

## The moderating effects of gender and education level on safe food handling intention among consumers in Sibul, Malaysia: based on the Theory of Planned Behavior

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### Abstract

The consumers who did not comply with safe food-handling practices also contributed to the occurrence of food contamination. This study adapted the Theory of Planned Behavior (TPB) to examine the moderating effect of gender and level of education differences that influence the intention of safe food handling at home. A total of 623 consumers based in Sibul, Malaysia completed a questionnaire that measured attitude, subjective norm, perceived behavior control (PBC), and intention. Based on PLS-SEM multi-group analysis (PLS-MGA) by permutation approach, gender demonstrated no moderating effect on the TPB relationships in each state. Meanwhile, the level of education was a significant moderator between PBC and intention. In this relationship, it was indicated that PBC for consumers from lower education group was stronger than their counterparts. These results offered useful information for local authorities or educational institutions to gain a better understanding of consumer behavior towards safe food handling, allowing the authorities to develop intervention accordingly.

## 1. Introduction

Food is vital for human to grow. Food is considered to be safe if it is not harmful to health. Nevertheless, the risk of food contamination from processing to consumers' consumption has become a global issue nowadays. The possibility of food contamination during processing occurred due to existing contaminants in raw food combined with improper cleaning, transportation, heat treatment, packaging, and storage (Nerín *et al.*, 2016).

In the southeast Asia region, more than 150 million people were infected with foodborne diseases (FBD) with more than 175,000 reported deaths every year (World Health Organization, 2015). Malaysia still has the highest number of food poisoning cases compared to other countries (Ministry of Health Malaysia, 2016, 2017). In Sarawak, a total of 805 cases of poisoning were reported in 2010 (Berita Nasional Malaysia, 2011) and

this number increased to 1,017 in 2014 (Boon, 2014). Food contamination does not only occur in premises such as hotels or restaurants; households are also the main source of foodborne pathogens transmission. Such cases are due to food mishandling among consumers including poor personal hygiene, cross-contamination, and violation of time-temperature control (European Food Safety Authority and European Centre for Disease Prevention and Control, 2016; Kamala and Kumar, 2018).

Improving safe food handling behavior among consumers should minimize the number of FBD cases, as recommended by the European Association for Food Safety (Flynn *et al.*, 2019). It was believed that an engagement in particular behavior can be explained by the individual's intention (Ajzen, 1991). The intention of safe food handling may influence consumer's behavior, causing them to be more likely to practice food safety measures.

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Theory of Planned Behavior (TPB) was developed by Ajzen (1991) after the revision of the Theory of Reasoned Action (TRA). Both theories described how behavior was affected by intention as a motivating factor. Note that the motivating factor was indicated by an individual's willingness and effort to perform the behavior. The existence of perceived behavior control (PBC) as one of TPB components differentiated these theories. Based on TPB, intention was explained through attitude, subjective norm, and PBC. Attitude is defined as consumer's evaluation of safe food handling while the subjective norm is the expectation of the people who have a close relationship with consumers in-charge of food handling. Apart from that, the PBC is denoted as the perceived easiness of safe food handling. Alternatively, PBC also includes consumers' self-efficacy, in other words, if they are personally able to handle food safely (Ajzen, 2002).

Most of the previous studies reported that females are more conscious about food safety compared to males. The findings indicated that females are good at food preparation, handling, and storage (Sanlier *et al.*, 2012; Sanlier and Konaklioglu, 2012). Traditionally, females are frequently involved in food preparation at home, contributing to their prioritization of kitchen hygiene (Lazou *et al.*, 2012; Hassan and Dimassi, 2014; Omari *et al.*, 2018). Females are also more involved in the preparation of food at home because they enjoy doing the task and it becomes a part of their daily habit (Turnbull-Fortune and Badrie, 2014). Due to these reasons, females performed better than males in food preparation.

