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Psychosocial Determinant of Occupational Safety and Health Among Chainsaw Operators in Southwestern Nigeria: Application of the Theory of Planned Behavior.

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Abstract

Chainsaw is one of the mechanized wood harvesting tools being used in the forest sector, fatalities and serious injuries common among chainsaw operators are of high percentage. The aim of this study was to utilize the Theory of Planned Behavior (TPB) model to assess the behavioral intention of operators towards occupational health, safety which can be influenced by occupational stress. Occupational stress, health and safety risks can influence behavioral intention and outcome expectation among chainsaw operators, and the TPB model was effective to help detect some of its constraints, which are significant to this fundamental study. Participants of about two hundred and fifteen ranging from twenty (20) years of age to eighty-three (83) years elderly men were selected randomly at the felling/logging sites (n = 215) and a questionnaire survey tool was used for quality assessment including eight (8) dichotomous items and twenty-seven (27) Likert items. The reliability test for the data collected was assessed using Cronbach's Alpha, estimated to be 75.4%. Results indicated that out of the model's constructs applied, attitude to behavior and subjective norm with p – value of 0.000 and 0.004, respectively, were significant predictors while others were not virtually relevant during this research. This implies that attitude to behavior and subject norm could influence operator's expectation of their behavioral intention to occupational stress management, compliance with health, safety and environmental impact awareness, which may help to prevent occupational accidents and minimize the negative impact of chainsaw operation in the environment.
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Keyword: Psychosocial; occupational stress; safety and health; chainsaw operators; theory of planned behaviour.

INTRODUCTION

Forestry workers are primarily involved in logging activities that are classified as heavy workload activities (Masci *et al.*, 2022b). Logging generally includes three primary work tasks, which are designated as felling, delimbing, and bucking (Muhdi *et al*., 2020; Masci *et al.*, 2022a). Felling consists of cutting down the tree; delimbing refers to cutting or trimming branches, as well as the upper part of the tree, and bucking consists of cutting the tree trunk into smaller pieces (Masci *et al*., 2022a). These three processes, on a metal tooth. Chainsaw milling is seen as a debatable trade because it does not really adapt into sustainable forest management (SFM) initiatives; its unsustainable dependency on limited resources by local communities and it is associated with non – regulation industry and illegal operations. Lack of unemployment is a critical factor driving many people to use forests unsustainably through illegal timber falling. Cerutti and Lescuyer (2011). Chainsaw operation has some adverse impacts on the environment such as increased rate of deforestation with resultant effect on the environment, illegal logging and felling, depletion of rural community's livelihood Owoyemi *et al.*, (2013).

The forest sector operation is one of the most dangerous occupations worldwide, due to its very high physical and psychological demands. Many forms of risks and perils are associated with the sector. Some records show that a high percentage of fatalities and serious injuries are common among chainsaw operators (Masci *et al.*, 2022a). According to Okon *et al*. (2019) risk factors involved in chainsaw operation include having little opportunity to influence the work; lack of experience of the work; negligence and inappropriate actions of the operators; smoking; poor physical fitness; and a previous history of muscular and joint disorder, exposure to excessive noise and vibration. Operators are often exposed to Carbon (II) Oxide emission and the risk of biomechanical overload in the low back, which negatively impacts their health (Iftime *et al.*, 2020; Masci *et al*., 2022a). In addition, there is also a high level of physiological workload among chainsaw operators that is associated with awkward body postures during the activity, poor psycho-social environment, little recognition for heavy work performed and low self-esteem (Okon *et al.*, 2019; Masci *et al.*, 2022a).

Psychological determinant can be defined as a person's individual characteristics, such as cognitions, beliefs and motivation that could potentially be associated with physical activity (Bauman *et al.*, 2012). According to Thomas *et al.* (2020), psychosocial factors are characteristics that influence an individual psychologically and/or socially. Such factors can describe individuals in relation to their social environment and how these affect physical and mental health. Psychosocial refers to the interrelationships between individuals' thoughts, behaviors, and their social environment (Nkporbu *et al.*, 2016). To effectively prevent, mitigate and control these workplace accidents, adverse environmental impacts, occupational stress, occupational health and safety risks, a behavioral model was developed to carefully assess the work related psychological and social behavior which could influence health, safety, efficiency and productivity of operators before, during and after operation. The Theory of Planned Behavior (TPB) is a socio-psychological model that seeks to understand human behavioral intentions and assesses how individuals' intentions transform into specific behaviors. Therefore, the aim of this study was to evaluate the psychosocial behavioral intention of chainsaw operators towards their compliance to occupational health and safety measures and their understanding of the impacts of chainsaw operation on the environment using TPB predicting the presumption of attitudes, subjective norms, and percieved behavioural control of the chainsaw operators.

