Journal of the Society of Automotive Engineers Malaysia
Volume 5, Issue 1, pp 13-21, January 2021
e-ISSN 2550-2239 & ISSN 2600-8092

Development and Validation of a New Questionnaire Assessing Women Perception on Malaysian Road Environment (WPRE)

I. H. Abu Samah[*1,6], I. M. Abd Rashid[2,6], W. A. F. Wan Husain[3], A. S. Shamsudin[4], M. H. Amlus[5,6], N. S. A. Rahim, S. N. Ramlan[1,5] and A. F. Salleh[6]

[1]Faculty of Social Sciences & Humanities, Universiti Teknologi Malaysia (UTM)
[2]Faculty of Business, Universiti Teknologi Mara (UiTM), Melaka
[3]Faculty Industrial Management, Universiti Malaysia Pahang (UMP)
[4]College of Business, Universiti Utara Malaysia (UUM)
[5]School of Business Innovation & Technopreneurship, Universiti Malaysia Perlis (UniMAP)
[6]Sport and Engineering Research Centre (SERC), Universiti Malaysia Perlis (UniMAP)

[*]*Corresponding author: irzahanie@utm.my*

ORIGINAL ARTICLE **Open Access**

Article History:

Received
15 Aug 2020

Accepted
30 Oct 2020

Available online
1 Jan 2021

Abstract – *High mobility rate among women has made them more vulnerable in the road environment. Lifestyle changes have urged many women to increase their mobility due to accommodate current demand. Therefore, women are exposed to the risk of accidents as many of them are populated in the road environment. However, most studies and instrumentation on-road environments are universal and not specifically targeting women's perception and anticipation preventing road accidents. Hence, the current study is developing and validating instrumentation of women's perception in Malaysia Road Environment. The sample of this study is 93 women with various age numbers. Out of 7 constructs, 6 were found most reliable and valid with the Cronbach Alpha value > 0.75. The present research provides details of factor analysis results, composite reliability, average variance extract, and reliability analysis which all concluded that the internal consistency of WPRE was not violated. Results reveal items developed are suitable to be adapted in future research with some modification. Finally, this research contributes to developing and validating women's perception in a road accident which is reliable and valid for measuring WPRE.*

Keywords: Women, other drivers, emotion, Malaysia road environment, ability, new questionnaire, instrumentation, validation

Journal homepage: www.jsaem.saemalaysia.org.my

1.0 INTRODUCTION

Globally, almost three times as many males as compared to females die from road traffic injuries in several developing countries (World Health Organization, 2018). The statement makes that females are having fewer injuries in the event of road accidents. The situation always made up an assumption for most of the regulators to run a test and car crash simulation dummy using a model whose figured as a man. It is undeniable that this situation clearly pictures that man requires extra attention in the road accident topics. However, there is a lack of perception when saying only men do have a higher risk of road accidents because nowadays women's mobility rate is increasing day by day as they are becoming family breadwinners. Furthermore, the risk is greater for women when Malaysia has recorded the third-highest death rate of road accidents in the Asian region (Lum, 2019). Despite the current situation, however, less attention was given to women about their situation. Even so, women tend to have safer driving behavior (Cestac et al., 2011; Taubman-Ben-Ari & Yehiel, 2012), however, it does not guarantee that they are free from any risk on road.

1.1 Women and Road Environment

Having a good road user does not guarantee that there will be no accidents. There are also other factors that can cause accidents especially the road condition and the heterogenous of the road users. Research has proven that human behavior and environmental factors were discussed as a topic for road accidents (Sami et al., 2013), in which human error is most often to blame in road accidents (Hole, 2018). In discussing human error that causes road accidents, research has looked into the demographic factor of the road users which consist of male, female, and various age categories. Statistics showed that injury and fatality rates for males are higher for every category of road injury victim in several developing countries (WHO) it is because high speeding on the road is likely to occur among male drivers (Cestac et al., 2011). This circumstance can cause harm to other drivers especially women, as they are actually at greater risk of death or injury when a crash occurs (Barry, 2019). Meanwhile, previous research presented that adult drivers have four different styles of driving which are risky, angry, anxious, careful (Taubman-Ben-Ari & Katz-Ben-Ami, 2013). Different personality styles also depend on gender, for example, empathy and tolerance are more exhibited by female drivers than male drivers (Cordellieri et al., 2016). Meanwhile, due to the personality differences and different styles of driving imposed by the drivers, women have a higher risk on the road (Santamariña-Rubio et al., 2014).

