The Application of Theory of Planned Behaviour in Pedestrian Safety: A Literature Approach

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ABSTRACT

Road accidents among pedestrian become an important issue that needs to be mitigated due to high injuries and fatalities cases. Pedestrian is a weakest group of people compared to the drivers because they are not fully protected. The accidents involving pedestrian may occur due to their own negative crossing behaviour. This study is purposely to identify the effectiveness of theory of planned behaviour (TPB) in predicting pedestrian behaviour. TPB has three main constructs which are attitudes, subjective norms and perceived behavioural control that significant to behavioural intention. Some studies used extended TPB by adding other constructs such as moral norms, perceived risk, conformity tendency, perceived severity, and past behaviour to predict pedestrian behaviour more accurately. This study used a literature approach where some of the previous studies are examined and the results of the studies are being analysed using descriptive analysis. The results show that TPB is suitable to predict pedestrian behaviour because the constructs are significant and comply with its fit. This study also shows that pedestrian behaviours are differ according to their age and gender. Most of previous studied states that young people tends to perform risky behaviours compared to old people. Children pedestrian are more vulnerable and have a high tendency to involve in road accidents and have a high fatality risk. Men are more risk-taking compared to women and men have high tendency to violate road regulations and exposed to injuries and fatality while women have more positive crossing behaviour.

Keywords: Theory of Planned Behavior (TPB); pedestrian behavior; attitudes; subjective norms; perceived behavioral control; behavioral intention.

INTRODUCTION

Road accidents involving collision between vehicles are often being main focus by most of researchers where the drivers or riders and passengers are the victims. However, road accidents involving pedestrian also need to be concern because they are the second most frequently occurred after collision between vehicles (Zhou et al. 2018; Díaz, 2002). Moreover, accidents involving pedestrian also recorded as the highest number of fatalities (Hashemiparast et al. 2016; Xu et al. 2013). Based on the research done by Rahimi et al. (2012), there are more than 30 percent of pedestrians died annually in Iran. Avery and Jackson (1993) state that accidents involving pedestrian is the biggest accidental killer of children and adolescents in Britain. These show that pedestrian is one of the main contributors to the road accidents.

Pedestrian is the weakest group of people (Hou et al. 2021; Xu et al. 2013) that have a high risk to injuries and fatality during road accidents (Zhuang & Wu, 2011). The pedestrian is not protected by any mechanism, so the impact that they will facing are more serious compared to collision between vehicles (Abdul Hanan et al. 2015). The road accidents not only involving loss of lives, but the injuries and fatalities can affect the nation's economic growth (Gitelman et al. 2012; Hashemiparast et al. 2016) where it will require a large sum of money for treatment and repairs costs. Injuries that caused by road accidents can also affect the victim's performance, efficiency and fitness (Javadi et al. 2015) where they will spend the rest of their lives with disabilities (Tabibi & Kiafar, 2013; Kavosi et al. 2015). The high numbers of accidents and fatalities will also affect the country's images where it will show that the country is not safe enough.

Child pedestrian that involving in road accidents also needs attention. Child pedestrian frequently having injuries during peak hour which coincide with their journey to and from school, between 8.00 a.m. and 9.00 a.m. in the morning and 3.00 p.m. and 6 p.m. in the afternoon (Tight, 1996). The child pedestrian tends to involve in road accidents when they are alone (Tight, 1996) and during they intent to cross the road (Southwell et al. 1990). Child pedestrian tend to

cross the road in risky situation (Hashemiparast et al. 2016; Zhou et al. 2009).

There are some factors that can cause the accidents and fatalities among pedestrians where the most of road accidents involving pedestrian occurred due to pedestrian's carelessness (Abdul Hanan et al. 2015; Petzoldt, 2014; Hyman et al. 2010). Adbel-Aty and Radwan (2000) states that 95% of road accident occurs due to human factor. The accidents can occur when the pedestrian not give full attention or not focus during crossing the road such as using phone (Lennon et al. 2017; Salmon et al. 2012) and cross the road while listening to music. Nasar and Troyer (2013) estimated about 1506 pedestrians are injured due to phone usage while crossing the road in 2010.