Nonetheless, it has been argued that males are better than females in some food safety practices. Females are known to be aware of food poisoning outbreaks, but males are reported to have more experience with food poisoning. Therefore, males are more concerned about the proper handling of food such as separating food using different containers and identifying the recommended temperature of refrigeration to slow down the growth of microorganisms (Al-Shabib *et al.*, 2016; Zeeshan *et al.*, 2017).

Previous studies also found that those with high education levels have good level of knowledge, attitude, and practice (KAP) in relation to food safety (Oladoyinbo *et al.*, 2015; Faremi *et al.*, 2018). Highly-educated respondents such as university or college graduates have better KAP because they are more likely to have attended courses related to food safety (Pepple, 2017). Due to this reason, they have higher awareness about the major pathogens that can cause FBD (Hayajneh *et al.*, 2016).

On the other hand, there were also studies proving that the level of education is not related to KAP in food safety (Alrabadi *et al.*, 2013). Individuals with higher education do not necessarily have better KAP in food safety. Somewhat surprisingly, this group is reported as being more often infected by FBD compared to their counterparts (Osagbemi *et al.*, 2010). Based on these observations, it is possible to establish a relationship between education level and safe food handling intention.

As a result of the above discussion shows that the presence of gender and education level would moderate the relationship between attitude, subjective norm and PBC with safe food handling intention. Thus, the research model and hypotheses for this study were developed as shown in Figure 1.

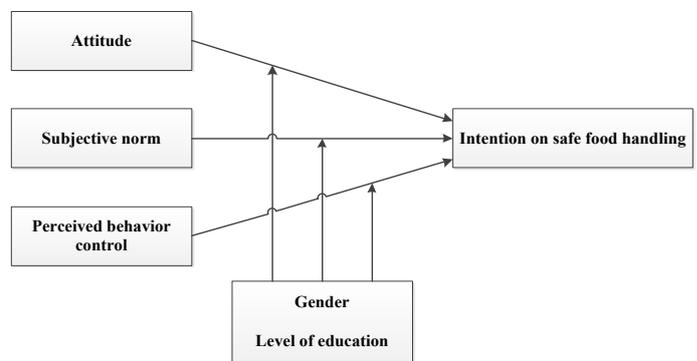


Figure 1. Research model

### Hypotheses:

H1: The relation between attitude, subjective norm, and PBC with intention is moderated by gender.

H2: The relation between attitude, subjective norm, and PBC with intention is moderated by education level.

This study is aimed to predict the intention of safe food handling that is moderated by gender and level of education among consumers in Sibu, Malaysia.

## 2. Materials and method

### 2.1 Data collection

A self-reporting questionnaire that was distributed by survey forms was used as the research instrument. A total of 800 questionnaires were distributed in six major shopping centers in Sibu, Malaysia. This survey targeted consumers that were over 20 years old and those who prepared food on a regular basis at home. Respondents were informed about the purpose of the survey and their consent was obtained in the participation of this study. Data collection was done over a period of five months. A total of 623 of 800 completed questionnaires were used for the final analysis, contributed to a response rate of 77.9%. To confirm the minimum sample size for this

study, G\*Power 3.1.9.2 software was used to calculate the estimation based on the number of predictors, effect size, and statistical power, which was equivalent to 77 samples.

## 2.2 Survey design

The questionnaire was divided into two main sections; i) section A contained seven questions concerning the demographic profiles; and ii) section B contained the TPB constructs where there are four constructs with each having 5 questions adapted from existing literature, making a total of 20 questions (Table 1). For each question, respondents were required to rank their opinions on a 5-point Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree).

## 2.3 Statistical analysis

The data collected were tested with the following sequence: common method bias (CMB), outer measurement model evaluation and moderation effects. Harman one-factor test and variance inflation factor (VIF) were employed to evaluate the data CMB. IBM SPSS Statistics 20 were used to perform the Harman one-factor test while VIF was determined using the SmartPLS 3.0 software (Ringle et al., 2015). In addition,

SmartPLS 3.0 software was used to perform the Partial least Squares Structural Equation Modelling (PLS-SEM) analysis to examine the hypotheses for non-normal data distribution and small sample size (Hair et al., 2017). The multi-group analysis (MGA) was used to determine the effect of gender and level of education as moderators on safe food handling intention.

