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What influences parents' decisions to use sustainable mode (public bus) with their children? A case study in Batu Pahat, Johor

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Abstract. Malaysia is facing a challenge on how to improve the quality of public transportation system along with the city's urbanization since public transport is one of the sustainable approaches to minimise the use of private vehicles on road that mainly contributes to CO_2 emissions that affect the environment, negatively. The lack of public transport services has become a barrier for people to access all the facilities and socialize among the community. Studies on the use of public transport by children are rarely discussed and has lack of attention among community. Thus, this study aims to determine parents' perceptions in using sustainable mode such as public bus with children in terms of accessibility, affordability, safety and comfortability, as well as to analyse the subjective factors affecting parents' decisions to use public bus with their children based on the Theory of Planned Behaviour (TPB). The survey method via questionnaire has been distributed through face-to-face (self-administered questionnaire) and online method (via Google Form) among 100 adults (aged 18 and above, and married) who lives in Batu Pahat, Johor. Then, the data were analyzed by applying Mean Score Method and multiple linear regression analysis using Microsoft Excel. The results show that safety is the main aspect influencing parents' decisions to use public buses with their children. In addition, Attitudes and Perceived Behavioural Control are found to be the significant components influencing Intention, and the Intention influences parents' decisions to use public bus with children for all activity types.

1. Introduction

Malaysia was facing a challenged on how to improve the quality of the public transportation system along with the city's urbanization [1]. Public transport interpreted as a shared passenger transport service that is applicable for public uses as the movement of people and good to meet the basic need of society that require mobility and access [2]. Ambak et al. [2] stated that Malaysian government highly recommends public to utilize public transport to decrease traffic flow, reduced accident rate and initiative for more savings due to increase of fuel prices. However, according to Liu et al. [3], private car usually was perceived to be more attractive than public transport because of its convenience, flexibility, independence, comfort, speed, and reliability and because driving was perceived to be more pleasurable and bears a status symbol.

To date, studies on public transport among children are not discussed much and lack of attention and attraction among the community, especially in Malaysia. Studies into childhood mobility have demonstrated a need to increase public transport use amongst children [4]. In addition to service scheduling difficulties, combined with a negative attitude by passengers and service providers will hinder the use of public transport by children and their carers. Bus drivers, which may saw children, babies and young people as out of placed and unwelcome on commuter services [5]. As a result, parents were very concerned towards accessibility, affordability, safety and comfortability when using public transport, including public bus. Currently, less than 25% of Malaysians use public transportation in their daily travels [6]. This shows that the use of public transport among the community especially children is still lacking. Thus, this study aims to investigate the underlying reasons that influencing parents' decisions to use public bus with their children. This can be achieved by determining the parents' perceptions in using public bus with children in terms of accessibility, affordability, safety and comfortability, as well as to analyse the subjective factors affecting parents' decisions to use public bus with their children based on the Theory of Planned Behaviour (TPB).

2. Issues on public bus use among parents with children

In Malaysia, there were still fewer studies on the use of public transport especially among children. According to Visnes Øksenholt & Aarhaug [7], insecurity and expectations about public transportation appear to be a problem. People with disabilities and parents with children usually do not trust public transportation. Some have had little experience using public transportation, with prior bad experiences generating psychological obstacles even if they would never face those exact issues again. Most of the literature on issues using public bus among parents with children is focusing on four aspects namely: (1) accessibility, (2) affordability, (3) safety and (4) comfortability.

2.1. Accessibility

According to Grant-Smith et al. [5] study in South East Queensland, Australia and Stockholm, Sweden, accessibility is one of the most significant barriers to using public transport identified by the parents of small children. Accessibility constraints may include impractical bus stop location, inadequate seating and shelter availability at stops and stations. Furthermore, toilets at stations and interchanges that are too limited to satisfy an adult with a baby stroller or pram and the efficiency of the paths to bus stops are also the obstacles that need to be overcome to enable individuals to use public transport. At the end, all these constraints and difficulties may discourage parents and caregivers from utilizing public transportation and make it even more difficult for them to utilize it when they need to.