The accidents that involving pedestrian also contributed by pedestrian's violation (Taubman-Ben-Ari & Shay, 2012; Castanier et al. 2013; Qu et al. 2016; Deb et al. 2017). Some of them not abide the road regulations by crossing the road illegally (Rosenbloom, 2009; Hijar et al, 2003). Illegal crossing includes crossing the road during red light for pedestrian, do not use pedestrian crossing, crossing the road abruptly and do mid-block and diagonal crossing in order to save time (Baltes, Chu & Guttenplan, 2003). Şimşekoğlu (2015) states that low level of pedestrian safety is because of low level of compliance to traffic rules and unsafe attitudes of pedestrian. As unsafe crossing behaviour increases, the risk of injury and death increases (Lin et al. 2007; Schabrun et al. 2014).

Behavior is one's reaction that influences their own emotion in a specific situation (Triandis et al. 1965). Behavior is often being associated with psychology because behavior involve one's emotion and motivation (Lancaster & Ward, 2002). One's behavior also reflects their own personality either good or bad personality (Machin & Sankey, 2008). Based on the studies done by Bilema et al. (2017) and Evans and Norman (2003), the pedestrian behavior can affected their intention to cross the road either they will cross safely by complying regulations or they willing to take risk by crossing the road illegally. Their behavior can affect their own intention even though there are good pedestrian's facilities such as pedestrian crossing. According to Zhuang and Wu (2011), compared to waiting patiently at the curb, pedestrians more likely to cross the road at unmarked crossways.

Other than that, distracted behavior of pedestrian may cause injuries and accidents. The example of distracted behavior is using mobile phone while crossing. The usage of mobile phone while crossing either to pick a phone calls, messages, social apps, listening music or playing online game increase the crash risk (Bungum et al. 2005; Lamberg & Muratori, 2012; Schwebel et al. 2012; Thompson et al,

2013; Gauld et al. 2014; Qureshi et al. 2015; Shahrzad et al. 2016; Russo et al. 2018, Hou et al. 2021) and leads to injuries and fatalities (Zhang et al. 2017; Hou et al. 2021). Khan et al. (2014) also states that cross the road while using phone can cause an inattention blindness. They cannot give full attention during crossing the road.

Distracted behavior not only increase the crash risk and fatality risk, but it can disturb the pedestrian crossing movement where this behavior can cause the pedestrian wait longer time to cross and also can missed more safe opportunities to cross (Byington & Schwebel, 2013; Hou et al. 2021). Phone usage may cause they walk slower than usual, then increase the risk exposure (Hatfield & Murphy, 2007). Young people frequently do the distracted crossing (Neider et al, 2010) compared to older people because older people spend less time using mobile phone (Hou et al, 2021). Stavrinos et al. (2011) states that college students are more likely to have injury compared to other pedestrian due to distracted walking by using phone.

Negative crossing road behavior needs to be mitigated because if these behaviors are repeated continuously, the behavior tends to form and execute the intention without more effort (Wood et al. 2002; Aarts & Dijksterhuis 2000; Ferreira et al. 2006) that will lead to increase in road accidents. Therefore, this research purposely to study the application of theory of pedestrian behaviour in road safety in order to access pedestrian's behaviour in a certain situation.

THEORY OF PLANNED BEHAVIOUR (TPB)

The theory of planned behaviour (TPB) is used to predict one's behaviour. TPB originally known as Theory of Reasoned Action (TRA), introduced by Fiesbein and Ajzen (1975). TRA explained to measure attitude and social normative perception towards one's specific behaviour which leads to behavioural intention (Montano & Kasprezyk, 2002). Then, TRA is being modified as TPB by Ajzen (1991).