## 3. Results

### 3.1 Descriptive analysis

Table 2 shows the demographic characteristics of the 623 respondents who participated in this study. Most of them were between 30 and 39 years old, employed, and prepared food at home for at least 3 days per week.

### 3.2 Common method bias (CMB)

Data for this study was gained through a similar self-reported questionnaire, warranting the use of Harman's one-factor test to examine the CMB (Podsakoff et al., 2003). It was indicated that the first factor explained 14.46% of the total variance. As the value was below 50%, it can be concluded that the issue pertaining to CMB had not been detected (Tan et al., 2017). In addition, the presence of CMB was also detected based on the VIF that was higher than 3.3 (Kock, 2015).

Table 1. Questionnaire for the TPB constructs

Constructs	Description of measurement items	Source
AT	A1: Washing food utensils using a sanitiser is a safe practice.	Nik Rosmawati et al. (2015)
	A2: Leaving cooked food at room temperature for more than 2 hours is harmful to health.	Turnbull-Fortune and Badrie (2014)
	A3: Consuming expired food, without inspecting the changes in its smell and taste, will increase the risk of getting a foodborne illness.	da Cunha et al. (2014)
	A4: It is necessary to store raw food and cooked food separately.	da Cunha et al. (2014)
	A5: Reheating leftover food until it steams or boils is safe.	Lum et al. (2013)
SN	S1: My family thinks that I should cover my hair during food preparation.	Nik Rosmawati et al. (2015)
	S2: My family expects that I wash my hands with soap and water, after touching my face, nose, ears, and mouth.	Nik Rosmawati et al. (2015)
	S3: My family wants me to wash my hands with soap and water after using the toilet.	Nik Rosmawati et al. (2015)
	S4: My family expects me to wash my hands before touching meat/raw chicken.	Nik Rosmawati et al. (2015)
	S5: My family thinks I should handle food hygienically in the household.	Bai et al. (2014)
PBC	P1: I like learning about how to keep my food safe for consumption.	Majowicz et al. (2015)
	P2: I am concerned about getting food poisoning.	Majowicz et al. (2015)
	P3: I am confident that I can cook safe, healthy meals for myself and my family.	Majowicz et al. (2015)
	P4: I perceive that I have total control over safe food handling in the household.	Bai et al. (2014)
	P5: It's totally up to me whether I handle food hygienically in the household.	Bai et al. (2014)
INT	T1: I plan to make an effort to prepare food hygienically with every meal.	Mullan et al. (2013)
	T2: I want to make an effort to prepare food hygienically with every meal.	Mullan et al. (2013)
	T3: I am expected to prepare food hygienically at every meal.	Mullan et al. (2013)
	T4: I aim to make an effort to prepare food hygienically with every meal.	Mullan et al. (2013)
	T5: It is very likely that I will prepare food hygienically with every meal.	Shapiro et al. (2011)

Notes: AT= Attitude, SN= Subjective norm, PBC= Perceived behavior control, INT= Intention

Table 2. Demographic profile of respondents

	Characteristics	Percentage (%)
Gender	Male	45.3
	Female	54.7
Age (years)	20 – 29	21.2
	30 – 39	34.3
	40 – 49	26.6
	50 and above	17.8
Education level	Primary school and below	31.6
	Secondary school	35.2
	Tertiary school and above	33.2
Employment status	Yes	61.8
	No	38.2
Number of persons in the family	1 – 2	25
	3 – 5	41.4
	6 and more	33.5
Number of children in the family	0	17.8
	1	32.4
	2	33.1
	3 and more	16.7
Frequency of food preparation at home	Every day	29.5
	3 – 6 days per week	39.3
	Less than 3 days per week	31.1

Nevertheless, the VIF for all latent variables ranged between 1.00 and 1.22. Thus, it was confirmed that the data set was free from any CMB issue.

