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A Case Study on Application of the Theory of Planned Behaviour: Predicting Physical Activity of Adolescents in Hong Kong

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Abstract

Objective: The aim of this case study was to predict the physical activity intention and behaviour of secondary school students in Hong Kong by applying the Ajzen's Theory of Planned Behaviour (TPB) and past physical activity behaviour.

Methods: 486 students (250 male and 236 female), ranging in age from 11 to 18 years, were enrolled in this study. By means of self-administrated questionnaire, demographic data, past physical activity and variables of theory of planned behaviour, such as attitude, subjective norm and perceived behavioural control were measured.

Results: About 75% of students did not meet the standard of the physical activity recommended by government. Male had significantly higher behavioural intention than female. The variables of theory of planned behaviour explained 53.1% of physical activity intention with significant factors of subjective norm and perceived behavioural control (PBC), increasing to 56.2% with the addition of past physical activity behaviour. When predicting physical activity behaviour, theory of planned behaviour accounted for 26.6% of the variance. The prediction was further improved by including past physical activity behaviour.

Conclusions: Results of this study give evidence that the theory of planned behaviour is a useful framework for prediction of physical activity intention of adolescents in Hong Kong. Among the variables, perceived behavioural control and past behaviour played a significant role in modelling the physical activity intention and behaviour of secondary school students.

Keywords: Health promotion; Physical activity; Past behaviour; Intention; Attitude; Adolescents

Introduction

It is well-known that regular physical activity brings many health benefits. It not only helps to improve body fitness, but also prevents chronic diseases, relieves pressure and extends social network [1-3]. According to World Health Organization [4], inadequate physical activity ranked the fourth leading cause of global mortality. Diseases caused by lacking physical activity were reported that have contributed to 6% of global mortality rate. For the sake of society, regular physical activity was suggested to be essential to improve public health and relieve financial burden on public medical expenditure indirectly [5,6]. A study estimated that the social costs expensed on each citizen due to physical inactivity could be up to €150-300 each year in Switzerland and United Kingdom [7].

Adequate physical activity is particularly important to children and adolescents. Habits developed in early stage are rooted and more likely to be maintained throughout the rest of life. Teenagers who have a positive attitude towards physical activity would more likely be sustained their exercise practice at 5-10 years later [8]. Hence, regular physical activity habits in early stage of life could also help to maintain a healthy lifestyle in adulthood. According to the survey by Department of Health [9], it revealed that majority of population did not have enough physical activity, there was over 60% of Hong Kong citizens (aged from 18-84) could not fulfil the requirements of regular physical activity. In addition, students in Hong Kong were reported lacking of physical activity [10]. Excluding physical education lessons in school, there were nearly 70% of students did not have adequate amount of physical activity to bring health benefits [11]. Similar alarming figure was also recorded in UK, there were only about one-third of people had adequate level of physical activity [12].

Fishbein and Cappella suggested that application of behavioural theories could help to generate effective health intervention programmes

and design persuasive communication [13]. In order to tackle the problem of physical inactivity amongst adolescents, researchers have tried to explain physical activity behaviour by using different psychological models [14]. Theory of Planned Behaviour (TPB) [15] is designed to predict human behaviour. It is one of the models which is widely adopted in predicting physical activity behaviour [16,17]. A number of studies reported that TPB model had a high validity in predicting physical activity intention and behaviour [18,19]. Various works have applied TPB to study physical activity behaviour and supported suitability of the theory among adolescents [20]. Hagger et al. pointed out that few significant cross-culture differences in the structural relations among the TPB constructs were spotted [21]. However, only few studies of TPB application in predicting physical activity behaviour of Hong Kong students have been found.

TPB is a model generated from the Theory of Reasoned Action (TRA) [15], which assumes that the specific behaviour is determined by intention to perform it [22]. The model extended the TRA by supplementing the perceived behavioural control (PBC) because TRA experiences difficulty in explaining behaviours in which a person does not have volitional control over it. Armitage and Conner made an excellent review on TPB [19]. Basically, there are three antecedents of behavioural intention, which are attitude, subjective norm and PBC. Figure 1 shows the detail of TPB model.