However, past researches on driving behavior (Martinussen et al., 2013, 2014; Rosli et al., 2017) regardless of respondents' age, gender, and personality, they being assessed using Driver Behaviour Questionnaire (DBQ). Therefore, this study, using the evidence from the literature, current research develops the content of WPRE's item based on the significant female's opinion (Rolinson et al., 2018).

2.0 METHODOLOGY

2.1 Instrument Development

The risk that exists in the road environment is derived from people, road conditions, and many other factors that are generally involved in the event of a road accident. Several factors that contributed towards road accident such as personality (Cestac et al., 2011) which research had

proven that femininity score predicted positively safety skills while driving (Özkan & Lajunen, 2006), gender (Lipovac et al., 2017) which female had better-driving behavior, and driving styles careful (Taubman-Ben-Ari & Katz-Ben-Ami, 2013) which driving styles of anger and risky were less among women. Meanwhile, based on ordinary driver's opinions (female) (Rolinson et al, 2018) on factors of road accidents are based on vehicle, behavior, road, and physical condition (Rolison et al., 2018). Table 1 portrays the constructs and explanation of female driver's opinions. The explanation of the constructs interpreted about female driver's opinion on the accident risk that may occur to them in the road environment. It classifies the term in general without having to scrutinize each concept that listed in the explanation table. Therefore, after critical review, there is a need to further expand and categorize the construct better to suit our current research need, which is to answer the women's perception of the Malaysian road environment.

Table 1: Female driver's opinion

Construct	Explanation of the constructs
Vehicle	Vehicle defect, brakes, steering, overload
Behavior	Other drivers, excessive speed, dangerous driving, distraction, loss of focus, careless, overconfidence, uncertain, illegal U-turn, fail to signal, mobile phone, sudden brake.
Road condition	Hazard, dazzling light, objects, animal, oil, mud
Physical condition	Under drug influence, fatigue, physical impairment, eyesight, mental

Source: *Adapted from Rolinson et al. (2018)*

WPRE Questionnaire was develop grounded by the study of Rolinson et al. (2018). The current research used findings from the previous researchers to create and categorize the constructs and items into different factors which are tabulated in Table 2.

Table 2: Initial development of construct WPRE

Factors	Item
Ability	11
Emotion	5
Another Driver	10
Precaution	4
Road Condition	5
Road Environment	8
Physical condition	8

Source: *Author*

Table 2 portrays several factors identified in this research. above factors were discovered by Rolinson et al (2018). Hence, current research interpreted the findings of driver's opinions based on female drivers into a construct. Each construct has its own items. Examples of the item for each construct are depicted in Table 3.

Table 3: Construct and items

Construct	Items
Ability	1. I consider myself as an experienced driver 2. I can drive alone on the highway without any fear 3. I can drive alone on the rural area without any fear
Emotion	1. Driving helps to soothe my sadness 2. I sometimes cry while driving 3. Driving helps me to forget all of my problems for a while.
Another driver	1. I always experience other drivers speeding behind me without safe distancing 2. I always see other drivers making an illegal U-turn 3. I always see other drivers disobeying traffic light
Precaution	1. I frequently check my brakes, lamp and signal before driving 2. I frequently get my hands off the steering while driving just to check the alignment of the car. 3. I am anxious if I'm driving with a full passenger in a car.
Road Condition	1. I usually drive on the road that is under construction. 2. The road that I use usually had inadequate signage. 3. The road that I use usually have either oil or mud.
Road Environment	1. In my opinion, Malaysian road environment is the safest road in southeast Asia. 2. I have no doubt in driving alone in my hometown. 3. I have no doubt in driving alone outside of my hometown
Physical condition	1. Sometimes I feel fatigued while driving for more than 1 hour. 2. I cannot drive for long hours due to back pain 3. I cannot drive for long hours due to my health condition

Source: *Author*

3.0 RESULTS AND DISCUSSION

3.1 Result Analysis of WPRE

Measuring the instrument development and validation requires looking at the exploratory analysis which looking at the factor loading and also confirmatory factor analysis looking at the measurement model.