The main theme of TPB is one's intention that will influences behaviour and TPB's constructs can explain intention and behaviour with high accuracy among different populations (Rhodes et al. 2007; Darker, Larkin & French, 2007; Sun et al, 2015). Abdul Hanan et al. (2015) states that TPB is used to explain the psychosocial factors that influence pedestrian intentional behaviour. TPB widely used in predicting pedestrian's behaviour while crossing the road such as the studies that being done by Holland and Hill (2007), Evans and Norman (2003) and Zhou and Horrey (2010). Barrero et al. (2013) evaluating pedestrian's behavior while crossing the road in an urban setting by using TPB constructs. The behavior of each pedestrian is differed to each other.

There are three main constructs to measure one's behavior using TPB which are attitudes, subjective norms and perceived behavioral control. Attitudes are formed based on one's assessment either positive and favorable or negative and unfavorable towards the specific behavior (Howarth, 2006; Ajzen, 2011; Hashemiparast et al. 2016). Attitudes can be changed according to certain factors, reason and environment (Finch, 2008). Subjective norms focused on involvement of trust of other relevant individuals towards pedestrian. Subjective norms are individual perceptions towards the specific behaviour and their motivation to comply the trust of other relevant individuals such as their family and friends. Hashemiparast et al. (2016) stated that subjective norms are social pressures that will affect one's decision performing a specific behaviour.

Perceived behavioural control (PBC) is one's assessment towards their own capability to involve in a specific behaviour based on their own strength either they easily or hardly to perform the behaviour. An individual tends to cross the road when he thought it will be more easy to cross rather than cross the road in depicted manner even though the action can leads to road accidents (Evans and Norman, 1998). Past experiences of the individuals can affect the PBC. PBC can also being affected by an expectation and the present of obstacles. (Hashemiparast et al. 2016; Yang & Sun, 2013). These three main constructs of TPB will be used to measure behavioural intention (BI). Glanz et al. (2008) states that BI is the best predictor of an actual behavior performance of individuals.

Based on the study done by Evans and Norman (1998), TPB is relatively parsimony where this application introduced a simple model of the proximal influences on intentions and behaviour. There is a shortage of using TPB to predict one's behaviour which is lack of comprehensive validated instrument to measure the constructs that affecting the intention of pedestrian to cross the road. This shortage can be mitigated by identifying the suitable predictors that affecting pedestrian's intention to cross the road (Hashemiparast et al. 2016). Hagger et al. (2002) and Downs and Hausenblas (2005) state that the application of TPB is

being neglected where open-ended question will critically establish the cognitive foundations of respondent behaviour, normative and control belief that are required in TPB. While, Scott et al. (2007) states that information absence is one of TPB shortage where respondents are unaware of their walking behaviour and unable to explain it accurately.

Evans and Norman (2003) states that there are researchers suggested TPB may be augmented by the inclusion of a range of additional predictor which can caused a significant increment in the amount of variance explained in intention. The efficiency of TPB can be improved by adding relevant factors as extended predictors to the original TPB (Ajzen, 1991) such as affective states (Evans & Norman 2003), moral and personal norms (Evans & Norman 2003; Xu et al. 2013), descriptive norms (Zhou et al. 2015) and group identification (Norman et al. 2005), self-identity (Evans & Norman 2003), social norms (Park and Smith, 2007). Risk estimation also needs to be considered to predict the intention such as perceived risk and perceived severity (Walsh et al. 2008; Zhou & Horrey, 2010; Yagil, 2000; Hashemiparast et al. 2016) because if the risks are being underestimate, the pedestrian will tend to violate the regulations and make a risky behaviour.

METHODOLOGY

This study used a literature approach where some of the previous studies are examined and the important information regarding to the methodology and results of the studies are being analysed using descriptive analysis. The data obtained will be shown in a form of table and the results will be explained. Then, the conclusion will be made and there is some suggestion on improving the pedestrian safety.

RESULTS

The results of this study are simplified in Table 1. There are some notes that need attention.