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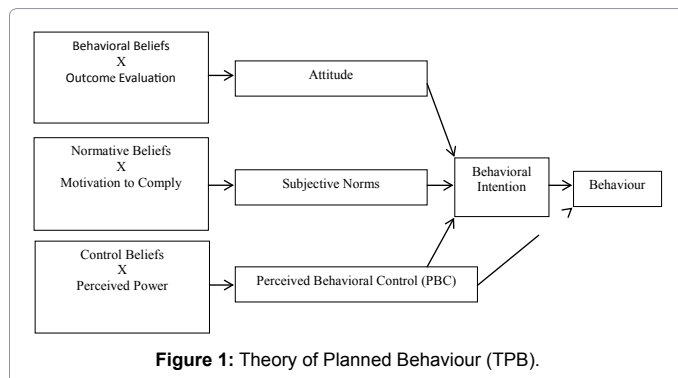


Figure 1: Theory of Planned Behaviour (TPB).

Behavioural intention is the measure of an individual's willingness to perform a desired behaviour. Based on the rationale of TPB model, behavioural intention is a proximal predictor of behaviour [15]. The higher behavioural intention is towards a specific behaviour, the more likely is that the person engaged in that behaviour. Attitude is the measures of the salient behavioural beliefs. It is the function of an individual who perceived the likelihood of outcome due to performing a behaviour and individual's evaluation of that outcome [23]. Fishbein and Ajzen suggested that attitude could be classified into affective (e.g. unpleasant / pleasant etc.) and instrumental elements (e.g. harmful / beneficial) [22]. Subjective norm measures the effect of social influence exerted on individuals. It is the perception that individuals perceived the pressure whether they perform or not a specific behaviour [15]. Some studies suggested that subjective norm in predicting physical activity was a rather weak predictor. Subjective norm was less significant in predicting physical activity in adults. However, teenagers were more subject to significant others such as peer and parents [24]. PBC is the measure of 'people's perception of the ease and difficulty of performing the behaviour of interest' [15]. The extent that individuals could successfully transform their behavioural intention into actual behaviour greatly depends on their volitional control over that behaviour. Because of the higher control on behaviour, the intention on performing behaviour would be higher [22]. Measures of PBC reflected an individual's control over a specific behaviour.

Several studies revealed that the factor of past behaviour played a significant role in prediction of future behaviour [25]. Past behaviour and future behaviour were closely related. The addition of past behaviour could significantly enhance the prediction of variance in future behaviour [26]. Hagger et al. suggested that the addition of past behaviour would influence attitude, subjective norm, PBC and behaviour significantly [27]. In addition, there is an attenuation effect on attitude to behavioural intention, and on behavioural intention to behaviour. One study suggested that routine physical activity in a consistent environment would develop into habits [28]. The habits strength would be stronger with increasing frequency of past behaviour. Strong habit strength would attenuate behaviour-intention relationship [29].

Although TPB model is widely used in foreign countries, the application for predicting physical activity behaviour among teenagers in Hong Kong is not common. As the behavioural intention and behaviour are affected by age, gender, cultural, ethical and educational factors [15], the factors relating to attitude, subjective norm and PBC may be different in predicting physical activity behaviour in Hong Kong. From the studies of Wang et al. [30] and Zhang et al. [31], the psychosocial factors and motivation of Chinese students towards physical activity were reported to be quite different from the data of

western samples. The aim of the present case study was to apply the TBP model in prediction of behavioural intention and physical activity behaviour amongst Hong Kong secondary school students.

Materials and Methods

Participants

The current research was carried out during the 2011-2012 academic year. One secondary school in Hong Kong was selected to participate in this case study. With response rate of 60.5%, there were in total 486 (250 male and 236 female) participants enrolled out of 803 invitations, ranging in age from 11 to 18 years. All of participants were Chinese. Data was taken from the corresponding students from Form 1 to Form 5 with the help of class teachers.

Procedures

All subjects participated voluntarily. Test would be conducted only after having the oral consent of corresponding participant. Ethical requirements for the collection of personal data of the Institute of Vocational Education were strictly followed.

Data were collected in two phases. In phase 1 (January 2012), questionnaire was translated into Chinese and given to students, which contained measures of basic demographic information, past physical activity behaviour and TPB variables. In phase 2 (March 2012), eight weeks after phase 1, the physical activity behaviour was measured.

Instruments

Questionnaire, consisting of three parts, was employed as a mean to measure students' behaviour. The basic demographic information included gender, height, weight, health status was measured in the first part. In the second and third part, physical activity behaviour and TPB variables were measured accordingly.

Regarding the TPB variables, all items were measured by using 7 point Likert Scale. The questionnaire items were adapted from a measure used previously by Yu and Chen [32,33]. The items extracted from these studies were pretested and the internal reliability, Cronbach's α , was over 0.70.

