

Reliability and Construct Validity of the Malay Version of Theory of Planned Behaviour (TPB) for Smoking Cessation

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Abstract

Objective: The aim of this study was to evaluate the psychometric properties of the Malay translated version of the Theory of Planned Behavior (TPB) intention to quit smoking questionnaire. **Methods:** A cross-sectional study was performed involving 185 male smokers. The forward-backward translation procedure was adopted to translate the questionnaire from English to Malay. The internal consistency and stability were assessed using Cronbach's alpha and a correlation analysis and Exploratory Factor Analysis was conducted. **Result:** The translated questionnaire showed good internal consistency with Cronbach's alpha values of 0.86, 0.64, 0.74 and 0.90 for each of the four respective factors. The test-retest reliability revealed acceptable stability, with Spearman's correlation coefficients ranging from low to moderate ($r > 0.30-0.50$) and a satisfactory inter class correlation coefficient (ICCs). The construct validity achieved an acceptable factor loading for each construct which ranged from 0.40 to 0.90. **Conclusion:** The current study provided psychometric evidence for an appropriate, reliable and valid tool of TPB Malay version. This questionnaire could be applied in evaluating smoking cessation interventions in Malaysia.

Keywords: Theory of planned behavior- translation- validation- smoking

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Introduction

Smoking is one of the main public health issues worldwide. According to the Global Adult Tobacco Survey (GATS) in 2007, 1.1 billion smokers consume 5.3 trillion cigarettes annually worldwide (Drope, 2010). In Malaysia, more than 40% of Malaysian (4.7 million) adult males were smokers based on a ten-year survey conducted by the GATS in 2011 (Mohd Yusoff et al., 2011). Moreover, smoking is highly related to chronic diseases and serious illnesses. Cigarette smoking has a temporary acute effect but causes very serious illnesses. In addition, the total tobacco-attributed deaths are projected to increase from 5.4 million in 2005 to 6.4 million in 2015 and 8.3 million in 2030 (Mathers and Loncar, 2006). Additionally, tobacco is responsible for 10% of all deaths globally (Mathers and Loncar, 2006).

Cigarette smoking can be considered a behavioural problem. According to the World Health Organization (WHO), cigarette smoking is the action or habit of inhaling and exhaling the smoke in cigarettes (Dioso, 2014). Cigarette smoking can also be considered an addictive behaviour and substance abuse. Cigarette smoking differs across different socio-cultural backgrounds. Thus, the pattern of intention to cease smoking in Malaysia must

be explored.

The theory of planned behaviour (TPB) is an established theory. The TPB was developed by Ajzen in 1991 and is an extension of the theory of reasoned action (Ajzen and Fishbein, 1980). The TPB was designed to predict and explain human behaviour in specific contexts (Ajzen, 1991). The TPB details the determinants of an individual's decision to enact a particular behaviour (Conner and Armitage, 1998). Ajzen's theory was used to understand the relationship between intention and behaviour. According to the TPB, the more positive a person's attitude (Att), the stronger the subjective norms (SN) and the greater the perceived behaviour control over the behaviour (PBC), the stronger the intention (Int) to perform the behaviour and, hence the more likely the person is to perform the behaviour. TPB is widely used in many behavioural and health-related behavioural studies (Norman et al., 1999; Hardeman et al., 2002; Moan, 2005), including studies investigating smoking behaviour (Godin, 1992).

TPB is simple compared to other behavioural model questionnaires (Norman et al., 1999). This theory was established to provide a strong prediction of smoking intention and behaviour (Godin, 1992) and is considered a valid model for predicting the initial attempts to quit

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(Norman et al., 1999). Understanding smoking cessation behaviour is of utmost importance for policy, prevention and interventions in Malaysia; thus, a Malay version of the TPB is considered important. Consequently, a valid tool for assessing the intention to quit is critically important since there is no Malay version available. This valid questionnaire is needed for obtaining an understanding of smoking behaviour in a local culture.

This study aims to determine the validity and reliability of the translated version of the TPB from English to Malay. Due to a limited Malay translated version available for measuring the behaviour of smoking, we decided to translate this TPB questionnaire in local language. The only available version is the Trans Theoretical Model (TTM) (Yasin et al., 2011). However, as compared to TTM, the TPB is simpler and consists of fewer items. Thus, using the TPB to measure the smoking behaviour of individual smokers, particularly those who are in a smoking cessation clinic, is more practical to be used. In addition, this TPB questionnaire can be used to validate the available translated scale.

Materials and Methods

Study design and sampling method

This cross-sectional study was conducted in 10 centres, including hospitals, clinics, a training centre and universities. The participants were recruited using a convenience sampling method.

