all inner VIF values are close to 3 and lower, thus, no collinearity problem exists.

**Table 3.** Collinearity assessment

Construct	VIF
AGR	2.811
AD	2.543
CONS	2.771
EXT	2.045
NEU	2.587
OPN	2.763
RAP	2.256

Note: EXT = Extraversion, AGR = Agreeableness, CONS = Conscientiousness, OPN = Openness to experience, NEU = Neuroticism, AD = Aggressive driving and AP = Accident proneness

The next step was to test the direct and indirect relationship postulated in Figure 1. First, this study examined the direct relationship of five factor personality traits and aggressive driving on accident proneness (see **Figure 3**). Figure 3 exhibits the illustration of structural model to predict aggressive driving and accident proneness. The values inside brackets appeared on the arrows represented empirical  $t$ -value, while values outside brackets were path coefficients,  $\beta$ . The detailed results of the direct relationship structural model assessment were presented as follows (see **Table 4**).



**Figure 3.** PLS Structural Model

Note: EXT = Extraversion, AGR = Agreeableness, CONS = Conscientiousness, OPN = Openness to experience, NEU = Neuroticism, AD = Aggressive driving and AP = Accident proneness

**Table 4.** Direct Path Coefficients

Direct Path	Beta ( $\beta$ )	Standard deviation (SD)	t-values	p-values	$R^2$	Effect size ( $f^2$ )	$Q^2$
AGR $\rightarrow$ AP	-0.071	0.074	1.126	0.115	0.582	0.005	0.322
AD $\rightarrow$ AP	0.256	0.053	2.442	0.002		0.368	
CONS $\rightarrow$ AP	-0.295	0.072	3.773	0.001		0.323	
EXT $\rightarrow$ AP	0.025	0.066	1.273	0.223		0.007	
NEU $\rightarrow$ AP	0.038	0.061	1.191	0.265		0.009	
OPN $\rightarrow$ AP	0.457	0.051	4.829	0.001	0.357		
AGR $\rightarrow$ AD	-0.461	0.063	3.311	0.002	0.647	0.271	0.358
CONS $\rightarrow$ AD	-0.271	0.078	2.814	0.001		0.263	
EXT $\rightarrow$ AD	0.021	0.054	1.042	0.217		0.006	
NEU $\rightarrow$ AD	0.273	0.068	2.975	0.001		0.352	
OPN $\rightarrow$ AD	0.033	0.055	1.071	0.124		0.008	

Significant at p-value < 0.05, t-value > 1.645

Note: EXT = Extraversion, AGR = Agreeableness, CONS = Conscientiousness, OPN = Openness to experience, NEU = Neuroticism, AD = Aggressive driving and AP = Accident proneness

Table 4 indicates that AD ( $\beta = 0.256$ ) and OPN ( $\beta = 0.457$ ) were positively significant to AP, while CONS ( $\beta = -0.295$ ) was negatively related to AP. The variance in the endogenous construct (AP) explained by the model in the study was at moderate levels, 58.2% ( $R^2 = 0.582$ ). Moreover, AD and OPN were discovered to have large effect size while CONS has medium effect size. Another means of assessing the direct path of all predictors toward AP is by calculating the  $Q^2$  value. The  $Q^2$  value ( $Q^2 = 0.322$ ) recorded medium predictive relevance of the direct path on AP.

Further, the direct relationship of all predictors towards AD are summarized in Table 4. Among five latent factors, AGR ( $\beta = -0.461$ ) and CONS ( $\beta = -0.271$ ) were negatively related to AD, while NEU ( $\beta = 0.273$ ) was positively associated with AD. The  $R^2$  value of the endogenous construct (AD) is 0.647 that indicates a moderate level of variance explained by the predictors. The latent factors of AGR and CONS have medium effect size while NEU has a large effect size. The  $Q^2$  value ( $Q^2 = 0.358$ ) recorded medium predictive relevance of the direct path on AD.

Additionally, the indirect effects of five factor personality traits and accident proneness through aggressive driving are recapitulated as followed (see **Table 5 and Figure 3**). For instance, AGR ( $\beta = -0.132$ ), CONS ( $\beta = -0.158$ ) and NEU ( $\beta = 0.169$ ) have indirect effects on AP through AD. Also, the 95 per cent of bootstrap confidence interval (CI) does not straddle a 0 in between for the indirect effects AGR, CONS and NEU on AP through AD. This indicated that there is mediation [29].

