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This paper elicited context specific underlying beliefs for physical activity, fruit and vegetable consumption and smoke-free behaviour from the Theory of Planned Behaviour (TPB), and then determined whether the TPB explained significant variation in intentions and behaviour over a 1 month period in a sample of grade 7–9 (age 12–16 years) adolescents. Eighteen individual interviews and one focus group were used to elicit student beliefs. Analyses of this data produced behavioural, normative and control beliefs which were put into a TPB questionnaire completed by 183 students at time 1 and time 2. The Path analyses from the main study showed that the attitude/intention relationship was moderately large for fruit and vegetable consumption and small to moderate for being smoke free. Perceived behavioural control had a large effect on being smoke free and a moderately large effect for fruit and vegetable consumption and physical activity. Intention had a large direct effect on all three behaviours. Common (e.g. feel better, more energy) and behaviour-specific (e.g., prevent yellow fingers, control my weight) beliefs emerged across the three health behaviours. These novel findings, to the adolescent population, support the importance of specific attention being given to each of the behaviours in future multi-behavioural interventions.

Keywords: adolescent; theory planned behaviour; schools; physical activity; healthy eating; smoke-free

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Introduction

Tobacco use, physical inactivity and unhealthy eating represent a major public health crisis facing today's youths (Public Health Agency of Canada, 2004). In Canada, 29% of youths (age 12–17 years) are overweight or obese (Shields, 2005), 49% (age 12–14 years) are inactive (Cameron, Craig, & Paolin, 2005), 61.5% (ages 9–18) do not eat at least five fruits and vegetables a day (Garriguet, 2006) and 21% (grade 5: age 10 years; grade 9: age 14 years) have tried smoking (Health Canada, 2007). Thus, understanding the factors related to the development of these health behaviours is foundational to creating effective interventions to change how they emerge. Furthermore, interventions that target multiple behaviours through multiple mechanisms (i.e. curriculum, physical education, policies, role modelling) simultaneously (Deschesnes, Martin, & Hill, 2003) may provide schools with a comprehensive and coordinated approach to school health.

Understanding how lifestyle behaviours develop and manifest during adolescence is critical to any action for change (Busseri, Willoughby, & Chalmers, 2007; Wolfe, Jaffe, & Crooks, 2006). The school is a primary social environment that can reach a significant proportion of youths (Baker, Dilly, Aupperlee, & Patil, 2003) and acts as a site for prevention and promotion of multiple behaviour interventions (Deschesnes, et al., 2003). Examples of three successful intervention programs include: the Coordinated Approach to Child Health (CATCH) (Nader et al., 1999), Planet Health (Wiecha et al., 2004) and Not-On-Tobacco (NOT) (Horn, Dino, Kalsekar, & Mody, 2005). Some common success elements across these three programs are inclusion of multiple stakeholders, familiarity with the culture of the school, flexibility for local adaptation, building effective partnerships and use of theory (Franks et al., 2007). Baranowski, Anderson, and Carmack (1998) and Sharma (2006) suggest that using a theoretical framework for school-based programming helps determine which constructs work and to what extent. Unfortunately, evidence of the effectiveness of multiple behaviour change for some school-based interventions has been moderate and conflicting (Dooris, 2006; Kolbe et al., 2004). One explanation might be that the same intervention approach (i.e. structure, content and delivery) has been used to change all the targeted behaviours (National Institutes of Health, 2003) when different approaches are needed.

The Theory of Planned Behaviour (TPB), derived from an earlier theoretical framework, the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), is a suitable theoretical approach to consider multiple behaviour change because it allows for the identification of beliefs relevant to the production of all three health behaviours within a given context (Ajzen, 1986). That is, whereas the theoretical approach and behavioural context (i.e. schools) are consistent, the specific targets of belief based interventions can be tightly tailored from the TPB perspective.

The TRA proposed that behavioural intention was the strongest and most proximal predictor of behaviour. Behavioural intention represents a person's readiness to perform the behaviour in question (Conner, Rodgers, & Murray, 2007) and is, in turn, predicted by two constructs: attitude toward the behaviour and subjective norms for performing the behaviour. Attitude reflects the degree to which a person evaluates behaviour and its outcomes as positive or negative (Conner et al., 2007). Subjective norms represent a person's perception of social pressure to engage

in the behaviour (Conner et al., 2007). The TPB extends the TRA with the inclusion of a third variable, Perceived Behavioural Control (PBC), a person's perception of being able to control production of the behaviour (Ajzen, 1986). In addition to influencing behaviour through behavioural intentions, PBC is also hypothesised to exert a direct influence on behaviour, bypassing behavioural intentions.