Sample size calculation

There are no fixed methods for determining the required sample size. The sample size used in this study was based on the participants per item ratio (N: p). In this study, a 10:1 item per participant ratio was used, which is the most recommended ratio (Osborne and Costello, 2004). Using this ratio, the minimal sample size required for conducting factor analysis was met (Hair et al., 2010). Since the original TPB consists of 18 items, the minimal sample required was 180 participants. This study obtained approval from the Universiti Teknologi Mara (UiTM) Ethical Committee.

Instrument

The following instruments were used for data collection: 1) a sociodemographic questionnaire and 2) the Malay version of TPB questionnaire (TPB-M). The sociodemographic questionnaire measures age, educational level, marital status, job categories and smoking characteristics. This information was used to describe the characteristics of the participants in this study. The questionnaire composed of 18 questions, consisting of four factors, including attitude (7 items), subjective norms (3 items), (4 items) and intention (4 items). The rating of the attitude scale was divided into 7 semantic scales, whereas the other factors were rated using a seven-point Likert scale (1=not at all, 4=moderately and 7=very much). The final version of the Malay version of TPB was distributed and self-administered to daily smokers from ten different centres.

Translation process

The translation and validation process was conducted according to the standard guidelines (Wild et al., 2005). This study was divided into three phases (see Figure 1). The details of each phase are explained below.

Forward Translation

The forward translation phase consists of a forward translation of the original TPB questionnaire by Bierman (2012) from the English version to a Malay version (target language). This translation was performed by two translators, who were familiar with Malaysian culture, and their first native language was Malay. The first forward translator (F1) has a Diploma in Professional Translation from Dewan Bahasa dan Pustaka, Malaysia (DBP), a local national language institute. And the second forward translator (F2) has a Bachelor's Degree in Arts (Literature in English) and was certified as a translator by the Malaysian Institute of Translation and Books (ITBM).

Reconciliation

The reconciliation process produced two versions of the Malay translation. Both translations were compared by the members of the research team to identify the discrepancies and ambiguities in the words and sentences of the translated version. This process aimed to produce the best translation of the original context.

Backward translation

Back translation is the process in which the reconciliation version is translated from Malay back to the original language (English). This process was performed by a translator from the ITBM.

Harmonization

Harmonization was performed by two panels who were members from the research team. In this process, the backward version was compared to the original version. Finally, the pre-final version was produced.

Face validity

During face validity the investigator distributed the pre-final version of the questionnaire to the target population for face value evaluation. During this phase, ten smokers were cognitively debriefed. Ten respondents are sufficient for pilot testing using an interview type of pilot testing (Eremenco, 2005). The respondents were Malaysian smokers whose first language was Malay. The respondents were also daily smokers. The respondents were interviewed and asked to identify words or sentences that they did not understand. The respondents were encouraged to suggest alternate suitable words with which they were familiar. Then, the feedback from this cognitive debriefing was discussed among the two panels in the research team, and the final version (TPB-M) was produced.

Field testing and psychometric analysis

The final phase of this study involved field testing and a psychometric analysis. The field testing was conducted by distributing the final version of the questionnaire to

the target population. The participants were recruited via fliers distributed in each centre, snowball sampling and announcement during assembly. An overview of the translation validation process of TPB is shown in Figure 1.

Statistical analysis

The demographic data were analysed by descriptive statistics using IBM SPSS version 23.0. To analyse the psychometric properties, descriptive statistics were used for all items, followed by an exploratory factor analysis (EFA), reliability analysis. The EFA and reliability analyses were conducted using IBM SPSS 23.0.

The reliability of the questionnaire was determined by internal consistency (Cronbach’s alpha), Spearman’s correlation coefficient and interclass correlation coefficient (ICC) of the test-retest data. The EFA was performed using principal axis factoring (PAF) extraction and oblique rotation (Promax) method (Tabachnick and Fidell, 2001). The PAF was selected because it is the best choice for non-distribution data (Beavers et al., 2013; Costello and Osborne, 2005) and is unlikely to produce more cross loading (Beavers et al., 2013). To determine the suitability of the data for factor analysis, the Kaiser-Meyer-Olkin (KMO) measure of sampling and Bartlett’s test of sphericity (Williams and Brown, 2010) were performed.