2.2. Affordability

Affordability refers to households' ability to purchase basic goods and services [8]. According to Litman [9], affordability refers to household's ability to save money, it is particularly evident in the expenditure patterns of lower-income household, and their response to reduced income or new cost burdens. For example, public transit services tend to provide affordability because they provide a fallback option to lower-income commuters when their vehicles are unavailable. In addition to providing flexible options that can reduce transportation costs which can support affordability, there is also a need to encourage the provision of public transportation at a cost that is affordable. Similarly, free or discounted travel for children can help keep costs down.

2.3. Safety

Safety represents the emotional evaluation the individual makes regarding aspects of safety connected to travel [10]. Service gaps might be one of the indirect factors influencing feeling of safety while commuting [11] and if more people feel unsafe on public transport, they are less likely to use it [5]. Moreover, as much as 80% of the women feel unsafe while boarding and getting off the bus due to the fear that they will get hurt while waiting for the bus, which could be the fact that there is not enough lighting at the bus stop, the footpaths are not level, or the bus does not stop at the bus stops [11].

According to Soh et al. [8], speeding, mechanical failures, driver fatigue, poor road and weather conditions, and even sleep disorders are some examples of safety issues. Speed has always been linked to road safety, which can lead to accidents.

2.4. Comfortability

Comfort might be an important consideration for riders of public bus transport. Enhancing the quality of service of public transport is often positioned as a strategy which can pull passengers towards using bus transit [12]. The design and location of the bus stop play an important role in encouraging the use of public transport when there is a topic raised during the interviews concerning access to public transport in terms of bus stops [5]. Some people might consider bus stops to be good if they had roofs, streetlights, a safe place to wait, and safe parking for cars and bikes [13].

3. Theory of Planned Behaviour (TPB) in assessing subjective factors

Both subjective (e.g. awareness, attitudes, habit, etc.) and objective (e.g. travel time, walking time, car ownership, etc.) factors were necessary for evaluating the performance of public transport services [14]. However, many studies (e.g. [15]-[16]) have investigated the objective factors on public transport use, but lack of empirical evidence of the influence of subjective factors such as psychological variables, especially on the children's issues. Thus, this study applies the Theory of Planned Behaviour (TPB) [17] model framework for investigating the subjective factors influencing parents' decisions to use public bus with children, which act as behaviour (BEH) of this study. According to the theory, the intention to perform the behaviour is the main driver of behaviour [17]. TPB can also influence a person in each of their actions [18]. Figure 1 shows the four main components in TPB namely attitude (ATT), subjective norms (SN), perceived behavioural control (PBC), and intention (INT) that lead to the behaviour (BEH). According to Ajzen [17], the degree to which a person views a behaviour positively or negatively is what is meant to be meant by the term attitude toward the behaviour. The more positive attitude individuals have, the stronger their intention to conduct a certain behaviour. Behavioural intention is a measure of the strength of individual's willingness to perform certain behaviour. TPB hypothesizes that behaviour is the outcome of the combined effect of intention and perceived behavioural control. Intention, in turn, is predicted by attitude, subjective norm and PBC [17].

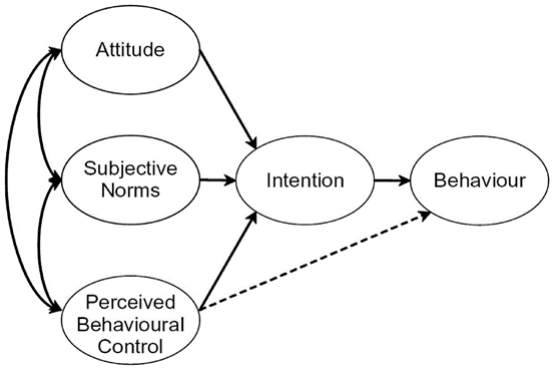

Figure 1. Theory of Planned Behaviour [17]

4. Research method

4.1. Survey design and pilot study

This study uses a survey method via questionnaire to collect data and this questionnaire was written bilingual (Malay and English) to help respondents fully comprehend the questions before responding. Patten [19] states that questionnaires provide an efficient way to collect data. The questionnaire in this study has 3 sections: Section A is socio-demographic information, Section B includes respondent's

experience in public bus use with children (in terms of frequency and trip purpose) and Section C includes respondent's perceptions and decisions in using public bus with children in terms of accessibility, affordability, safety and comfortability, as well as the TPB components. Five-point Likert Scale has been used due to prefer smaller response scales reasons. In this paper, however, only data of Section C is analysed and discussed.