Theory of planned behaviour

The TPB is a social psychological model that seeks to understand the human behavioral intention and assess how individuals intentions transform into specific behaviors (Figure 1). Its central tenet is that a person's intention to perform a given behavior is based on three factors; attitudes, subjective norms and perceived behavioral control (Oludoye *et al.*, 2023). Ajzen introduced TPB as a model to evaluate the impact of social pschological factors and this is considered as one of the most useful socio psychological models for understanding and predicting human behavioral and has been applied to the prediction of a wide range of social and health behaviours (LarMorte, 2022). Over the last decade, there has been increased interest in

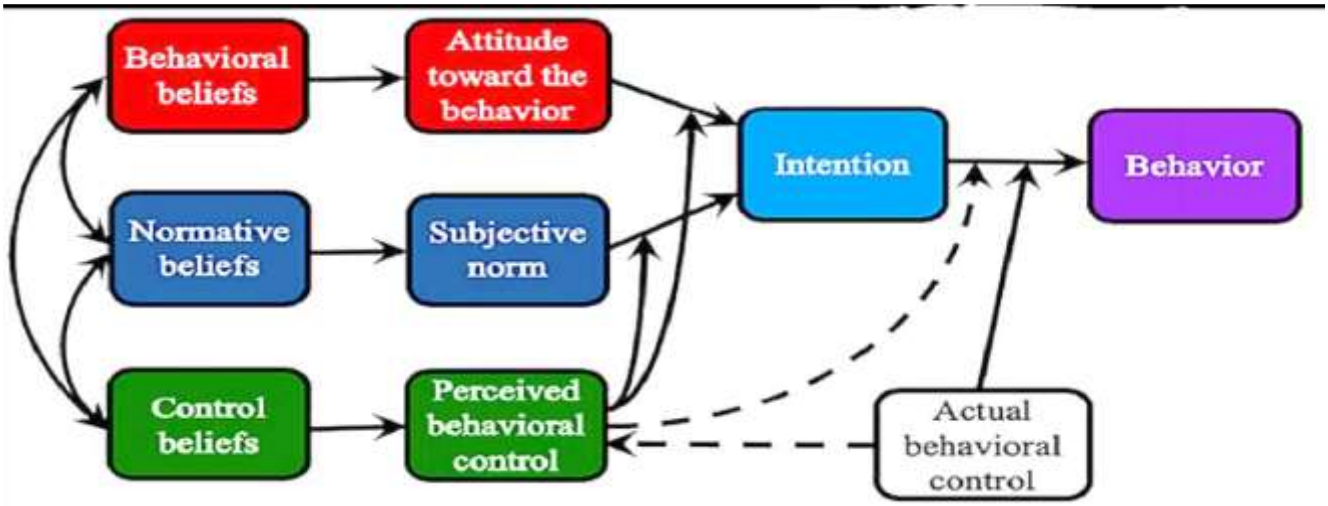

Figure 1: A schematic of the theory of planned behavior diagramatic model
Source: Ajzen (2019).

applying the TPB to environmental science research world wide since it can provide valuable implications not only for predicting and managing individual behavior, but also for increasing social and environmental sustainability (Li *et al*., 2019).

METHODOLOGY

Study Area

The study was carried out in Ado Odo, Ota Local Government Area (LGA's) in Ogun State, Nigeria (Figure 2). It lies betweeen Longitudes 2^0 53E and 3^0 14E, and Latitudes 6^0 39N and 6^0 30N. The LGA covers an area of 1,460 square kilometres and shares boundaries with Lagos State in the South, Yewa South(Egbado), Ifo LGA in the West and Ipokia LGA in the North East (Ogunyemi *et al.*, 2017).

Figure 2: Map showing the study area.

It lies in the tropical sub–equatorial climatic zone and experiences a high temperature throughout the year. The soils are pooly drained and exhibit the colour of the underlying geology and the residents mostly engage in farming, fishing, trading and hunting (Balogun *et al.*, 2015).