### 3.3 Outer measurement model assessment

Table 3. Result of the measurement model

Construct	Indicator	Loading	CR	AVE
AT	A1	0.641	0.773	0.534
	A2	0.811		
	A3	0.537 (deleted)		
	A4	0.63		
	A5	-0.082 (deleted)		
SN	S1	0.691	0.812	0.526
	S2	0.836		
	S3	0.496 (deleted)		
	S4	0.743		
	S5	0.581		
PBC	P1	0.622	0.798	0.502
	P2	0.634		
	P3	0.82		
	P4	0.697		
	P5	0.414 (deleted)		
INT	T1	0.923	0.951	0.796
	T2	0.922		
	T3	0.865		
	T4	0.912		
	T5	0.836		

The reliability and validity were examined for the assessment of the measurement model. Internal consistency reliability was measured through composite reliability (CR) while the outer loadings were used to measure indicator reliability. Furthermore, the average variance extracted (AVE) was used to evaluate convergent validity. As depicted in Table 3, all CR values exceeded 0.7 while AVE exceeded by more than 0.5 (Hair *et al.*, 2017). Items with outer loadings that were less than 0.4 were deleted to increase the CR and AVE as factor loading should exceed the threshold of 0.6 (Chin *et al.*, 1997).

The discriminant validity (DV) was assessed using heterotrait-monotrait (HTMT) ratio of correlations approach. Based on the most outperform and high sensitivity rate criterion (HTMT<0.85), it was confirmed that the DV was achieved (Henseler *et al.*, 2015), as shown in Table 4.

Table 4. Discriminant validity result

	Attitude	Intention	Norms	PBC
Attitude				
Intention	0.499			
Norms	0.629	0.609		
PBC	0.349	0.335	0.228	

### 3.4 Moderating effect

Since the moderator variable was not continuous, the moderating effect was determined based on group

comparisons by multi-group analysis (MGA). The permutation approach was adopted as the analysis did not meet the prerequisite of distributional presumption (Hair *et al.*, 2017). Afthanorhan *et al.* (2015) proposed that a permutation test was appropriate to determine the effects of categorical variables in the relationship between exogenous and endogenous constructs.

Moreover, dichotomisation was a common technique used when the moderating variables were divided into two value categories. The level of education had to be transformed into a categorical variable, while no further refinement was required for gender (Henseler and Fassot, 2010). The dichotomisation process was executed using the median split method in SPSS.

Based on Table 5, consumer's gender did not moderate their attitude, subjective norm, and PBC towards intention on safe food handling. Although gender was not a significant moderator, the comparison between the three components of TPB revealed that male (path coefficient = 0.419) and female (path coefficient=0.391) had a greater effect on the relationship between the norm and intention. Apart from that, the level of education had no significant effect as a moderator for the relationship between attitude and subjective norm with intention. Nevertheless, education only moderated the relationship between PBC and safe food handling intention with a significant difference of a 5% level

between low education level (path coefficient = 0.320) and high education level (path coefficient = 0.165), as shown in Table 6. The results stipulated that the path strength of low education level was stronger than the high education level.

#### 4. Discussion

Most previous studies only examine the direct relationship between the TPB variables with intention in safe food handling. These gaps are evident in Mullan and Wong (2009); Mullan *et al.* (2013); and Bai *et al.* (2014) studies. Therefore, the purpose of this study was to examine the effect of gender and level of education as moderators towards safe food handling. Interestingly, gender did not moderate any relationship between determinants in TPB model with intention in safe food handling. This finding shows that gender is not a factor that influences the intention of safe food handling. Generally, safe food handling should be practiced by everyone regardless of their gender. Either male or female, both are involved in food handling at home and show equal concerns about food hygiene (Missagia *et al.*, 2013).