Before the questionnaire was distributed to the respondents, a pilot study was done to check for the reliability of the questionnaire. 10 respondents were selected as it constitutes 10% of the total sample size, which is 100, and the questionnaire has been distributed via online platform (Google Form). To analysing the reliability of internal consistency questionnaire items, Cronbach's Alpha coefficient were used as a reference [2]. George & Mallery [20] state that the reliability of the scales was ensured by alpha coefficients that greater than 0.7 would been considered acceptable and if the value less than 0.5 needed to redesign the questionnaires. Cronbach's Alpha Coefficient for Section C (respondent's perception in using public bus with children in terms of four aspects mentioned) is 0.961 and the value for Section C (respondent's decision to use public bus with children based on the TPB) is 0.953. Both values show that the questions have excellent internal consistency [20].

4.2 Sampling, data collection and analysis method

This study applied probability sampling methods since the study is applying quantitative methods to achieve the study objectives. Stratified sampling technique is used in which the population of study is divided into strata based on their age (aged 18 years and above) and marital status (married). According to Department of Statistics Malaysia (DOSM) [21], the number of married populations between 2017 and 2021 is 6688 people. Thus, by using Slovin's formula [22], the total number of samples required is 99 people. Therefore, this study used 100 respondents. The questionnaires have been distributed to people at bus terminals and bus stops where they used public buses with the children. The respondents were required to answer all the questions as it will be set as mandatory for them to answer the questions.

Mean Score Method is used to analyse the dominant aspect concerning the parents' perceptions to use public bus with children. Correlation and multiple linear regressions analyses are used to analyse the subjective factors influencing parents' decisions to use public bus with children. Model 1 tests the relationship between the TPB elements of ATT, SN and PBC towards INT. Model 2 tests the relationship between INT and PBC towards Behaviour (the use of public bus with children) (BEH). Model 3 tests the relationship between INT and PBC towards Behaviour (the use of public bus with children) (BEH) for leisure activities (e.g., going to cinema, doing sports, etc.). Model 4 tests the relationship between INT and PBC towards Behaviour (the use of public bus with children) (BEH) for maintenance activities (e.g., doing laundry, going to the Friday prayer among male, etc.). Finally Model 5 tests the relationship between INT and PBC towards Behaviour (the use of public bus with children) (BEH) for mandatory activities (e.g., work and study). All these models portray the TPB relationship shown in Figure 1. All the analysis was done using Microsoft Excel software. Equation 1 and 2 show the formula for regression analyses.

$$Y = B_0 + B_1X_1 + B_2X_2 + \cdots + B_nX_n \quad (1)$$

Where:
Y = dependent variable (Intention)
X_1, X_2, … X_n = independent variable (Attitude, Subjective Norm, Perceived Behavioural Control)
β_0, β_1, β_2, … β_n, = coefficients of regression of independent variables in the study

$$Y = B_0 + B_1X_1 + B_2X_2 \quad (2)$$

Where:
Y = dependent variable (Behaviour)
X_1, X_2, … X_n = independent variable (Intention and Perceived Behavioural Control)
β_0, β_1, β_2, … β_n, = coefficients of regression of independent variables in the study

5. Data analysis and results

The total respondent for this study is 100 individuals (aged 18 and above and married). Most of them are male (69%), Malay (95%), low-income group (less than RM4.850 per month) (78%), own at least a car (92%), living at their own residence (60%), has at least one children (aged 12 years and below) in a household (84%), employed full time (84%) and working in a private sector (40%).

5.1. Analysis of parents' perceptions in using public bus with children in terms of accessibility, affordability, safety and comfortability

Table 1 shows the mean score and standard deviation for the items that contribute to parents' perceptions in using public bus with their children in terms of accessibility, affordability, safety and comfortability. The highest mean value among that four aspects are 3.70 which in aspect of safety where respondents' perception shows that they enjoy using public bus with their children more than using self-owned vehicles when facilities available to use public buses in safe and reassuring conditions. Surprisingly, the lowest mean score is 2.53 for the item "Public buses provide facilities for parents to travel with children strollers or prams and shopping items" which is in terms of comfortability aspect. This is contradicted with the results found by Grant-Smith et al. [5] in their study in Australia and Sweden.

Table 1. Mean Score and standard deviation for parents' perceptions on using public bus (N = 100).