Data collection

The chainsaw operators were mainly residents of Ado Odo-Ota LGA of Ogun State; some are registered members of the Felling Machine Operator Union of Nigeria (FMOUN) while some belongs to Plank Sellers' Association of Nigeria (PSAN) (Iju/Iyana). Two hundred fifteen (215) operators were sampled using a random sampling method which was done individually and in groups using questionnaire that consist of nine (9) socio – demographic survey items and six (6) sessions which consist of eight (8) dichotomous questions and 27 Likert scale items. Operators were approached at felling sites and sawmills, they were educated on the importance of the study particlarly on their health, safety and the work environment. Then, after a period of two (2) months, operators volunteered to provide reliable information to the survey questionnaire with an agreement on maximum confidentiality. The validated questionnaire was based on the constructs of the theory of planned behavior. This are TPB constructs measure

Attitude to behavior

The operator's target attitude to behavior (positive or negative) towards OS and the adverse impact of their operation on their health, safety and the environment.

Subjective norm
The social and environmental influence of important personalities' concern on the operators towards OS and the adverse impact of their operation on their health, safety and the environmental.

Perceived behavioral control (PBC)
Operator's cognizant of their behavioral control towards OS and the adverse impact of their operation on their health, safety and the environment.

Intention
Operator's disposition towards OS and the adverse impact of their operation on their health, safety and the environment.

Behavioral
Operator's conduct towards OS and the adverse impact of their operation on their health, safety and the environment.

Safety and environmental impact awareness
Operator's awareness on safety and the impact of chainsaw operation on the environment.

The operator's safety and environmental impact awareness measure was designed to validate that they were truly the right people to participate in this survey, which implies that they are the appropriate operators that can provide relevant, adequate, and reliable data for this study to guarantee the specificity and accuracy of the data collected.

Reliability of data
Data collected was assessed using the Cronbach's Alpha estimated to be 75.4%, and from 75.4 – 100% justifies the questionnaire used for this study.

RESULTS AND DISCUSSION

Demographic distribution of operators
Figure 3 shows the age of the chainsaw operators, which was evenly distributed with no noticeable bias towards any age group. Chainsaw operators aged 48-57 years constitutes the highest percentage (31.2%) while operators aged 18-27 years constitutes the lowest percentage (11.2%). The marital status of the chainsaw operators who are married was (63.3%) being the highest, while the single status has the lowest percentage (8.8%). The study was more influenced by the response of the married operators. The educational