Table 4: Descriptive analysis (N=93)

	Minimum	Maximum	Mean	Standard Deviation
Ability	2.27	5.00	3.546	0.520
Emotion	1.60	5.00	3.400	0.776
Another Driver	2.40	5.00	3.915	0.576
Precaution	1.13	4.25	3.029	0.603
Road Condition	1.00	4.00	2.724	0.643
Road Environment	1.75	4.88	3.240	0.598
Physical Condition	1.13	4.25	2.680	0.603

Source: *Author*

The questionnaire was distributed to women respondents using google form and within two weeks, 93 respondents were able to give feedback the content validity was measure by experts and proofreading before the questionnaire was distributed out. Results in Table 4 portray descriptive analysis of the construct. A 5-point Likert scale was used for the respondent to answer the statement ranging from strongly disagree-1 to strongly agree-5. The result reveals that the maximum answer is 5 and the lowest is 1. The majority of respondents are at intermediate and low in the belief of the WPRE. The lowest means score is physical condition interpret that respondents not favorable with the questions. Descriptive analysis able to explain that respondent's opinion on the WPRE is varied with the score of standard deviation indicates the value spread out wider range which is far from the mean score.

Meanwhile, to measure the internal consistency of the construct, factor loading using factor analysis (maximum likelihood) with rotation matrix explain in Table 5.

Table 5: Factor Loading

	Ability	**Emotion**	**Another Driver**	**Precaution**	**Road Condition**	**Road Environment**
A1	0.628					
A2	0.813					
A3	0.844					
A4	0.824					
A5	0.816					
A6	0.739					
A8	0.526					
E1		0.656				
E2		0.517				
E3		0.803				
E4		0.813				
E5		0.718				
OD1			0.805			
OD2			0.745			
OD3			0.851			
OD4			0.846			
OD5			0.505			
OD9			0.608			
PRE3				0.856		
PRE4				0.882		
RC2					0.762	
RC3					0.509	
RC4					0.802	
RC5					0.900	
RE3						0.789
RE4						0.725
RE5						0.832
RE6						0.608
RE8						0.569

Factor loading acceptable >0.7

Table 5 explains the factor loading that belongs to their construct. Indicators of each construct should at least have a score value of more than 0.7. However, some loading that showed less than 0.7 is retained as the value of AVE is more than 0.5 (Hair et al., 2012). The diagonal table indicates that the score for each indicator belongs to their construct.

Table 6: Indicator deleted

Construct	Indicator	Item
Precaution	PRE1	I frequently check my brakes, lamp and signal before driving
	PRE2	I frequently get my hands off the steering while driving just to check the alignment of the car.
Road Condition	RC1	I usually drive on the road that is under construction.
Another Driver	OD6	I experienced a car in front of me putting on the emergency brakes while driving.
	OD7	I always see drivers on their mobile phones while driving.
	OD8	sometimes I feel that the drivers around me are not tolerable.
	OD10	I always see a driver with a slow reaction causing trouble on the road.
Ability	A7	I consider myself focused on the road while driving.
	A9	Slow reaction drivers can trigger my anger.
	A10	I abide by all the rules and regulations on the road.
	A11	Sometimes I ignore the rules and regulations on the road.
Road Environment	RE1	In my opinion, Malaysian road environment is the safest road in southeast Asia.
	RE2	I have no doubt in driving alone in my hometown.
	RE7	I believe that Malaysian people are adhering to traffic rules and regulations.

Table 6 explains indicators that have been eliminated as the loading score is less than 0.7. even though the loading score is less than 0.7, however, researchers emphasizing that the deleted item should be tested in vast in future research. the deleted item was due to the low score of loading, which the score may vary across the group of women ages. Meanwhile, Table 7 explains the measurement model.