Item	Mean	Standard Deviation
Bus stops provide adequate seating and shelter for me and my children	3.39	0.820
Bus station provide unlimited facilities such as toilets for children's use	2.85	0.936
The location of the bus stop is strategic (the public's hotspot area)	3.53	0.717
The bus stop area has sufficient lighting to prevent criminal from happening	3.70	0.759
Bus drivers obey to speed limit	3.50	0.689
Bus drivers drive with prudence	3.49	0.689
Public buses in clean condition for children's use	3.08	0.734
Public buses are comfortable for children's use	3.04	0.764
Public buses provide facilities for parents to travel with children strollers or prams and shopping items	2.53	0.881
Public buses provide adequate seats for parents who travel with children	3.30	0.732
The location of the bus stop is near to your house	3.17	1.407
The location of bus stop is near to your regular destinations	2.97	1.123

5.2 The subjective factors affecting parents' decisions to use public bus with their children based on the TPB

5.2.1. Descriptive analysis

Table 2 shows the mean and standard deviation of the TPB components. The components have a mean value ranging from 2.13 to 4.25. The results show that the all the PBC components in terms of costs, limited resources available (e.g., no private vehicles in a household) and travel time are having a high concern among parents compared to other components with all the mean values above 4.00. In contrast, all the SN components in terms of peer pressure from family members and close friends have a low mean value in which ranging between 2.13 to 2.35. This may indicate that the support from important persons to the respondents on using public bus with children are low and not encouraging.

Table 2. Mean and standard deviation for TPB components (N = 100).

Item	Mean	Standard Deviation
You feel relaxed when using public bus with your children (ATT)	2.76	1.074
You feel easy when using public bus with your children (e.g., public buses provide comfortable and safe seats for children) (ATT)	2.59	1.045
You feel free when using public bus with your children (e.g., public buses have ample space and are comfortable for children to sit compared to private vehicles) (ATT)	3.04	0.875
My family members prefer me to use public bus with my children compare to private vehicle (SN)	2.13	0.761
My close friend would support me using public bus with my children to conduct various activities (shopping center, leisure place and monthly check-up for children) (SN)	2.35	0.925
My family members think I should use public bus with my children to conduct various activities (shopping center, leisure place and monthly check-up for children) (SN)	2.20	0.765
Limited transportation resources allow me to use public buses with children (e.g., no private vehicles) (PBC)	4.21	0.832
The use of public buses with children to conduct various activities helps to reduce transportation costs (e.g., free fare for children 6 years old and below) (PBC)	4.25	0.757
The use of public buses with children will increase the travel time compared to using their own vehicles (PBC)	4.09	0.900
You are willing to use public bus with your children for leisure activities in the future (INT)	3.27	0.802
Public bus will be the primary trip mode for me and my children in the future (INT)	2.60	0.899
My children and I will use public bus for travel in the future (INT)	2.68	0.909

5.2.2. Correlation Analysis

Table 3 shows the coefficient of correlation between the dependent variable and the independent variables, respectively. It is found that all the TPB components are significantly ($p < 0.05$) correlate with behaviour of parents to use public bus with children (BEH). The coefficients, however, show a weak relationship with a range between -0.235 to +0.204. As expected, PBC has a weak negative relationship with BEH, meaning that the higher the constraints in using public bus with children, the lower the exact use of public bus with children. As for the other components such as ATT, SN and INT are positively weak relationship, as expected which indicate that the positive the attitude, the high the peer pressure and the high the intention to use public bus with children, will contribute to the actual use of public bus with children among parents.

Table 3. Correlation analysis for the TPB components.

	ATT	SN	PBC	INT	BEH
ATT	1				
SN	0.657*	1			
PBC	0.273*	0.170*	1		
INT	0.577*	0.486*	0.450*	1	
BEH	0.183*	0.204*	-0.235*	0.171*	1

Notes*: Correlation is significant at the 0.05 level (2-tailed)

INT=Intention, ATT=Attitude, PBC=Perceived Behavioural Control,

SN=Subjective Norms, BEH=Behaviour

5.2.3 Multiple linear regression analyses

Multiple linear regression analysis is used to examine the subjective factors influencing parents' decisions to use public bus with children. Model 1 tests the relationship between the TPB elements of ATT, SN and PBC towards INT. Model 2 tests the relationship between PBC and INT towards BEH. All these two models are covered in all activity types. Meanwhile Model 3 tests the relationship between INT and PBC towards BEH for leisure activities (e.g., going to the cinema, doing sports, etc.), Model 4 tests the relationship between INT and PBC towards BEH for maintenance activities (e.g., doing laundry, going for Friday prayer for male, etc.) and Model 5 tests the relationship between INT and PBC towards BEH for mandatory activities (e.g., work and study). Note that the items for ATT, SN, PBC and INT are the same for all activity types. Only items for BEH have different questions asked for each activity type.