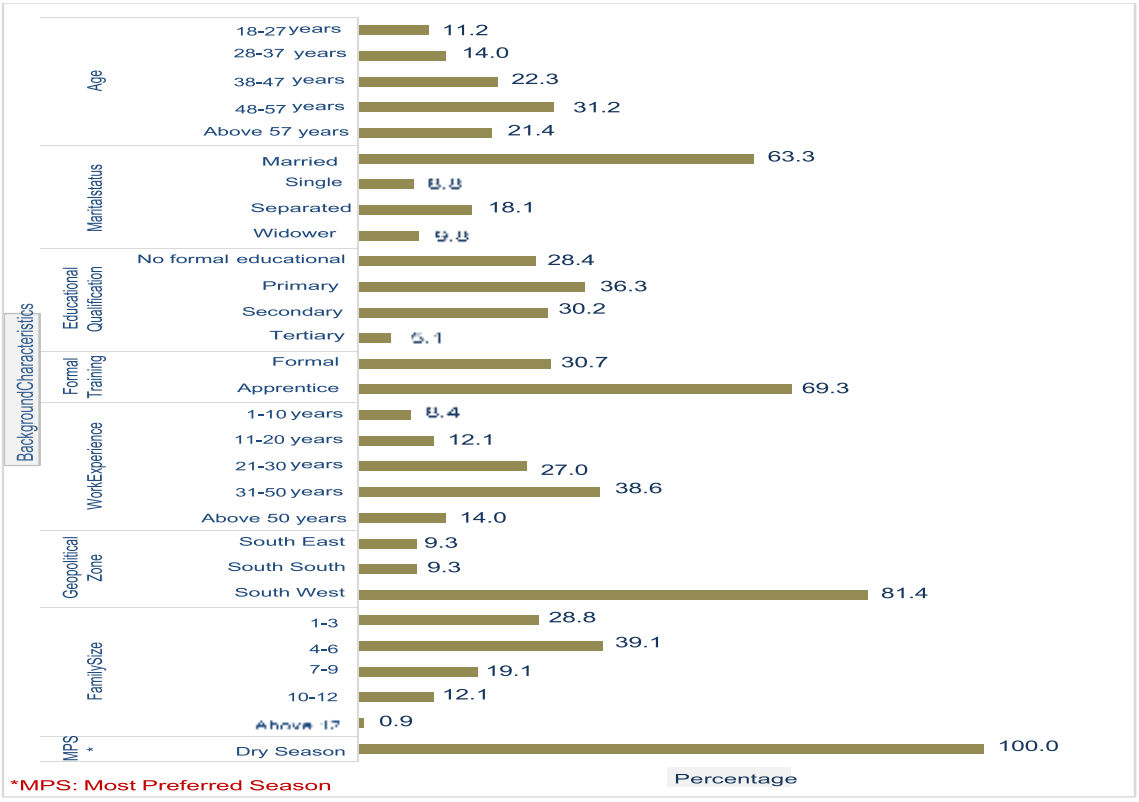

Figure 3: Demographic distribution of chainsaw operators

qualification of operators has the tertiary education holders as the lowest percentage (5.1%), while the remaining percentages were distributed among other categories, that is, no formal education (28.4%), primary education (36.3%) and secondary education (30.2%). The majority of the operators claimed they were formally trained (69.3%) and the responses likely to be biased towards this group with respect to training. Operators who have worked for 31-50 years have the highest percentage (38.6%), while those within 1-10 years have the least percentage (8.4%). Southwest have the highest percentage of operators (81.4%) than other regions in the south. Operators with family size ranges between 4-6 constitutes the highest percentage (39.1%), followed by family size between 1-3 (28.8%). Virtually all operators prefer dry season for their logging activities.

Safety and environmental impact awareness

Chainsaw operators have different opinions as regards the health and safety risks involved in chainsaw operation. About 50.8% of operators were adequately aware of the health, safety risk and the environmental impacts of their work and work environment, but 49.2% of the operators were not aware (Table 1).

Table 1: Distribution of Responses on OS, Safety and Environmental Impact Awareness

Awareness	No	Yes
Have you heard of safety and environmental impact awareness?	48.8	51.2
Do you have any prior training on question 1 above?	68.8	31.2
Do you agree that the Chainsaw operation contributes to environmental pollution?	74.9	25.1
Are you aware of personnel protective equipment (PPE)?	77.2	22.8
Do you often encounter work accident/injury due to OS?	0.0	100.0
Do you go for medical check often?	15.8	84.2
Can you really manage OS?	31.2	68.8
Average Percentage	49.2	50.8

The Personnel Protective Equipment (PPE) awareness was 22.8% as well as their regular safety protection while 77.2% are not aware neither do they take their regular protection seriously. Although, 51.2% are aware of their work safety and the impact of the activities on the environment. This implies that they are not naive to their health, safety and environmental impact awareness. About 25.1% of the operators believed that their activities actually contribute to environmental pollution while about 74.9 could not agree to that. Lack of training on safety and environmental impact poorly contributed to operator's overall awareness score. Interestingly, virtually all operators in the context of this study do encounter work accidents. About 84.2% of the operators claimmed to do medical checkup as at when due, and 68.8% claimed they could manage occupational stress (OS) at work. Figure 4 shows the categorical distribution of operator's responses which implies that 57.7% have a good awareness against 42.3% with poor awareness, 59.5% displayed poor attitude against 40.5% of good attitude, 57.7% showed poor subjective norm against 42.3% good subjective norm, 62.8% could control their perceived behavior against 37.2% that could not, 61.4% displayed poor behavior against 38.6% of good behavior while 60.5% have poor intention and 39.5% possess good intention about their occupational safety and environmental impact awareness.

Percentage distribution of demographics and variables

Table 2 shows demographic characteristics and variables against the safety and environmental impact awareness of chainsaw operators. This indicates the variables that are significantly associated with operators' awareness. Age, marital status, formal training, work experience, attitude and subjective norm were found to be significantly associated with operators' safety and environmental impact awareness. This shows a significant relationship exists between occupational stress, safety and environmental impact awareness and the TPB variables. The association of the attitude and subjective norm of the operators are statistically significant at ($p<0.05$). However, perceived behavioral control,