TABLE 1. Case studies

No	Author	Year	Focus of study	Methodology	TPB						Extended TPB		Notes
					A	SN	PBC	I	B	BI	PB	O	
1	Diaz	2002	To study pedestrian's attitudes towards traffic violations	Survey (146 participants from the city of Santiago)	✓	✓	✓		✓	✓			
2	Evans and Norman	2003	To predict road-crossing intentions among adolescents	Survey (1833 participants among adolescents)	✓	✓	✓	✓				✓	Moral norms, anticipated affect and self-identity
3	Xu, Li and Zhang	2013	Pedestrian's intention to violate traffic laws using a dual-process model	Survey (323 participants from China)	✓	✓	✓			✓	✓	✓	Injunctive norms, descriptive norms, personal norms
4	Sun et al.	2015	Walking behaviour of university students	Survey (169 participants from Chinese University of Hong Kong)	✓	✓		✓	✓				
5	Zhou, Romero and Qin	2015	To predict pedestrian's violating crossing behaviour	Survey (260 participants from Dalian, China)	✓	✓	✓			✓		✓	Descriptive norm, perceived risk and conformity tendency
6	Abdul Hanan et al.	2015	Examined pedestrian intention to cross road using mobile phone	Survey (107 participants from one of northern university in Malaysia)	✓	✓	✓			✓			
7	Hashemiparast et al.	2016	Risky pedestrian behaviour during road-crossing using psychometric study	Survey (380 participants from Tehran, Iran)	✓	✓	✓			✓		✓	Perceived risk, perceived severity
8	Bilema, Haurula and Rahman	2016	To identify pedestrian's characteristics based on their demographic	Survey (200 participants from Batu Pahat)	✓	✓	✓	✓	✓				
9	Suo and Zhang	2016	Pedestrian red light crossing among university students and their peers	Survey (300 participants from Southwest University)	✓	✓	✓			✓	✓		
10	Koh & Mackert	2016	To predict crossing behaviour while texting	Survey (329 college students in the Southwest)	✓	✓	✓			✓		✓	Perceived risk, personal norms and self-efficiency
11	Barton et al	2016	To predict crossing behaviour under various types of distraction	Survey (80 adults participants)	✓	✓	✓			✓			

… continued

No	Author	Year	Purpose	Method	A	SN	PBC	I	B	BI	PB	O	Others
12	Hemmati and Gharlipour	2017	Safe behaviour in road crossing among middle school students	Survey (364 students in Qom, Iran)	✓	✓	✓	✓	✓				Safe behaviour in road crossing
13	Sundararajan et al.	2018	Pedestrian behaviour on safe crossing by using facilities	Survey (300 participants from Kluang and Batu Pahat, Malaysia)	✓	✓	✓	✓	✓				Perceived consequence, perceived safety
14	Piazza et al.	2019	To predict crossing behaviour while using mobile device	Survey (480 adult participants)	✓	✓	✓	✓		✓			
15	Demir, Ozkan & Demir	2019	To compare TPB and prototype willingness model (PWM) in pedestrian violations	Survey (486 participants of university's students)	✓	✓	✓	✓	✓			✓	Willingness
16	Hou et al.	2021	Behaviour crossing the road while using mobile phone	Survey (387 participants from China)	✓	✓	✓	✓	✓			✓	Mobile phone involvement (MPI) and situation

Notes:
A: Attitudes
SN: Subjective norms
PBC: Perceived behavioural control
I: Intention
B: Behaviour
BI: Behavioural intention
PB: Past behaviour
O: Others

DISCUSSION

The application of TPB mostly related to pedestrian's safety and their behaviour during road-crossing. This study shows that TPB is the best choice for predicting the behavioural intentions of pedestrians because the constructs are significant and comply with its fit. Based on previous studies, most of them are quantitative where they used survey questionnaire as their instrument of study. The respondents or participants of their studies are pedestrians among various range of ages which are children, adolescents and university's students.