The variations explained in Model 1 is the highest in which 44.6% variation in dependent variables of INT are explained by the variations in independent variables of ATT, SN and PBC. However, for other models, the variations explained by the independent variables of INT and PBC towards variations of dependent variable BEH are considered low (Model 2 = 15.1%; Model 3 = 13.8%; Model 4 = 9.6% and Model 5 = 22%). This may be due to the fact that the number of independent variables explaining the dependent variables is too small, thus affecting the R-square values of the model. Thus, the models can be accepted to give at least some insights on the factors influencing parents to use public bus with children.

Figure 2 to 5 show the structural models of the TPB components toward the behaviour of parents' decisions to use public bus with children for all activity types and for each of activity types (leisure, maintenance and mandatory), that are based on regression analyses done. For all activity types, ATT and PBC components are significantly affecting the intention (INT) of parents to use public bus with children (at $p < .05$) meanwhile SN component is significantly affecting the INT marginally (at $p < .10$), as shown in figure 2. Meanwhile, both INT and PBC components are significantly affecting the BEH for all activity types (at $p < .05$), except for mandatory activities (see figure 5) in which the INT component is significantly (marginally at $p < .1$) affecting the behaviour (BEH) of parents using public bus with children to conduct mandatory activities. However, the PBC component is significantly affecting the BEH for mandatory activities at $p < .05$. These results show that all the TPB components do affect the intention and behaviour of public bus use with children among parents significantly, however, the subjective norm has less effect on the intention and thus, the behaviour. Meanwhile, the intention component towards behaviour of parents to use public bus with children for mandatory activities has less effects ($p < .10$) as compared to the perceived behavioural control component.

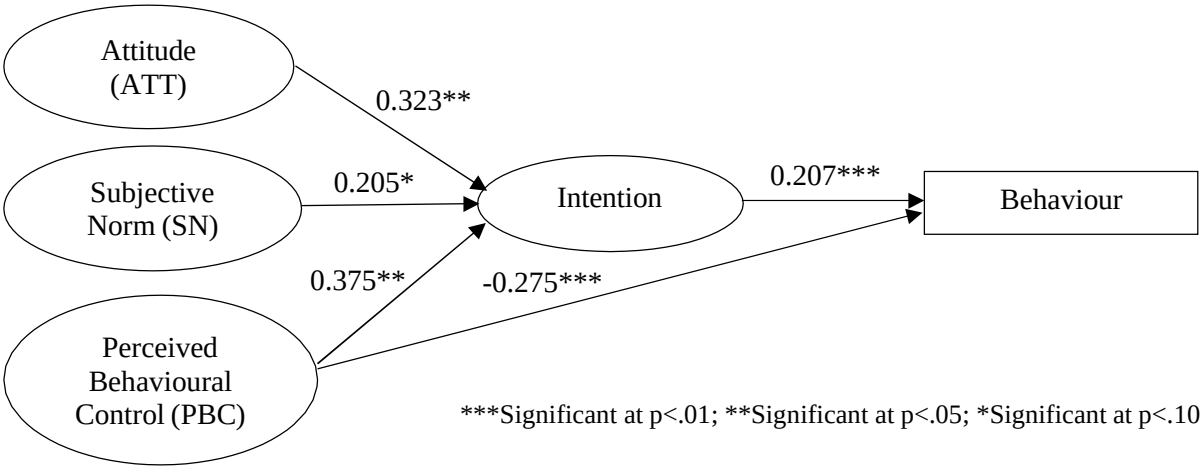

Figure 2. Structural model of TPB components on the behaviour of parents to use public bus with children for all activity types.