Attitude

Attitude was measured by semantic differential bipolar scale, scoring from -3 to +3. There were in total five items. The format of the questions was 'For me to do 'regular physical exercise' is'. Bipolar adjective was used for scoring (e.g. harmful/beneficial, worthless/valuable, unimportant/important and etc.). Attitude towards regular physical activity was measured by taking the mean scores. The internal reliability of these five items was satisfactory (Cronbach's $\alpha=0.93$).

Subjective norm

It consisted of two questions. Subjective norms items scored from -3 to +3. An example question was 'Most people who are important to me would support if I intend to do regular exercise in the forthcoming month.' The scale displayed an acceptable degree of internal consistency (Cronbach's $\alpha=0.89$). The mean scores of subjective norm items were used.

Perceived behavioural control (PBC)

It consisted of three questions. The sample question was 'I would insist on taking regular exercise in the forthcoming month no matter I meet any obstacles.' PBC was measured by using unipolar scale, scoring

from +1 to +7. Internal consistency for this section was acceptable and good enough for analysis (Cronbach's $\alpha=0.89$).

Behavioural intention

Three questions were used to measure behavioural intention. Unipolar scale was used, which it scored from +1 to +7. Questions of whether 'I plan', 'I try' and 'I intend' to do 'regular exercise' in the forthcoming month' were asked. Cronbach's α for this section was 0.926 and displayed a high degree of internal consistency. The mean scores were used for analysing.

Physical activity behaviour

The extent of physical activity behaviour relied on self-report finding. In the first phase of study, past physical activity behaviour was measured. According to the work of Fishbein and Ajzen [22], behaviour composed of four elements, which are action, target, context and time. In the questionnaire, the level of physical activity behaviour of the participants was measured by inquiring the frequency and duration of physical activity per week in the recent month (excluding frequency and time duration of physical education lessons in school). The item was measured with a 6-point Likert scale. The scale for physical activity frequency was from 'never', '1 time', '2 times' to 'over 5 times'. For the physical activity duration, there were 5 options, which was '0-10 mins', '11-20 mins' ... to 'More than 50 mins' accordingly. In the second phase of study, physical activity behaviour of the past 8 weeks was measured accordingly. The physical activity behaviour of individuals was measured by multiplying the physical activity duration by frequency.

Participants who completed full set of questionnaire in phase 1 and 2 were paired up for analysing. Questionnaires with any missing answers would be omitted from analysing. Statistics software, SPSS 16.0, was used for analysing.

Results

Physical activity behaviour

In this case study, it was revealed that the most popular types of physical activity were jogging (63.2%) and quick walk (55.3%). The usual physical activity places were sport court (50.8%) and school (48.6%). The most common physical activity companions were friends (67.3%) and schoolmates (62.3%). The average amount of physical activity in phase 1 of the study was 116.6 (SD=102.4) minutes per week. In phase 2, two-months follow up, the average amount of physical activity was 112.5 (SD=99.1) minutes per week.

Nearly 60% and 50% of students exercised less than 3 times per week and 30 minutes at each section respectively. By conducting cross-tabulation, about 75% (369 out of 486 students) of students did not meet the standard of the physical activity guideline recommended by the Leisure and Cultural Services Department in Hong Kong (30 minutes per session and at least 3 times a week). Worst still, around 17% of students did not do any physical activity within the recent month.

Gender effect of TPB scores and exercise intensity

The gender effect was tested by independent *t*-test analysis. Referring to Table 1, male had a significantly higher behavioural intention scores (M=5.12; SD=1.29, compared to M=4.86; SD=1.22, p-value=0.025, <0.05), higher PBC scores (M=1.11; SD=1.24, compared to M=0.61; SD=1.39, p-value=0.0001, <0.001), longer exercise time (M=136.05; SD=105.30 compared to M=96.01; M=95.29, p-value=0.0001, <0.001) than female students.

Health status between TPB scores and exercise intensity

The effect of TPB variables and health status was tested by independent *t*-test. The number of students who reported bad health status and good health status were 76 and 410 respectively. Students, who believed that they were in good health status, were found to achieve higher scores in behavioural intention (M=5.06; SD=1.23 compared to M=4.59; SD=1.34, p-value=.005, <0.001), higher PBC (M=0.97, SD=1.32, compared to M=0.32; SD=1.31, p-value=.0001, <0.001) and longer exercise time (M=124.00; SD=103.79 compared to M=76.10; SD=84.42, p-value=.0001, <0.001). The results are shown in Table 2.

Descriptive statistics of TPB

Descriptive statistics and bivariate correlations for the variables of interest are shown in Table 3.