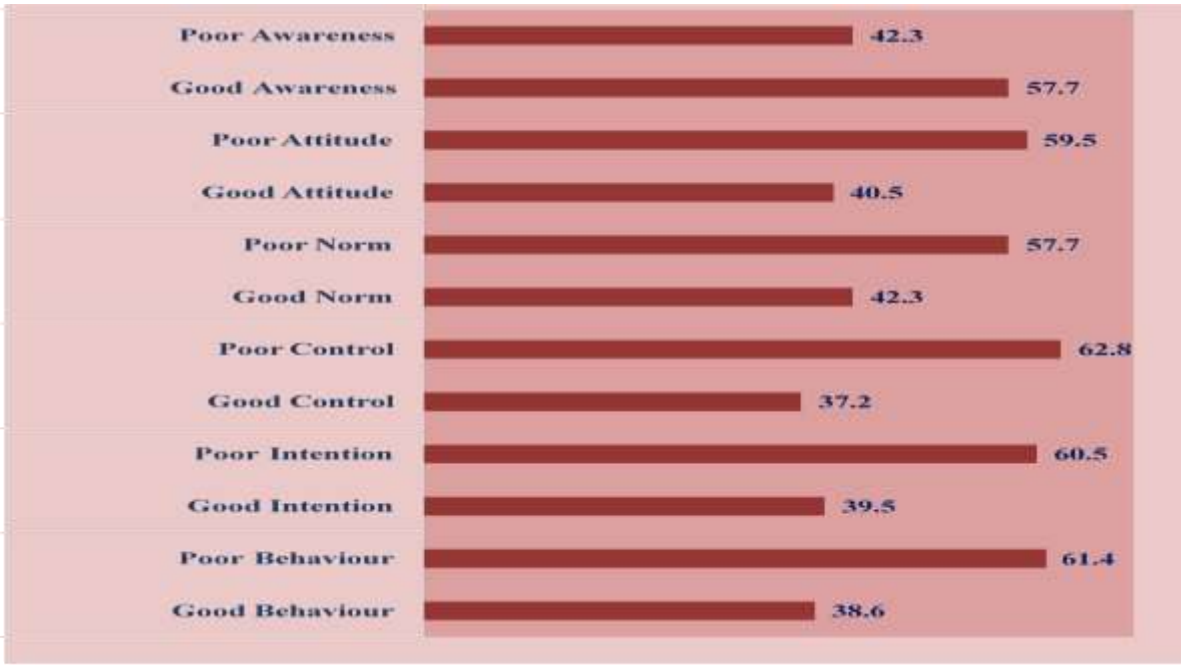

Figure 4: Categorical distribution of Responses

intention, and perceived behavior are not significant. Also, 86.2% of operators with good attitude have good awareness and therefore, they can manage occupational stress, while 38.3% of operators with a poor attitude have no awareness.

Regression of demographic distribution and variables

Table 3 shows the logistic regression between variables associated in Table 2. Though, perceived behavioral control, intention and perceived behavior were not associated in Table 2, but included in this model because they are variables of research interest. Two models are unadjusted models where factors were examined without controlling others, and the adjusted where factors were examined when others are controlled. For the unadjusted, the odds of association of age 28-37 years were significant at (OR = 0.32, $p<0.05$). This shows that operators aged 28-37 years have lower odds of being aware of occupational stress management, health, safety and the impact of their activities on the environment compared to operators aged 18-27 years. The single and separated marital status also have lower odds of safety awareness compared to married operators (OR=0.28, $p<0.05$, OR=0.08, $p<0.05$ respectively). Other factors that are significant includes apprentice formal training status, working experience of 11-20, 21-30, 31-50 and above 50 years, attitude and subjective norm which all have lower odds of occupational stress, health, safety and environmental impact awareness compared to their respective reference categories at $p<0.05$. This implies that when other factors are controlled, the adjusted regression, only 57 years above, was significant and has higher odds of occupational stress, health, safety and environmental impact awareness.

CONCLUSION

This study provides critical insights into the application of the Theory of Planned Behavior in understanding chainsaw operators' occupational safety and health intentions in South-Western Nigeria. It reveals that two core components of the theory-attitude toward behavior and subjective norm-significantly predict the operators' behavioral intentions and expectations. The findings emphasize that employing behavioral models can effectively promote greater compliance with occupational health, safety, and environmental regulations among chainsaw operators. Furthermore, the study demonstrates that positive attitudes and supportive social pressures (subjective norms) can lead to improved safety practices, reducing the risk of occupational accidents, safeguarding operators' well-being, and minimizing the environmental harm associated with chainsaw operations. This study has heightened awareness among chainsaw operators regarding the serious risks inherent in their occupation.