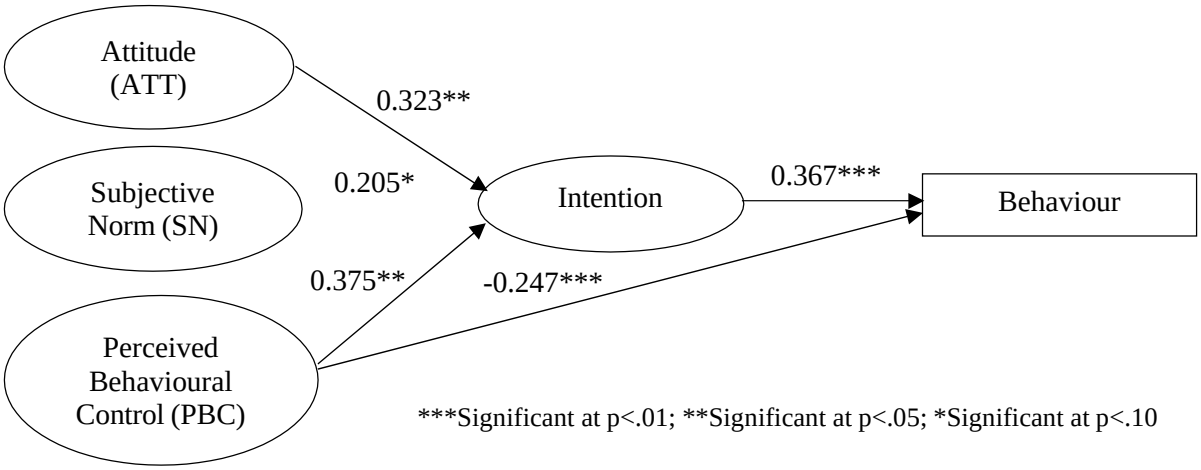

Figure 3. Structural model of TPB components on the behaviour of parents to use public bus with children for leisure activities.

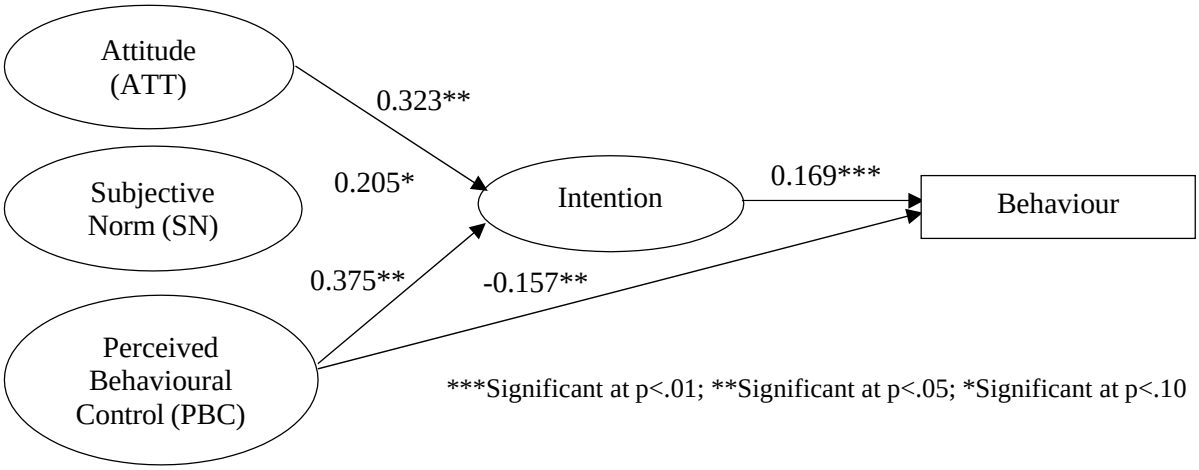

Figure 4. Structural model of TPB components on the behaviour of parents to use public bus with children for maintenance activities.