ATTITUDES, SUBJECTIVE NORMS AND PERCEIVED BEHAVIOURAL CONTROL

Most of previous study will used the basic parameters or variables of TPB which are attitudes, subjective norms and perceived behavioural control. These parameters will influence the behaviour or intention or behavioural intention of pedestrian in making their decisions during road-crossing. Based on this study, 93.75% of previous studies (15 from 16 studies) used all three main constructs of TPB to predict pedestrian behaviour. The study done by Xu et al. (2013) only use attitudes and PBC constructs to predict behavioural intention of respondent with addition of other constructs.

Díaz (2002), Xu et al. (2013), Hashemiparast et al. (2016), Suo and Zhang (2016), Koh and Mackert (2016) and Sundararajan et al. (2018) studies show that attitude, subjective norms and PBC are significant towards behavioural intention. From the study done by Bilema et al. (2017), attitude construct is significant and respondents are agree that attitudes strongly influence the intention and behaviour, whereas intention has a strong relationship with behaviour on pedestrian safety. Bilema et al. (2017) also states that when a pedestrian shows a good and polite attitude when crossing the street, pedestrian will be in safe. While, Evans and Norman (1998, 2003) and Barton et al. (2016) state that PBC is the strongest predictor of pedestrian's behaviour where an individual more likely to engage in risky situation as long as the situation is seen to be easy to perform (Evans & Norman, 1998; Rutter et al. 1995).

While, Hou et al. (2021) states that three of four standard TPB constructs which are attitudes, intention and PBC are significant predictors of the behaviour. So, these constructs should be prioritized when developing safety interventions and policies (Hou et al. 2021). Hemmati and Gharlipour (2017) states that the relationship between safe behaviour with attitudes, PBC and intention are significant while relationship between safe behaviour with subjective norms is not significant. Safe behaviour in road crossing is low among students, therefore the application of TPB can increase safe behaviour in road crossing (Hemmati & Gharlipour, 2017).

Whereas, Abdul Hanan et al. (2015) study indicated that subjective norm and PBC influenced significantly towards intention to cross the road when using mobile phone. The respondents known that an action of using mobile phone while crossing the road can put them in a dangerous situation, but as they seen other pedestrian using mobile phone while crossing, they believed that it is safe (Abdul Hanan et al. 2015). Based on research done by Zhou et al. (2015), attitudes and subjective norms are significant. The respondents have negative attitudes towards violating road-crossing rules behaviour because they believed these action will caused road accident (Zhou et al. 2015).

Then, Sun et al. (2015) states that PBC is the strongest predictor of intention and behaviour, whereas subjective norm and attitudes are small and statistically insignificant. In results, this TPB framework can be used as walking promotion in the university campuses (Sun et al. 2015). Next, Piazza et al. (2019) states that attitude is the strongest predictor (Lennon et al. 2017) while PBC is the weakest predictor in predicting behaviour of using mobile phone while crossing. So, attitude and subjective norms need to be prioritized in behavioural interventions (Piazza et al. 2019)

Demir, Ozkan and Demir (2019) states that PBC is the strongest predictor while subjective norm did not predict the intentions significantly. Most of respondents thought they are likely to involve in pedestrian violation, so in order to reduce the violations, it is important to reduce the PBC (Demir, Ozkan & Demir, 2019). Lastly, to reduce the inconsistency of subjective norms, normative factors such as moral norms, descriptive norms and personal norms will be added as extended TPB (Koh & Mackert 2016; Nemme & White 2010).

EXTENDED CONSTRUCTS

Some of the previous studies added several new variables and apply it as extended TPB. The additional parameters are used to obtain more accurate results in various situation of each studies. This study shows that 62.5% of previous studies (10 from 16 studies) add some other constructs to extend the original TPB. The additional constructs are moral norms, anticipated affect and self-identify (Evans & Norman, 2003), safe behaviour in road crossing (Hemmati & Gharlipour, 2017), descriptive norm, perceived risk and conformity tendency (Zhou et al. 2015), perceived risk and perceived severity (Hashemiparast et al. 2016), injunctive norms, descriptive norms, past behaviour and personal norms (Xu et al. 2013), past behaviour (Suo & Zhang 2016), mobile phone involvement and situation (Hou et al. 2021), perceived risk and personal norms (Koh & Mackert, 2016), willingness (Demir, Ozkan & Demir 2019) and perceived consequence and perceived safety (Sundararajan et al. 2018).