Results

Participant characteristics

The characteristics of the 185 male smokers are shown in Table 1. The mean age of the study population was 25.66±7.6 years. The highest proportion in this sample was Malay n=169 (91.4%), followed by Indian, 0.5% (n=1) and others 4.3%(n=8). Most smokers in this study were single 63.2% (n=117), married 35.1% (n=65) and widowers 1.1% (n=2). Amongst the smokers completed primary 0.5% (n=1) or secondary 58.4% (n=108) school, were certificate holders 8.6% (n=16) or had a university level education30.8% (n=57). Regarding the smoking-related characteristics, the mean number of cigarettes smoked per day was 9.74±6.4, and the participants have been smoking for 9.94±7.1 years. Of the participants,33% (n= 61) were in the pre-contemplation stage, 37.8% (n=70) were in the contemplation stage, and 28.1% (n=52) were in the preparation stage. The addiction and nicotine dependence level ranged from 0 to 8. The participants were categorized as follows: no dependence n=25), low dependence 22.2% (n=41), low to moderate dependence 33%(n=61) , moderate dependence 25.9% (n=48) and high dependence 3.8% (n=7).

EFA and reliability analysis

The EFA was conducted using PAF with oblique rotation. This procedure was performed to examine the structure of the TPB. The eligibility test was based on the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, which was greater than 0.5 (0.85), and Bartlett’s test of sphericity was significant (p<0.001). The results of the eligibility test indicated that these data were suitable for a factor analysis. The communalities (extraction) of

Table 1. Sociodemographic and Smoking Related Information for Study Participants

	mean±SD	N (%)
Age, mean±SD	25.66±7.6	17-51
Race n (%)		
Malay		169 (91.4)
India		1 (0.5)
others		8 (4.3)
Marital status n (%)		
Single		117 (63.2)
Married		65 (35.1)
Widower		2 (1.1)
Educational level n (%)		
Primary		1 (0.5)
Secondary		108 (58.4)
Certificate		16 (8.6)
University		57 (30.8)
No. of cigarette per day, mean ±SD	9.74±6.4	
FTND Score	3.24±2.2	
Stage of change n (%)		
Pre-contemplation		61 (33.0)
Contemplation		70 (37.8)
Preparation		52 (28.1)
FTND category		
No dependence		25 (13.5)
Low dependence		41 (22.2)
Low to moderate		61 (33.0)
Moderate dependence		47 (25.9)
High dependence		7 (3.8)

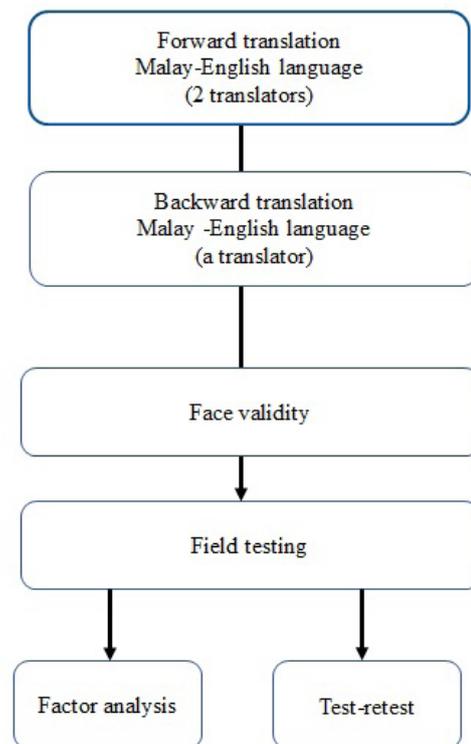


Figure 1. Overview of Study Procedures

Table 2. Summary of Retained Items from EFA Analysis

Factor	Items	Factor loading	Communality
Attitude (Att)	Att_2	0.583	0.427
	Att_3	0.660	0.414
	Att_4	0.429	0.326
	Att_5	0.823	0.646
	Att_6	0.894	0.758
	Att_7	0.834	0.679
	Subjective	<i>Att_1</i>	0.402
Norm (SN)	SN_8	0.741	0.653
Perceived	<i>SN_9</i>	0.554	0.371
Behaviour	PBC_12	0.769	0.582
Control (PBC)	PBC_14	0.873	0.768
	<i>Int_17</i>	0.478	0.348
Intention (Int)	<i>PBC_11</i>	0.780	0.668
	Int_15	0.876	0.763
	Int_16	0.913	0.787
	Int_18	0.798	0.579

* italic indicate the items that loaded on other than their original factor.

all items were satisfied (>0.25), except item No.10 which had a very low (0.09) communality. A low communality indicates that the low variation in an item is explained by the construct. In low communality items, the standard error is allowed to occur (Hair et al., 2014).

For the data extraction factor, scree plot and Kaiser Criteria with an eigenvalue of more than 1 showed that the TPB contained four factors, which is consistent with the original version. Four factors were extracted from Kaiser Criteria which represented 64.35 of cumulative percentage. Then, the pattern matrix showed factor loading of each item in its construct. Using this outcome, the cross loading was identified. The cross loading indicated that the questionnaire had a large factor loading on multiple factors (Matsunaga, 2011). The item No.13 was removed due to a cross loading of more than 0.32 (Osborne and Costello, 2004). Thus, 16 items remained in the questionnaire. The Malay version of the TPB and its item grouping are shown in Table 2. Four items were loaded onto different factors compared to the original version. Therefore, the other items were maintained in their original factor.

