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Original article

## The Effects of Personality and Attitude on Risky Driving Behavior Among Public van Drivers: Hierarchical Modeling

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### ABSTRACT

**Background:** Traffic injuries have become a significant public health problem in low- and middle-income countries. Several studies have examined the role of personality and attitude toward traffic safety in predicting driving behaviors in diverse types of drivers. Few studies have investigated risky behavior among public passenger van drivers. This study aims to identify the predictors of self-reported risky driving behavior among public van drivers.

**Method:** A total of 410 public van drivers were interviewed at terminal stations in Bangkok. Hierarchical regression models were applied to determine the effects of demographics, personality traits, and attitude on self-reported risky driving behaviors.

**Results:** The results indicated that drivers with a high education level, more working days, and high scores for normlessness and anger were more likely to report risky driving behaviors ( $p < 0.05$ ).

**Conclusion:** The personality traits and attitude toward speeding account for aberrant self-reported risky driving behavior in passenger van drivers. This could be another empirical basis for evidence-based road safety interventions in the context of public transport.

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### 1. Introduction

Traffic injuries have been recognized as a leading cause of morbidity and mortality, especially in low- and middle-income countries [1]. As a result of rapid urbanization and industrialization, the level of vehicle ownership and the number of road vehicle users have increased significantly [2,3]. Notably, Thailand has the highest road traffic injury mortality rate and is second in the world ranking of road traffic fatality rates, with 36.2 deaths per 100,000 people, which is an increase from 24.2 deaths per 100,000 people in the last decade [4]. Therefore, the severity of road traffic accidents in Thailand is an emergent traffic safety issue to tackle.

Bangkok has been classified as one of the most traffic-congested cities. The city has promoted several public transportation systems to provide the accessibility for urban population, such as buses, motorcycle taxis, and high-speed trains. Additionally, public passenger vans have served as a common mode of public transportation for residents of Bangkok and the intercity due to their

accessibility and affordability. In 2019, a total of 50,241 registered public vans operated on more than 100 routes in Bangkok [5]. It has been reported that incidents by vans have the second highest rate of mortality and morbidity compared to other forms of public transportation. Therefore, passengers in the vans are considered to be a vulnerable group due to the risk that is twice as high as that of buses in this area [6].

Due to the high number of passengers compared to other modes of transportation, safety among van passengers has been considered a high priority on the Thai government's agenda. The government has made a substantial effort in addressing the road injury crisis by implementing additional regulations to improve safety through safety vehicle and driving control, including enforcing the 13-seat limit, incorporating the use of a global positioning system, installing speed limit trackers, and requiring fastened seatbelts while traveling [5]. In addition, all passenger van operators are required to show that they have had their vehicles inspected for safety.

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It is widely accepted that vehicle driving is a complex task that requires cooperation among cognition, decision making, and physical control to ensure road safety. Several research studies in the last decade have emphasized the role of personality characteristics in risky driving and crash risk [7–10]. The association among various individual personality traits, attitudes, and risk-taking driving behaviors has been investigated in depth among young drivers by Ulleberg and Rundmo [11]. Previous studies have demonstrated that personality traits and attitudes could partly explain the peculiarities of the driver and play a key role in safe driving [12–15]. Furthermore, a study by Blanchette and Richards indicated that personality and altruism are widely viewed as positive human personal characteristics that tend to make people cooperative and willing to help others [16]. Studies have shown that these characteristics are reasonably associated with safe driving behaviors. Individuals with a high altruism score are more likely to drive carefully to prevent aberrant driving behaviors, including violation, error, and lapses [16,17]. Although previous research has analyzed the effect of personality and attitude in different groups of drivers at different ages and levels, this study is the first to investigate personality traits, attitudes, and self-reported risky driving behaviors in a group of public passenger van drivers.

## 2. Material and methods

### 2.1. Sample and procedure

A total of 420 Thai male public van drivers aged  $\geq 20$  years who hold a valid van driver's license were enrolled in the study. The routine work of the drivers was limited to no more than 10 hours a day (driving and resting hours), with an average driving speed of 90 km/h during the regular routes of intercity or intra-urban services. Subjects were recruited at three main van terminal stations in Bangkok by two trained research assistants during March–April 2018. An estimated 30 minutes were spent on each interview.

### 2.2. Instruments

The questionnaire consisted of four parts: demographic information, personality traits, attitude toward traffic safety, and risky driving behaviors.