Evans and Norman (2003) study shows that moral norms are not significant to road crossing intention while anticipated affect and self-identity are significant to the intention. Self-identity indicates that an individual thinks of himself as a 'safe pedestrian' eventhough actually some of their behaviour is not safe to crossing the road (Evans

and Norman, 1998). Then, Hemmati and Gharlipour (2017) adding determinant safe behaviour road crossing to original TPB and it shows a significant relationship between student's safe behaviour in road crossing and intention (Khalafe Nilsaz et al. 2013). Zhou et al. (2015) states that after adding descriptive norm, subjective norm was no more significant, then conformity tendency become a strong predictor, indicating that the presence of other pedestrians would influence behavioural intention. Conformity tendency is a tendency to change behaviour when other people do the same action such as pedestrian has greater chance to cross the road when other pedestrians are crossing (Zhou et al. 2009).

Moreover, Hashemiparast et al. (2016) states that individual that has low perceived risk will having a higher risk-taking behavior which leads to experience road accidents (Jonah, 1986). Besides, an individual that has low perceived severity also can leads to higher risk-taking behaviour (Hashemiparast et al. 2016; Lund & Rundmo, 2009; Yagil 2000). Whereas, Xu et al. (2013) states that a pedestrian will make a decision to cross the road illegally with influences of their past behaviour while personal norms and perceived control can predict pedestrian's intention independently. Suo and Zhang (2016) states that university students obey traffic rules more than their peers and past experiences tend to form a positive crossing habit.

Hou et al. (2021) add two extended predictors which are situation and mobile phone involvement where all predictors are significant to the pedestrian's behaviour and the results show that behaviour of using mobile phone while crossing reflects pedestrian's habit. A study done by Koh and Mackert (2016) shows that personal norms and self-efficiency are statistically significant predictors of behavioural intentions whereas perceived risks did not predict behavioural intention. The respondents are less confident in their control over texting while walking and they likely send and read messages while walking (Koh & Mackert 2016).

Demir, Ozkan and Demir (2019) compared the standard TPB with prototype willingness model (PWM) where attribute willingness is added to predict pedestrian violations. The result shows that willingness is a better predictor of behaviour and intentions (Elliott et al. 2017). To reduce the willingness to perform violations, placing physical barriers is one of options that can be done where the barriers can inhibit the willingness by removing the opportunity for behaviour (Demir, Ozkan & Demir 2017). Lastly, Sundararajan et al. (2018) study added two attributes which are perceived consequence and perceived safety, where both attributes are positively related to intention of safe crossing among pedestrian. Perceived consequence is factors that predict positive or negative consequences while perceived safety is the degree to which one's believes that using the facilities will influence his well-being point (Evans & Norman, 2003; Sundararajan et al. 2018).

AGE AND GENDER

Age and gender are the basic information that can be obtained by each pedestrian. The variation of age and gender of pedestrian will result in variation of behavioural patterns because they have different physiological and psychological characteristics (Gong et al. 2019). They will react differently according to the situation that they are in.

Beside showing the significant of TPB determinants towards pedestrian's behaviour, this study shows that age of respondents can affect their behaviour while crossing the road. Adults perceived more inhibitory of the subjective norms compared to young people (Díaz 2002). Adult has more control over violations and less intention to commit violations than young people (Díaz 2002; Parker et al. 1995, 1992a, 1992b). Wu et al. (2017) and Bernhoft and Carstensen (2008) state that adolescent and middle-aged pedestrian more likely to run a red light compared to older pedestrian. Adults also tends to make less mistake and more careful when crossing the road. Young people especially in the group age of 18-25 years old are commonly died and highly tends to involve in the road accidents (Saffarzadeh et al. 2011) while in Mazandaran, Iran most victims are in the 20-29 years old (Moosazadeh et al. 2013).