Table 2: Test of Association of Demographic Characteristics and Independent Research Variables

		OS, Health, Safety and Environmental Impact Awareness		Chi-square	p-value
		Poor Awareness N (%)	**Good Awareness N (%)**		
Age	18-27 years	15(62.5)	9(37.5)	10.49	0.033*
	28-37 years	16(53.3)	14(46.7)		
	38-47 years	23(47.9)	25(52.1)		
	48-57 years	21(31.3)	46(68.7)		
	Above 57 years	16(34.8)	30(65.2)		
Marital Status	Married	62(45.6)	74(54.4)	16.09	0.001*
	Single	14(73.7)	5(26.3)		
	Separated	11(28.2)	28(71.8)		
	Widower	4(19.0)	17(81.0)		
	Widow	0(0.0)	0(0.0)		
Educational Qualification	No formal educational	25(41.0)	36(59.0)	0.73	0.86
	Primary	33(42.3)	45(57.7)		
	Secondary	27(41.5)	38(58.5)		
	Tertiary	6(54.5)	5(45.5)		
Formal Training	Formal	37(56.1)	29(43.9)	7.36	0.007*
	Apprentice	54(36.2)	95(63.8)		
Work Experience	1-10 years	9(50.0)	9(50.0)	12.08	0.017*
	11-20 years	12(46.2)	14(53.8)		
	21-30 years	27(46.6)	31(53.4)		
	31-50 years	39(47.0)	44(53.0)		
	Above 50 years	4(13.3)	26(86.7)		
Geopolitical Zone	North Central	0(0.0)	0(0.0)	2.19	0.335
	North-East	0(0.0)	0(0.0)		
	North-West	0(0.0)	0(0.0)		
	South-East	11(55.0)	9(45.0)		
	South-South	10(50.0)	10(50.0)		
	South-West	70(40.0)	105(60.0)		
Family Size	1-3	35(56.5)	27(43.5)	7.33	0.119
	4-6	30(35.7)	54(64.3)		
	7-9	15(36.6)	26(63.4)		
	10-12	10(38.5)	16(61.5)		
	Above 12	1(50.0)	1(50.0)		
Attitude	Poor Attitude	79(61.7)	49(38.3)	48.73	0.000*
	Good Attitude	12(13.8)	75(86.2)		
Subjective Norm	Poor Norm	63(50.8)	61(49.2)	8.63	0.003*
	Good Norm	28(30.8)	63(69.2)		
Perceived Behavioural Control	Poor Control	58(43.0)	77(57.0)	0.06	0.805
	Good Control	33(41.3)	47(58.8)		
Intention	Poor Intention	57(43.8)	73(56.2)	0.31	0.576
	Good Intention	34(40.0)	51(60.0)		
Perceived Behaviour	Poor Behaviour	51(38.6)	81(61.4)	1.91	0.167
	Good Behaviour	40(48.2)	43(51.8)		

It is therefore recommended that operators prioritize their occupational safety and health responsibilities. Ignoring safety measures not only increases the risk of fatal accidents but also poses significant health threats and contributes to environmental degradation. Continuous education, behavioral reinforcement, and stricter compliance with safety regulations are strongly advised to foster a culture of responsibility and sustainability within the profession.

Table 3: Logistic Regression of Demographic Distribution and TPB variables

		Unadjusted Regression		Adjusted Regression	
		OR	**p-value**	**aOR**	**p-value**
Age	18-27 years				
	28-37 years	0.32*	0.029	0.00	0.999
	38-47 years	0.47	0.112	6.55	0.235
	48-57 years	0.58	0.198	5.37	0.177
	Above 57 years	1.17	0.702	8.26*	0.047
Marital Status	Married				
	Single	0.28*	0.029	-	0.999
	Separated	0.08*	0.001	-	0.999
	Widower	0.60	0.437	-	
	No formal educational				
Formal Training	Apprentice	0.45*	0.007	0.38	0.180
Work Experience	1-10 years				
	11-20 years	0.15*	0.009	3.24	1.000
	21-30 years	0.18*	0.010	0.00	0.999
	31-50 years	0.18*	0.004	0.00	0.999
	Above 50 years	0.17*	0.003	0.00	0.999
Attitude	Poor				
	Good	0.10*	0.000	0.05*	0.000
Subjective Norm	Poor				
	Good	0.43*	0.004	0.79	0.594
Perceived Behavioural Control	Poor				
	Good	0.93	0.806	0.77	0.480
Intention	Poor				
	Good	0.85	0.577	0.48	0.067
Perceived Behaviour	Poor				
	Good	1.48	0.168	1.18	0.742

OR: Odds ratio, aOR: Adjusted odds ratio

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