Table 7: Measurement model

Construct	Item	Loading	AVE	Cronbach Alpha	CR
Ability	A1	0.628	**0.562**	**0.866**	**0.898**
	A2	0.813			
	A3	0.844			
	A4	0.824			
	A5	0.816			
	A6	0.739			
	A8	0.526			
Emotion	E1	0.656	**0.504**	**0.784**	**0.832**
	E2	0.517			
	E3	0.803			
	E4	0.813			
	E5	0.718			

Another Driver	OD1	0.805	**0.560**	**0.851**	**0.882**
	OD2	0.745			
	OD3	0.851			
	OD4	0.846			
	OD5	0.505			
	OD9	0.608			
Pre-Caution	PRE1	0.443	**0.569**	**0.381**	**0.565**
	PRE3	0.856			
	PRE4	0.882			
Road Condition	RC2	0.762	**0.581**	**0.790**	**0.842**
	RC3	0.509			
	RC4	0.802			
	RC5	0.900			
Road Environment	RE3	0.789	**0.526**	**0.775**	**0.845**
	RE4	0.725			
	RE5	0.832			
	RE6	0.608			
	RE8	0.569			

In the measurement model, convergent validity was tested to see whether the construct shares a high proportion of variance in common, and to assess this Hair et al. (2012) suggested looking at factor loading (>0.7). Meanwhile, Composite reliability (>0.7 to 0.9) and AVE (>0.5). All value of these was mention in Table 7, which has met the requirement of reliability and convergent validity at this stage. However, 1 latent construct of pre-caution being eliminated as the Cronbach alpha is less than 0.7 and CR less than 0.8. Next, to assess discriminant validity, this research using Fornell and Lacker (1981). The construct of its own must load higher than other constructs and this can be checked by cross-loading in Table 8. The latent variables explained better the variance on its indicators than the variance of other latent variables. Therefore, discriminant validity in this study is not violated.

Table 8: Fornell & Lacker analysis

	Ability	**Emotion**	**Another Driver**	**Precaution**	**Road Condition**	**Road Environment**
Ability	**0.750**					
Emotion	0.202	**0.710**				
Another Driver	-0.100	0.174	**0.749**			
Precaution	0.464	0.041	0.191	**0.755**		
Road Condition	0.676	0.283	-0.161	-0.257	**0.725**	
Road Environment	-0.230	0.099	0.141	0.303	-0.120	**0.762**

Diagonal represents the root square of AVE while the off-diagonal represents correlations.

Meanwhile, The SRMR value shows a good fit for both the saturated model (0.10) and the estimated model (0.10). The value that indicates less than 0.10 or 0.08 is considered a good fit (Hu & Bentler, 1999). Based on the analysis above, WPRE instrument development and validation is good and reliable to proceed among women drivers in Malaysia. The final instrumentation of WPRE is not finalized yet as one construct being eliminated, yet the item could probably give a significant impact in future bivariate analysis.

4.0 CONCLUSION

The overall result shows that WPRE Questionnaire is stable and ready to embark on Structural Equation Modeling in the future. However, some of the indicators were deleted due to factor loading, Cronbach Alpha and Composite Reliability are less than the minimum value. However, due to the first pilot study testing the instrumentation, current research suggests a larger sample for a retest of the reliability analysis. Furthermore, current research also proposed using Confidence Interval-Based Estimation Result (CIBER) in the future to look at the behavior intervention on women in anticipation of prevention in a road accident. Behavior intervention may lead to behavior modification and techniques suggestion that could be an idea for ASEAN NCAP to use as a reference to instill safe driving behavior among women. The limitation of this research is it does not have any correlational study, or regression analysis to look at the effect of WPRE on women driving behavior. Therefore, this research warrants further investigation on WPRE in any form of research.

ACKNOWLEDGEMENTS

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the ASEAN NCAP ANCHOR III Grant (No. A3-C371) and (PY/2020/04534).

REFERENCES

Barry, K. (2019). The crash test bias: How male-focused testing puts female drivers at risk. Consumer Report. Retrieve from https://www.consumerreports.org/car-safety/crash-test-bias-how-male-focused-testing-puts-female-drivers-at-risk/.