#### 2.2.1. Part I: Socio-demographic information

The participants' ages, education levels, self-reported body mass indices, driving habits (years spent driving, days spent driving per week, daily driving distances, and usual driving speeds), and daily incomes were recorded for the demographic survey.

#### 2.2.2. Part II: Personality trait measures

The personality traits consisted of 27 items: normlessness (three items) [11], sensation-seeking (six items) [18], anger (six items) [19], anxiety (six items) [20,21], and altruism (six items) [22]. The participants rated all the items on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

#### 2.2.3. Part III: Attitude toward traffic safety

A six-item attitude scale was included to measure the participants' risk-taking attitudes regarding driving, which was adapted from Arnau-Sabates et al. [23]. The participants rated all the items on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

#### 2.2.4. Part IV: Risky driving behaviors

Van drivers' behaviors at the wheel were measured with 10 self-reported items, which included mobile phone use while driving,

alcohol use, sedative drug taking, quality of sleep, drowsiness and fatigue, speeding, and aberrant driving in the past week. The answers ranged from 5 (always) to 1 (never). Sum scores of risky driving behavior were calculated.

### 2.3. Ethical approval

Ethical approval for the study was granted by the university (COA: 2018/02-034). Participants received oral and written information about autonomy, data management, and withdrawal before enrolment. All participants provided informed consent before completing the survey.

### 2.4. Data analysis

Descriptive statistics were applied to examine the characteristics of the participants. Hierarchical regression models were applied to determine the effects of personality and attitude to self-reported risky driving behavior. There were three main variable groups for the hierarchical models: (1) eight demographic variables, (2) five personality traits, and (3) attitude toward speeding.

## 3. Results

A total of 420 potential subjects were approached, and 410 were willing to participate in the study (with a response rate of 98%).

### 3.1. Sample profile

Table 1 reports the socio-demographic characteristics of van drivers and their driving habit and experience. Regarding their self-reported driving behavior, 41.5% were classified in the high-risk group.

### 3.2. Effects on risky driving behaviors

A hierarchical linear regression with three steps was performed: demographic characteristics were included in block 1 of the hierarchical model, personality variables were added in block 2, and attitude toward speeding was added in block 3 to predict risky driving behaviors. Eight variables of the characteristics were entered in the first step and were able to explain 4% of the variance of risky driving behavior ( $F [8,401] = 2.06, p < 0.05$ ). After entering the personality traits in the second step, the model explained 19% of the total variance ( $F [13,396] = 7.01, p < 0.001$ ). This indicated that the personality traits explained the additional 15% of variance in risky driving behaviors ( $R^2$  change = 0.147,  $F$  change [5,396] = 14.37,  $p < 0.001$ ). The third step was performed by entering the attitude toward speeding, and the model explained 19% of the total variance ( $F [15,394] = 6.26, p < 0.001$ ). The attitude data explained an additional 0.01% of the variance in risky driving behaviors ( $R^2$  change = 0.005,  $F$  change [2,394] = 1.32,  $p > 0.05$ ). The largest unique contribution was made by anger ( $B = 0.124, p < 0.001$ ), whereas a statistically significant contribution was made by normlessness ( $B = 0.076, p < 0.001$ ), education level ( $B = 0.052, p < 0.05$ ), and working day ( $B = 0.116, p < 0.05$ ). Therefore, respondents with a high education level, more working days, and a high score for normlessness or anger were more likely to report a greater number of risky driving behaviors on average ( $p < 0.05$ ) (Table 2).

## 4. Discussion

The present study examined the role of personality and attitude towards risky driving behavior among public van drivers through