Discussion

There are several available English versions of the TPB questionnaire for smoking cessation in the literatures (Bierman, 2012; Godin, 1992; Topa and Moriano Leon, 2010). These questionnaires are used to predict the intention of smoking cessation. To the best of our knowledge, this is the first study to translate and validate the TPB questionnaire in Malay version. This TPB questionnaire underwent extensive translation and cultural adaptation. The psychometric properties of the Malay version of the TPB questionnaire were evaluated according to the standard guidelines suggested by Wild et al., (2005) to ensure the reliability and validity of the

questionnaire. This study established its psychometric properties using a factor analysis.

Overall, this study showed a satisfactory internal consistency, with Cronbach's alpha values of 0.86, 0.64, 0.74 and 0.90 for attitude, subjective norm, perceived behavioural control and intention, respectively. The original version of the TPB questionnaire by Bierman (2012) had Cronbach's alpha values of 0.85, 0.72, 0.76 and 0.91 for attitude, subjective norm, perceived behaviour control and intention, respectively. The internal consistency did not significantly differ, although this questionnaire used a 7-point Likert scale following the manual of constructing questionnaires for the TPB by Francis et al., (2004), whereas Bierman (2012) used a 5-point Likert scale. For the stability reliability, most ICCs had a moderate reliability (0.538-0.686), with a 95% CI ranging from 0.35 to

0.774, except for item No.9 and No.12, which showed poor reliability (<0.5). However, both items can still be acceptable because the 95% CI ranged from 0.12 to 0.54 and from 0.23 to 0.60, respectively; thus, the upper bound remained >0.5 (Koo and Li, 2016).

The EFA revealed that only 16 items were retained in the Malay version of the TPB. Two items were removed due to a very low communality item No.10 and cross loading item No.13. Communalities are the percentage of variance explained by the extracted factor. A cut-off value of 0.5 is ideal (Hair et al., 2010). Therefore, >0.25 is practically acceptable (Arifin, 2015). In this case, item No.10 had shown to have a very low communality (0.087). Only 8.7% of the variance was explained by the extracted factor, and the other 91.3% was the standard error. An item with a low communality is considered a poor-quality item in terms of representing a construct. Besides, item No.10, i.e., 'Most people like me quit smoking within three months following major heart surgery', showed a very low communality, which might be due to the context of the item. This item might be less suitable for our tested population, the majority of whom were young and less exposed to others with heart disease. Thus, the item might be less relevant to act upon normative beliefs and result in perceived social pressure in this selected sample.

For item No.13, the cross loading for this item was >0.32 . Thus, this item consists of a multidimensional construct. The deletion of the item with cross loading serves to clarify the factors and ease interpretation (Ho, 2006). Item No.13 was "if I really wanted to do it, I could quit smoking in the next three months". PBC is defined according to people's perceptions of their ability to perform a given behaviour shown to cross load with intention (a person's readiness to perform behaviour). The cross loading of both factors was high (0.40 and 0.43), which may be due to because the fact that the question appeared to be very similar to intention. The word 'wanted' was highly equivalent to the words used for measuring intention, including 'plan', 'will' and 'intend'. The word 'wanted' can be changed to another word that can be more accurately reflecting the ability to perform behaviour. Overall, these two items were removed due a statistical outcome that reflected the context and concept of the items for this population. Although, the deletion of both items

was needed in this sample, these items might be relevant for other samples with fewer modifications.

All remaining items had factor loading values ranging from 0.40 to 0.90. Ideally, the factor loading should be 0.50 (Hair et al., 2010), although >0.30 is commonly used in EFA (Arifin, 2015). However, four items in the Malay version loaded onto a factor other than the original factor. This occurred possibly because of the different setting of the study population. Thus, to overcome this issue, the related questions must be rephrased or tested with a wide range of populations and a large sample size (>200).

There are some limitations in this study. One of the limitations was the limited methods of recruitment of the participants in this study. This resulted in longer period taking to finish than expected. Second, there are no female and Chinese subjects in this sample, although females represent 1.4% of smokers in Malaysia and Chinese participants, represents the second highest race in Malaysia. Future studies should involve a more varied participant recruitment strategy to represent Malaysia's population. In addition, this study had only performed EFA.

In summary, our translation and validation of the TPB questionnaire provided satisfactory evidence of psychometric properties with acceptable reliability. This Malay version of the TPB questionnaire was considered valid and reliable for the Malaysian adult population. However, future studies might be necessary to validate the TPB in other groups of Malaysian population.

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Conflicts of interest

All authors have no conflicts of interest.

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