Predicting behavioural intention

There were in total two steps in predicting behavioural intention. Step (1) analysis: attitude, subjective norm and perceived behavioural control were entered as predictor variables in predicting behavioural intention. In Step (2) analysis: apart from attitude, subjective norm and perceived behavioural control, past behaviour were entered to predict behavioural intention as predicting variable.

Table 4 showed the regression analysis of behavioural intention; the result indicated that the variance of predicting behavioural intention increased after incorporating past behaviour. There was a minor increase of 3.1% (R^2 change=3.1, F change 27.97, $p<0.001$) in the variance in predicting behavioural intention. In both step (1) and step (2) regression analysis, predictor variable (attitude) did not show significant prediction. However, PBC showed a dominant prediction that could predict over 50% of the variance in behavioural intention. However, the addition of past exercise as a predictor slightly decreased the effect of PBC in predicting behavioural intention ($r=0.647$, $p<0.001$ to 0.547, $p<0.001$). The subjective norm accounted for 14% of variance in predicting behaviour intention.

Predicting future exercise behaviour

There were in total two steps in predicting physical activity behaviour. In step (1) analysis, behavioural intention and PBC were entered as variables in predicting future physical activity behaviour. In step (2) analysis, past exercise behaviour was added together with

Gender	Male (n=250) Mean (SD)	Female (n=236) Mean (SD)	P-value
BI	5.12 (1.29)	4.86 (1.22)	0.025*
PBC	1.11 (1.24)	0.61 (1.39)	0.0001***
Total Exercise time ^A	136.05(105.30)	96.01 (95.29)	0.0001***

*P<0.05, **P<0.01, ***P<0.001.

^A Total exercise time is total time engaging in exercise during the recent week

Table 1: Mean difference between gender for Behavioural Intention (BI) and Perceived Behavioural Control (PBC).

Health Status	Good Health Status Mean (SD)	Bad Health Status Mean (SD)	P-value
BI	5.06 (1.23)	4.59 (1.34)	0.005*
PBC	0.97 (1.32)	0.32 (1.31)	0.0001*
Total Exercise time ^A	124.00 (103.79)	76.10 (84.42)	0.0001***

*P<0.05, **P<0.01, ***P<0.001.

^A Total exercise time is total time engaging in exercise during the recent week

Table 2: Mean difference between health status for Behavioural Intention (BI) and Perceived Behavioural Control (PBC).

	BI	A	SN	PBC	PB	FB	Mean	SD
Behavioural Intention (BI)	1.00	0.320**	0.367**	0.709**	0.499**	0.475**	4.99	1.26
Attitude (A)	/	1.00	0.450**	0.295**	0.147**	0.133**	1.73	1.23
Subjective Norm (SN)	/	/	1.00	0.303**	0.136**	0.136**	1.63	1.10
Perceived Behavioural Control (PBC)	/	/	/	1.00	0.492**	0.479**	0.87	1.34
Past Exercise Behaviour (PB)	/	/	/	/	1.00	0.834**	116.61	102.44
Future behavioural Behaviour (FB)	/	/	/	/	/	1.00	112.53	99.09

*p<0.05, **p<0.01, ***p<0.001

Table 3: Descriptive statistics for TPB with inter-correlation between measures (n=486).

behavioural intention and PBC in predicting future physical activity behaviour.

With reference to Table 5, the regression of behavioural intention and PBC altogether explained only 26.6% ($F(2,483)=87.52, p<0.001$) of future physical activity behaviour in step 1. Both behavioural intention and PBC were significant in predicting future behaviour. However, the addition of past behaviour improved nearly 40% of prediction (R^2 change=0.436, F change= 291.47, $p<0.001$) towards future behaviour in step 2 analysis. Contrary to the results of step 1 analysis, none of behavioural intention or PBC was found to be significant in predicting future behaviour. Past behaviour was found to be the only significant predictor of future behaviour.

Discussion

In this case study, it gave a snapshot of the physical activity situation amongst secondary school students in Hong Kong. The results showed that about 70% of the subjects did not have adequate physical activity, and around 17% of them even did not take any exercise. These results are similar to the data from government [9].

Boys had more frequent and longer exercise duration per week than those of girls. The results are in line with the majority of studies [34-36]. According to the work of Sherar et al., the differences in the physical activity behaviour (including frequency and duration) were the results of maturity difference between boys and girls [37]. Boys have a later development of maturity during adolescent period and tend to be more sophisticated in engaging in physical activity. These explain why boys are more active than girls, and eventually spend more time in participating sports. As actively participation in exercising would enhance the exercise skills, boys are generally more competence in doing exercise [38]. The competency was reflected by higher PBC scores and in turns enhanced the exercise intention.