**Table 5.** Indirect Path Coefficients

Indirect Path	$\beta$	SD	t-value	Confidence Interval	
				LL	UL
AGR $\rightarrow$ AD $\rightarrow$ AP	-0.132	0.027	3.055	-0.118	-0.030
CONS $\rightarrow$ AD $\rightarrow$ AP	-0.158	0.032	2.987	-0.073	-0.015
EXT $\rightarrow$ AD $\rightarrow$ AP	0.026	0.014	1.317	-	-

NEU → AD → AP	0.169	0.037	6.326	0.023	0.073
OPN → AD → AP	0.024	0.012	1.428	-	-

Significant at p-value < 0.05, t-value > 1.96

Note: EXT = Extraversion, AGR = Agreeableness, CONS = Conscientiousness, OPN = Openness to experience, NEU = Neuroticism, AD = Aggressive driving and AP = Accident proneness

#### 4. Discussion

The first aim of this study was to examine the measurement model of personality traits, aggressive driving and accident proneness in a large sample of Malaysian licensed drivers. In accordance with the recommendation by [29], this study analysed the convergent validity and discriminant validity. All constructs had acceptable and satisfactory internal consistency and reliability. Therefore, the first aim of this study was achieved.

Next, the second aim of this study was to test the direct effects and indirect effects between five factor personality traits, aggressive driving and accident proneness among Malaysian licensed drivers. The first part of the PLS-SEM analysis indicated a significant negative effect of conscientiousness and positive significant effect of openness to experience on accident proneness consistent. Several previous studies also reported a significant effect of conscientiousness and openness to experience on accident proneness [3], [16] and [32]. Drivers that have high conscientiousness and low openness to experience traits are discovered to practice a discipline driving style such as obeying the traffic signs and rules while driving their car, therefore are less prone to be involved in road accidents [33].

Further, the current study found that aggressive driving has a positive significant effect on accident proneness in accordance with previous studies [10], [15], [20] and [34]. A possible clarification was discovered in the study population that most of the drivers practicing aggressive driving styles such as tailgating, cutting-in and swerving in and out of traffic had experienced road accidents at least once with several outcomes (e.g. major, minor injuries, near misses or traffic summons) [33] and [35].

The next section of PLS-SEM analysis discovered that personality traits of conscientiousness and agreeableness have negative significant effects on aggressive driving consistent with other studies [11] and [16]. The trait of conscientiousness refers specifically to efficient self-discipline and personal management, which also represents the elements that prevents aggressive driving [11]. This could mean that a driver with high conscientiousness may seem themselves as good drivers that practice meek driving style.

Furthermore, the negative relationship between agreeableness and aggressive driving shows that as the degree of agreeableness is higher, the aggressive driving will be lower. In the driving context, the trait of agreeableness refers to a kind, sympathetic, cooperative, peaceful driving style that opposite of aggressive driving style. This means that a driver with high agreeableness will not engage in driving aggression on the road.

Besides that, the present study shows the positive significant relationship of neuroticism on aggressive driving. Studies have shown that neuroticism has a positive impact on aggressive driving [6] and [11]. Notably, neuroticism refers to the stable tendency to respond with negative emotions to threat, frustration, or loss. Therefore, individuals that have high traits of neuroticism might be easily frustrated, which in turn triggers aggressive driving.

The last section of PLS-SEM analysis in the present study showed the indirect effects of five factor personality traits on accident proneness through aggressive driving. Findings from present study shows that conscientiousness, agreeableness, neuroticism have indirect effects on accident proneness through aggressive driving. Studies have shown that aggressive driving has mediating effects between the relationship of conscientiousness, agreeableness, neuroticism on accident proneness [16]. The aggressive driving becomes less practiced while positive personality traits increase, for instance, high self-discipline (high conscientiousness), high empathy (high agreeableness), stable emotion (high neuroticism), which reduce the accident proneness of the drivers. In addition, these findings clarify that perceived positive personality traits are more robust in decreasing driving aggression towards low accident proneness. Consequently, this study concluded that the criteria for positive personality traits should be a concern to all stakeholders in Malaysia to encourage less accident proneness.

#### 4.1 Conclusion and practical implications

For academic researchers, this study has enhanced the existing body of knowledge related to accident proneness literature. There have been very limited studies on human behavioural factors associated to accident proneness given that most studies focus on young motorcyclist rather than drivers [35-37]. This study provides a valuable contribution to enhance the understanding of accident proneness and factors associated to accident proneness among large sample of drivers whom are considered as high-risk road users since they commute every day using their vehicle to fulfil their daily activities.

The findings of this study suggest potential intervention approaches for minimizing or preventing road accidents. This includes public education which is suitable for all road users including innovative mass media campaigns that reinforce the positive consequences associated with the adverse effects of road accidents or emphasize the negative consequences of involving in road accidents (e.g. major and minor injuries, permanent disability and post traumatic disorder). These strategies could be implemented starting from generation Z until baby boomers' drivers in Malaysia.

#### 5. LIMITATIONS OF THE STUDY

There are several limitations could be discovered in this study even though the aims are empirically achieved. First, the sample might not signify the Malaysian driver as a whole since the data set was gathered in Northern part of Malaysia, without taking account into all respondents

from entire Malaysia. Second, the self-report responses from the participants may be subject to bias. While confidentiality has been ensured in this study, the participants answers may portray themselves in a more advantageous manner to which traffic violations have not been committed. A possible recommendation for future studies is a driving simulator analysis as A simulator driving study would enable to test drivers' various driving styles that could predict the driver's accident proneness.

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