It is the responsibility of the food handler to ensure that the food consumed by their family members are safe despite previous studies demonstrating that women's role is more dominant in this regard (Meysenburg *et al.*,

Table 5. Moderating effect of gender

Structural path	Path Coefficients Original (Male)	Path Coefficients Original (Female)	Path Coefficients Original Difference (Male - Female)	Path Coefficients Permutation Mean Difference (Male - Female)	2.5%	97.5%	Permutation p-Values	Remarks
Attitude > Intention	0.122	0.193	- 0.070	0.002	- 0.139	0.139	0.322	Not supported
Norm > Intention	0.419	0.391	0.028	- 0.001	- 0.127	0.127	0.655	Not supported
PBC > Intention	0.160	0.237	- 0.077	0.001	- 0.123	0.128	0.228	Not supported

Table 6. Moderating effect of education level

Structural path	Path Coefficients Original (Low)	Path Coefficients Original (High)	Path Coefficients Original Difference (Low - High)	Path Coefficients Permutation Mean Difference (Low - High)	2.5%	97.5%	Permutation p-Values	Remarks
Attitude > Intention	0.104	0.184	- 0.080	0.002	- 0.151	0.151	0.286	Not supported
Norm > Intention	0.315	0.442	- 0.127	- 0.001	- 0.139	0.135	0.070	Not supported
PBC > Intention	<b>0.320</b>	<b>0.165</b>	<b>0.155</b>	<b>0.006</b>	<b>- 0.126</b>	<b>0.140</b>	<b>0.020</b>	<b>Supported</b>

2014; Zyoud *et al.*, 2019). Simultaneously, family members also gave equal credence to both genders, although females are frequently considered better than males in food handling. Recently, males have also been proven to have good knowledge and practices regarding food safety as a result of positive influence by their parents at home (Mirzaei *et al.*, 2018). Family support might boost the confidence of consumers to be more aware of handling the food safely. Based on this finding, gender failed as a moderator variable and did not strengthen the relationships among TPB components.

On the moderating effect of education level, the permutation approach indicated that education level moderates the interrelation between PBC and safe food handling intention. Consumers with higher education are expected to have more exposure to safe food handling, especially if they have a background in health sciences (Nazer Ali *et al.*, 2018). Surprisingly, consumers of low education groups reinforce the relationship between the PBC and the intention of safe food handling. It implies that consumers with low education levels feel more accessible and comfortable to handle food safely than their counterparts. In other words, highly educated consumers may have more knowledge of safe food handling, but lower educated consumers are more concerned with food safety. This finding contradicts Veeck *et al.* (2015).

All in all, the highly educated group has an awareness of the importance of food safety, but certain factors inhibit its implementation. The lack of time is potentially the major contributing factor to the difference of intention between these two groups. Career demands may cause highly educated consumers to be less compliant or forget about safe food handling. Lack of time has been proven to be a deterrent factor for the implementation of safe food handling (Arendt *et al.*, 2015; Wandolo *et al.*, 2018), a logical explanation as 61.8% of consumers in this study are employed.

With their careers, those with higher education also have a more stable economic resource which allows them to hire housemaids to help with daily chores including food preparation (Alsayeqh, 2015). Lack of involvement may be the factor that makes them less applied safe food handling practices compared to those with lower education who prepare their own food. This point makes sense because only 29.5% of consumers in the study reported that they prepare food every day.

Despite that, the cross-sectional design did not allow cause and effect to be determined, but moderator and predictive effects can be observed (Sedgwick, 2014). The data for this study was based on self-reported surveys which may give rise to the bias issue. Moreover,

only two categories of the sociodemographic profile were tested as the moderator.

## 5. Conclusion

By assessing the moderating effects, this study contributed to the current knowledge and delineated several useful implications for the accomplishment of food safety among consumers and the enhancement of food handling. Although only education level moderates the relationship between the PBC and intention, this outcome can be used in designing and implementing some useful strategies to educate consumers so that they will be more aware of food safety. Prospective and longitudinal studies are recommended to further understand the moderators' effect on TPB relationships. Future studies should be conducted such as in-depth interviews or observation approach to study the consumer's actual behavior in food handling at home. Apart from that, two or more moderators based on diverse sociodemographic factors are encouraged to be examined for TPB to predict consumer's behavior on food safety.

## Conflicts of Interest

The authors declare no conflict of interest.

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