**Table 1**  
Characteristics of the respondents (n = 410)

Variables	Frequency (%)
<b>Age group (years)</b>	
<30	33 (8.0)
30–39	83 (20.2)
40–49	132 (32.2)
>49	162 (39.6)
(Median = 45.5, QD = 7.5 Min = 24, Max = 75)	33 (8.0)
<b>Educational level</b>	
Primary school	151 (36.8)
Secondary school	120 (29.3)
Higher than secondary school	139 (33.9)
<b>Van driving experience (years)</b>	
<5	163 (39.8)
5–10	166 (40.5)
>10	81 (19.8)
(Median = 7, QD = 3 Min = 0.3, Max = 40)	
<b>Daily income (Baht)</b>	
<400	109 (26.6)
400–500	154 (36.7)
501–1000	109 (26.6)
>1,000	38 (9.3)
(Median = 500, QD = 81 Min = 200, Max = 5,000)	
<b>Body mass index (kg/m<sup>2</sup>)</b>	
<18.5	11 (2.7)
18.5–22.9	113 (27.6)
23–24.9	89 (21.7)
25–29.9	139 (33.9)
≥ 30	58 (14.1)
(Median = 24.89, QD = 2.68 Min = 16.46, Max = 49.59)	
<b>Daily driving distance (km/day)</b>	
<100	54 (13.2)
100–199	140 (34.1)
200–299	137 (33.4)
300–399	57 (13.9)
>399	22 (5.4)
(Median = 200, QD = 55, Min = 20, Max = 1,050)	
<b>Number of working days in the past week</b>	
1–6 days	297 (72.4)
Every day	
(Median = 7, QD = 0.5 Min = 1, Max = 7)	
<b>Driving speed (km/h)</b>	
<80	329 (80.2)
80–90	49 (12.0)
>90	
(Mean = 90, S.D. = 4.5 Min = 60, Max = 110)	
<b>Self-reported risky behavior</b>	
Low risk	170 (41.5)
High risk	240 (58.5)
<b>Personality traits and attitude</b>	
	<b>Mean (SD)</b>
Normlessness	2.97 (0.90)
Sensation seeking	1.60 (0.63)
Anger	1.75 (0.67)
Anxiety	2.03 (0.74)
Altruism	4.56 (0.52)
Attitude towards speeding	2.43 (0.85)

the model of Ulleberg and Rundmo [11] and provided a better understanding of these two factors for road safety interventions in the context of public transport. The study highlighted that anger, normlessness, and more working days were systematically related to van drivers' behaviors. Consistent with previous studies among Serbian and Chinese drivers, the present study found that self-

**Table 2**  
Hierarchical linear regression results of risky driving behaviors

Dependent variable	Risky driving behaviors		
	Independent variables	Model I	Model II
<b>Socio-demographics</b>			
Age (control)	-.002 (.002)	-.001 (.002)	-.001 (.002)
Educational level (control)	.044 (.023)	.050* (.021)	.052* (.022)
Driving experience (control)	-.016 (.025)	-.020 (.023)	-.021 (.023)
Daily income (control)	.055 (.082)	.039 (.076)	.039 (.076)
BMI (control)	.007 (.035)	-.007 (.032)	-.006 (.033)
Daily driving distance (control)	.059 (.033)	.051 (.031)	.052 (.031)
Number of working days (control)	.108* (.054)	.115* (.051)	.119* (.051)
Usual driving speed (control)	.000 (.042)	.018 (.039)	.016 (.040)
<b>Personality traits</b>			
Normlessness		.077*** (.019)	.076*** (.019)
Sensation seeking		.020 (.030)	.020 (.030)
Anger		.127*** (.029)	.124*** (.029)
Anxiety		-.034 (.025)	-.033 (.025)
Altruism		.058 (.035)	.055 (.035)
<b>Attitude</b>			
Attitude towards driving speed			.014 (.021)
R <sup>2</sup>	.040	.187	.188
Δ R <sup>2</sup>		.147	.001
ΔF	2.062	14.368	4.78
F		7.006	6.531

Note: The first line in each cell is the raw regression coefficient, and the second line is the standard error value.

\*\*\*Significant at the 0.1% level.

\*\*Significant at the 1% level.

\*Significant at the 5% level.

reported anger predicted risky driving [24,25]. Several research studies identified that driving anger interferes with cognitive processes, such as attention and decision making; therefore, people experiencing anger could increase their risky driving, which could be displayed as aggressive driving, speeding, and aberrant driving behaviors [26–28]. Alonso et al. reported that the differences in the perception of aggressive behaviors depend on social situations and on the driver's personal features [29]. In addition, research studies confirmed that an anger trait has consistently been associated with greater crash involvement among drivers in different countries [25,27]. It has been reported that in a state of anger, drivers usually travel at high speed, maintain a short following distance, and are more likely to present aggressive behaviors, such as changing lanes with acceleration [30,31].