Cestac, J., Paran, F., & Delhomme, P. (2011). Young drivers' sensation seeking, subjective norms, and perceived behavioral control and their roles in predicting speeding intention: How risk-taking motivations evolve with gender and driving experience. Safety Science, 49(3), 424-432. https://doi.org/10.1016/j.ssci.2010.10.007

Cordellieri, P., Baralla, F., Ferlazzo, F., Sgalla, R., Piccardi, L., & Giannini, A. M. (2016). Gender effects in young road users on road safety attitudes, behaviors and risk perception. Frontiers in Psychology, 7, 1412. https://doi.org/10.3389/fpsyg.2016.01412

Hair, J. F., Sarstedt, M., Pieper, T. M., & Ringle, C. M. (2012). The Use of Partial Least Squares Structural Equation Modeling in Strategic Management Research: A review of past practices and recommendations for future applications. Long Range Planning, 45(5-6), 320-340. https://doi.org/10.1016/j.lrp.2012.09.008

Hole, G. (2018). The Psychology of Driving. Routledge. https://doi.org/10.4324/9781315516530

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural equation modeling: a multidisciplinary journal, 6(1), 1-55. https://doi.org/10.1080/10705519909540118

Lipovac, K., Đerić, M., Tešić, M., Andrić, Z., & Marić, B. (2017). Mobile phone use while driving-literary review. Transportation Research Part F: Traffic Psychology and Behaviour, 47, 132-142. https://doi.org/10.1016/j.trf.2017.04.015

Lum, M. (2019). We have the third highest death rate from road accidents. The Star. Retrieve from https://www.thestar.com.my/lifestyle/health/2019/05/14/we-have-the-third-highest-death-rate-from-road-accidents/

Martinussen, L. M., Hakamies-Blomqvist, L., Møller, M., Özkan, T., & Lajunen, T. (2013). Age, gender, mileage and the DBQ: The validity of the Driver Behavior Questionnaire in different driver groups. Accident Analysis & Prevention, 52, 228-236.

Martinussen, L. M., Møller, M., & Prato, C. G. (2014). Assessing the relationship between the Driver Behavior Questionnaire and the Driver Skill Inventory: Revealing sub-groups of drivers. Transportation Research Part F: Traffic Psychology and Behaviour, 26, 82-91. https://doi.org/10.1016/j.trf.2014.06.008

Özkan, T., & Lajunen, T. (2006). What causes the differences in driving between young men and women? The effects of gender roles and sex on young drivers' driving behaviour and self-assessment of skills. Transportation Research Part F: Traffic Psychology and Behaviour, 9(4), 269-277. https://doi.org/10.1016/j.trf.2006.01.005

Rolison, J. J., Regev, S., Moutari, S., & Feeney, A. (2018). What are the factors that contribute to road accidents? An assessment of law enforcement views, ordinary drivers' opinions, and road accident records. Accident Analysis and Prevention, 115, 11-24. https://doi.org/10.1016/j.aap.2018.02.025

Rosli, N. S., Yunus, J. M., & Hanan, S. A. (2017). Testing the Driving Behaviour Questionnaire (DBQ) on Malaysian drivers. In Proceedings of the 12th Malaysian Universities Transport Research Forum Conference (MUTRFC 2017), Universiti Teknologi Mara, Selangor.

Sami, A., Moafian, G., Najafi, A., Aghabeigi, M. R., Yamini, N., Heydari, S. T., & Lankarani, K. B. (2013). Educational level and age as contributing factors to road traffic accidents. Chinese Journal of Traumatology, 16(5), 281-285. https://doi.org/10.3760/cma.j.issn.1008-1275.2013.05.005

Santamariña-Rubio, E., Pérez, K., Olabarria, M., & Novoa, A. M. (2014). Gender differences in road traffic injury rate using time travelled as a measure of exposure. Accident Analysis & Prevention, 65, 1-7. https://doi.org/10.1016/j.aap.2013.11.015

Taubman-Ben-Ari, O., & Katz-Ben-Ami, L. (2013). Family climate for road safety: A new concept and measure. Accident Analysis & Prevention, 54, 1-14. https://doi.org/10.1016/j.aap.2013.02.001

Taubman-Ben-Ari, O., & Yehiel, D. (2012). Driving styles and their associations with personality and motivation. Accident Analysis & Prevention, 45, 416-422.

World Health Organization (2018). Global status report on road safety 2018. World Health Organization. Retrieve from https://www.who.int/publications/i/item/9789241565684