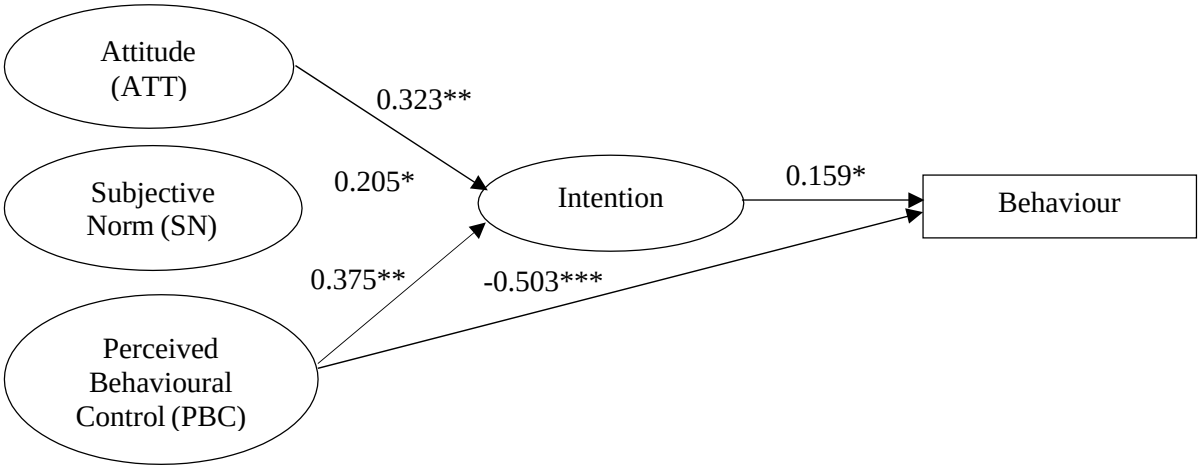

Figure 5. Structural model of TPB components on the behaviour of parents to use public bus with children for mandatory activities.

6. Discussions and conclusions

Based on the descriptive statistic of parents' perceptions in using public bus with children in terms of accessibility, affordability, safety and comfortability, the analysis revealed that the aspect of safety is likely to impact the parents' decision to use public bus with their children. Safety aspect is a concern for parents because they feel that by riding in their own vehicle, they know better and believe in a safe way of driving by themselves as parents. This findings aligned with a previous study by Stjernborg [23] in which social barriers may be caused by other passengers or by drivers and staff and they could also result from feelings of insecurity when travelling by public bus. They also consider that boarding a public bus poses a safety risk while at a bus stop if the location of the bus stop is not strategic and lack of lighting to allow criminal happened. Dghaim et al. [24] highlights that parents have concerns over safety for their children to use school bus to school including school's surrounding areas in Dubai. Mindell et al. [25] emphasize that perceived safety is one of the major barriers to use public bus to school in Dunedin, New Zealand.

The regression analyses show that the most influential factor affecting the parents' intentions to use public bus with children is positive attitudes towards public bus use and constraints or limitations that parents have (low costs, not having private vehicles and travel time) influence the parents' intentions significantly. This is in line with the study by Grant-Smith et al. [5], Morton et al. [12] and Mindell et al. [25] that facilities and services of public buses have impacted the use of the public bus. Meanwhile, the result on PBC is parallel with the study done by Donald et al. [26] in which PBC was found to be the most important variable in predicting the Intention of either participants driving or taking public transport to go to work. The intention component significantly (at $p < .01$) affect the behaviour for all activity types, except for mandatory activities (significant at $p < .1$). This is expected since the mandatory activities such as going to work and/or school/study need less intention but need enough resources (less cost and having no private vehicles) to conduct the mandatory activities, in which they have no choice but to participate in the activities in their daily routines.

Improving and enhancing public bus services in safety aspect could be taken as a main initiative from the local authorities to convince parents to take their children on sustainable mode such as public buses because from the findings of the study, the safety aspect affects the parents' perceptions in the use of public buses with their children. In addition, the service providers need to provide good quality services in terms of facilities to increase the positive attitudes among parents [25]. On the other hand, the policymakers may focus on the constraints that are faced by parents to use public bus with children such as fare since it significantly affects intention among parents to use public bus with children. Note that for now, children aged 6 years old and below can have free ride by using public bus in Johor. The relevant authority needs to review the itinerary of public buses and ensure that public buses travel on time to ensure that the public bus system is as effective as using an owned vehicle. They can also create several price promotions for bus fares, such as low-cost packages for parents who take their children on public buses. MaaS (Mobility as a Service) [27] concept that focused on transport system integration and Internet of Things may be considered in the future public transportation planning.

In the future studies, it is recommended to use different items for attitudes, subjective norms, perceived behavioural control and intentions for each type of activities (leisure, maintenance and mandatory) to capture much better effects of the factors, thus may increase the R-square values. In addition, it is recommended to run the analysis simultaneously using Structural Equation Model (SEM) to also capture a better effect.

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