The effects of drivers' education levels on their risk-taking driving behaviors have been reported in previous studies. A driver's education level can be considered the key component of socio-economic status, and a high education level is associated with high self-esteem and high personal performance [32]. This individual characteristic has the tendency to involve more risky behaviors in traffic, especially breaking road traffic rules [33]. Similarly, drivers with higher education in Southern California have frequently been reported to more likely drive at illegal speeds than

drivers with a lower educational level [34]. In a study conducted in Ghana, drivers with medium and high socio-economic status, including high education levels, were found more likely to be associated with a high frequency of risky driving behaviors than drivers with lower levels [35].

A positive association with the number of hours reported per week was found for traffic penalties among public transport drivers [36]. More working days per week among Thai van drivers was found to compare to commercial drivers in Turkey (6.55 vs 5.60 days/week) [37]. The working patterns of professional van drivers were similar to those of taxi drivers, which was considered a repetitive condition, and the inability to concentrate on the road while driving could result in fatigue, exhaustion, and a tendency to ignore safety procedures [38]. Working as a professional driver was reported as fatigue and affected the employees' functional capacities, responses, emotional exhaustion, and burnout, which could increase the risk for traffic crashes [38–42].

The present study shows that normlessness is related to self-reported risky driving behaviors among van drivers. It has been reported that psychological traits are significant predictors of risk-taking while driving [25,43]. Our findings can possibly be explained by the socio-cultural background of some personal characteristics concerning avoidance of social rules or regulations [44], which might play a major role in inducing risky driving tendencies in this population.

Excessive speed has been known to be a key contributor to public vehicle injuries in Thailand [5]. Driving in a complex road situation at excessive speed is a common risk for crash or near-crash involvement [45]. It is commonly known that the compensation for driving depends on the number of routes driven per day. Therefore, more routes generate more income, which motivates the driver to increase the speed. Furthermore, driving at excessive speed increases the accident risks of van drivers. Speed limits differ in Asian countries; for example, 90 km/h and 80 km/h are the rural speed limit and urban speed limit, respectively, in Thailand, whereas 40 km/h and 90 km/h are the urban speed limit and the rural speed limit, respectively, in Cambodia and Lao People's Democratic Republic [46]. A study of ambulance crashes in Thailand indicated that driving at excessive speed resulted in increased risks for road crashes [47]. It was indicated that speeds lower than 30 km/h can reduce the traffic fatality rate to below 10%, while driving over 50 km/h can result in a greater fatality rate, with an 80% possibility of serious collision [48]. It is important to note that road traffic legislation on speeding remains a challenge for road safety action in Thailand.

Practical implications for road traffic action to address the road safety crisis are urgent issues in Thailand. The emotional control programs for public drivers should be implemented to enhance safety outcomes. The strategy would be to focus the interventions on the emotional factors, such as anxiety and hostility that in the present study were related to aberrant driving behaviors. Similarly, anger expressed in driving situations may trigger aggressive behavioral responses that distract drivers and increase the probability to commit violations, errors, or lapses, thus putting drivers' and passengers' security at risk. The interventions designed to promote traffic safety in different groups of the public thus should work on including emotion regulation strategies, specifically in traffic situations. In addition, screening and implementing to focus the intervention upon drivers' attitudes should be used to enhance road safety.

Future research efforts should offer a deeper understanding of the personality, driving behavior, and crash involvement across varied public driver groups. Our study has certain limitations. First, the majority of van drivers were male, which may have limited the ability to generalize the study findings to the wider

population of Thai van drivers. Second, the use of self-reported driving behavioral measurements may have been susceptible to reporting or recall biases. To generalize the relationship between education level and risk-taking behavior, further research evidence based on a representative sample is recommended. Lastly, it is crucial to emphasize that the small impact size of the associations between personality traits and the potential for road traffic injury suggests that study disclosures should be treated with caution in applying them in the context of policy-making strategy.

## 5. Conclusion

We found that self-reported risky driving behaviors were associated with education level, more working days, and high scores for normlessness and anger. The present findings confirmed that the personality traits and attitude account for self-reported risky driving behaviors in passenger van drivers.

## Author contributions

Wirampa Tanglai and Orapin Laosee designed the study and supervised the project. Ching-Fu Chen supervised the data processing and analysis. Wirampa Tanglai performed the statistical analysis and drafted the manuscript. Cheerawit Rattanapan and Orapin Laosee helped revise the manuscript. All authors have seen and approved the final manuscript.

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## Conflicts of interest

All authors have no conflicts of interest to declare.

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