For child pedestrian, they tend to involved in accidents because most of them still cannot understands the risks that they will faced and they do not have the requisite perceptual or cognitive skills to cross the road safely (Evans & Norman 2003; Avery and Jackson 1993; Demetre and Gaffin 1994). Hemmati and Gharlipour (2017) and Tabibi and Kiafar (2013) state that the children will have ability to identify their high risk and unsafe action after the age of 10. Hou et al. (2021) states that older people are spend less time on mobile phone compare to young people, so young people are highly distracted while crossing the road and high tendency to involve in accidents.

Moreover, pedestrian behaviour can also being affected by the gender of respondents. Hemmati and Gharlipour (2017) shows that there is a significant relationship between student's safe behaviour in road crossing and their gender where girls tend to have more positive safe behaviour compared to boys in road crossing. So, it shows that there was a significant difference between gender and place of accident with type of accident (Khazaei et al. 2016). Men frequently violates the traffic rules such as not using crosswalk when cross the road than women. (Díaz 2002; Bernholf & Carstensen 2008). While, female pedestrian less likely to run red lights (Diaz 2002; Zhou et al. 2009; Wu et al. 2017). Men also willing to take more risks compared to women (Díaz 2002; Rajabpoor et al. 2005; Parker et al. 1995, 1992a, 1992b). So, it caused men to have higher tendency to involve in road accidents compared to women, while women have higher tendency to involve in non-fatal crashes. (Massie, Green & Campbell 1997; Soori 2002; Nasehi et al. 2013).

For child pedestrian, boys are twice likely to be injured compared to girls (Evans & Norman, 2003; Pless et al. 1989; Bener, 2005; Monsef et al. 2015) due to boys are having greater tendency to play on the streets and tought it is funny and amusing while the girls have a greater emphasis on safety (Zito et al. 2015). Hou et al. (2021) states that female has slightly higher percentage (56.5%) compared to male that using mobile phone while crossing in past two weeks where the higher usage of mobile is phone call and social applications.

IMPROVEMENT SUGGESTION

Some of the previous studies suggest some ways to reduce road accidents involving pedestrian and to improve pedestrian's safety. Bilema et al. (2017) states that the government needs to provide more road safety education among all generations either young people or adults to change the attitudes of road users. Road accidents involving child pedestrian can be reduced by introducing advance traffic training for preschool children and raise the training level for 9 years old children (Tabibi & Kiafar 2013). Sun et al. (2015) suggests to improve and provide more pedestrian walkways, providing street furniture and aligning walking path across areas of scenic beauty that provides a balance between shade and sunlight. Koh & Mackert (2016) suggest fine for texting while walking due to high risk involving in road accidents. Pedestrian Awareness Day is suggested by Abdul Hanan et al. (2015) in order to provide awareness about road safety especially towards student about the dangers that they may encounter during crossing the road.

CONCLUSION

As a conclusion, this study shows that TPB is suitable to predict pedestrian behaviour because the constructs are significant and comply with its fit. Attitudes, subjective norms and perceived behavioural control are TPB constructs that being used by most of the previous studies and the results show that these determinants are significant to behavioural intention of pedestrian. Some of previous studies extend the TPB by adding other constructs such as moral norms, anticipated affect, self-identify, safe behaviour in road crossing, descriptive norm, perceived risk, conformity tendency, perceived severity, injunctive norms, descriptive norms, past behaviour, personal norms, willingness, perceived consequence and perceived safety. The additional constructs can predict pedestrian behaviour more accurately. This study also shows that pedestrian behaviour are differ according to their age and gender. Most of previous studied states that young people tends to perform risky behaviours compared to old people. Children pedestrian are more vulnerable and have a high tendency to involve in road accidents and have a high fatality risk. Men are more risk-taking compared to women and men have high tendency to violate road regulations and exposed to injuries and fatality while women have more positive crossing behaviour.

DECLARATION OF COMPETING INTEREST

None

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