Students who perceived themselves with a good health status generally had higher scores in physical activity, behavioural intention and PBC than those who were with bad health status. The results are well matched with the fact that regular exercise is associated with physical and mental health benefits [39,40].

PBC showed a strong correlation with physical activity intention which corresponded to over 50% of variance of prediction towards intention. It indicated that PBC was the dominant factor towards physical activity intention. With regards to the regression analysis, attitude paid an insignificant role in predicting behavioural intention, while PBC was the dominant factor. The results are consistent with some previous studies, where PBC was one of the most predictable factors [41,42]. According to the results of Lazuras et al. 254 Greek secondary school students were studied, the data further indicated that PBC contributed most to the prediction of behavioural intention, where attitude did not [43]. The findings initiate to rethink the current physical activity promotion programme for school students.

Subjective norm was a moderate predictor of behavioural intention in the present study. A number of studies have shown that subjective norm is a less significant predictor of behavioural intention in the TPB model for adolescent [20]. The importance of subjective norm to intention may vary and diminish as age increases. Subjective norm is more predictive towards exercise intention for teenagers, who are susceptible to peer pressure or influence by parents (significant others) easily [24]. The efficacy in prediction may be due to age, experience and cultural difference. According to the report conducted by Department of Health [11], parents posed significant influence on childhood and adolescent in exercising. This showed that children and teenagers tend to be more active if their parents are following active lifestyle. In addition, peer influence may be another factor for engaging students in exercise. In present study, the most popular exercise companion was found to be friends and schoolmates. These evidences provide possible explanations that subjective norm is a moderate predictor for physical activity intention of students in Hong Kong.

When considering the presence of past behaviour, the predicting efficacy of TPB model for behavioural intention was slightly improved. The findings of the present work parallel with other studies that past behaviour is useful to improve the prediction of behavioural intention, although the improvement is moderate [20].

In this study, TPB model can only predict about 26% of variance of future behaviour by considering behavioural intention and PBC (Table 5). However, after the addition of past behaviour as a predictor, together with behavioural intention and PBC, the variance of prediction of future behaviour significantly improved to 70%. The contribution of other predictors, behavioural intention and PBC was yet attenuated. The attenuation effect of past behaviour has been investigated by a number of researchers [42,44]. In some studies, past behaviour which moderated both relationships of intention-behaviour and PBC-behaviour was reported Amireault et al. [25] For instance, among a sample of undergraduate students (n = 212), Kwan et al. found that intention and perceived behavioural control were not associated with students being physically active, past behaviour was a significant predictor accounting for the behaviour of physical activity, which was in line with the results of the current study [45].

Conclusion

The results of this study further confirmed that the physical inactivity situation amongst secondary school students in Hong Kong, about 70% adolescents was lack of exercise [11]. Boys were found to be more active in engaging exercise than girls significantly. In addition, TPB model was tested to predict physical activity intention and behaviour of secondary school students. The results were positive and gave evidences that TPB could be a useful tool to evaluate physical activity amongst adolescents in Hong Kong. In respect of TPB variables, PBC and past behaviour played a significant role in predicting behavioural intention and future behaviour, whereas, attitude was less significant. It requests public health practitioners to rethink the current health

Predictor	Step 1:	Step 2:
Attitude	0.065	0.064
Subjective norm	0.142***	0.145***
Perceived behavioural control	0.647***	0.547***
Past behaviour	/	0.201***
R ²	0.531***	0.562***

*p<0.05, **p<0.01, ***p<0.001

Table 4: Predicting behavioural intention of physical activity: hierarchical regression analysis (betas).

Predictor	Step 1	Step 2
Intention	0.272***	0.036
Perceived behavioural control	0.286***	0.068
Past behaviour	/	0.783***
R ²	0.266***	0.702***

*p<0.05, **p<0.01, ***p<0.001

Table 5: Predicting future physical activity behaviour: hierarchical regression analysis (betas).

promotion strategies amongst adolescents in Hong Kong. Campaigns or advertisements promoting leisure-time physical activity amongst adolescent group always focus on changing the attitude of audiences by conveying information of health benefits [46]; however, it may be the least significant predictor amongst TPB variables [43].

Some limitations in the present study should be acknowledged. First, the sample size of this work was limited to one secondary school (Form 1 to Form 5), it may not reflect the true picture of physical activity behaviour of secondary school students in Hong Kong. Second, all data were from self-report, which is subject to both random and systematic bias [47]. Third, as the questionnaire survey was taken between January and March, quite close to examination period, the level of past behaviour of students may be underestimated.

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