Ajzen (1991) theorises further that the goal of the TPB is not only to predict human behaviour, but to explain it. Thus, he proposes that whereas people can hold numerous beliefs about a particular behaviour at any one time, only salient beliefs (or information) in three categories will help to explain behaviour. The first category is behavioural beliefs, which influence attitudes toward the behaviour. These reflect the expected positive or negative consequences of performing the behaviour in question. The second category is normative beliefs, which underpin the subjective norms construct and reflect both the relevant sources of social pressure relevant to behaviour as well as the nature of that pressure. The third category is control beliefs, which provide the basis for perceptions of control and reflect salient factors in the experience of the individuals of interest that support or impede performance of the target behaviour.

Quite a large body of research supports the usefulness of the TPB for the prediction of intention and behaviour for a wide variety of behaviours. Recent meta-analyses (Armitage & Conner, 2001; Godin & Kok, 1996; Hagger, Chatzisarantis, & Biddle, 2002; de Bruijn et al., 2006) have demonstrated that the TPB is a robust predictor of health behaviours in a variety of domains including physical activity (Hagger et al., 2002; Saunders, Motl, Dowda, Dishman, & Pate, 2004; Baker, Little, & Brownell, 2003) and, to a lesser extent, nutrition behaviours (Baker, et al., 2003; Tsorbatzoudis, 2005; Messina, Saba, Vollono, Leclercq, & Piccinelli, 2004) in adolescents. However, there has yet to be a TPB study that examines its ability to explain multiple behaviours (i.e. physical activity, nutrition, and smoking) in a single sample of adolescents, which Ajzen (1991) would suggest is vital to informing the development of a multi-behaviour school-based intervention. Although the TPB proposes that the key predictors/constructs of all behaviours are similar (i.e. attitudes, subjective norms and PBC), it does not propose that all these factors have the same foundations or have a similar influence across behaviours. Previous research has shown that normative factors, in particular, have very different influences on a wide range of behaviours, but also within various populations, which speaks to the importance of the social context (Smith, Bean, Mitchell Speizer, & Fries, 2007). Thus, as Ajzen (1986) points out, it is critically important to examine the foundational beliefs for each of the behaviours of interest. By studying three behaviours simultaneously from the perspective of the same theory, it becomes possible to determine which construct is likely to be the critical one in the production of each of the behaviours as well as to give targets for future interventions.

The overall goal of this study was to contribute to the understanding of the theoretical mechanisms of multiple health behaviour changes in a sample of adolescents (grades 7–9; ages 12–16). Specifically, the 'first' purpose was to elicit context-specific physical activity, fruit and vegetable and smoke-free related beliefs via a series of interviews and a focus group. It was hypothesised that common and behaviour-specific beliefs would emerge. The second purpose was to determine whether the TPB explained significant variation in physical activity, fruit and vegetable consumption and smoke-free intentions and behaviour over a 1 month

period in a separate study. It was hypothesised that attitudes and PBC would significantly predict intention, which in turn, would significantly predict behaviour for all three health behaviours. The third purpose was to examine the associations between the behavioural, normative and control beliefs and the TPB global constructs. It was hypothesised that common and behaviour-specific relationships would emerge.

Methods

Belief elicitation (Purpose 1)

Participants and procedure

The questions to generate the context-specific beliefs relevant to the three health behaviours based on Ajzens' (1991) recommendations were piloted with a focus group of six students in grades 7–9 (2 students per grade) and interviews with eighteen individual students. During the focus group students first completed the questionnaire independently. Then collectively the students reviewed each of the items and made suggestions for additional items or clarification of the items reviewed. In addition 18 students in grades 7–9 (three males and three females per grade) were then randomly selected from two schools (one urban and one rural) to participate in full belief elicitation interview. These interviews took place 2 months before the full study began and these students did not participate in the full study.

Analysis and results

In-depth content analyses of the transcript data from the focus group and interviews were conducted to identify and prioritise the key beliefs about fruit and vegetable consumption, physical activity and being smoke-free. Six researchers reviewed the transcripts and coded the data according to the behavioural, normative and control belief conceptual definitions in order to categorise the identified belief statements. As recommended by Ajzen and Fishbein (1980), two TPB experts performed content analysis of the items generated and reached agreement on the order and labelling of the beliefs. Then the beliefs most often listed were retained for the student questionnaire. Based on this analysis, common (i.e. across the three behaviours) and behaviour-specific beliefs were generated (Tables 1–3).

Main study (Purpose 2 and 3)

Participants

Four (two urban; two rural) of the eight intermediate schools within a school district in Eastern Canada participated in the study. Eligibility criteria included: publicly funded school; consent to use class time to gather data; and socioeconomic status that is representative of the school population. A total of 313 consent forms were mailed to parents asking for permission of their child to participate in the current study. Of these, 26 students were excluded because they refused to participate, no consent form was returned, or they were absent the day of data collection leaving 287 (i.e. 91.6%) students who completed the baseline questionnaire. At time two, 96 students were lost to attrition as a result of students attending a large band concert and the schools could not reschedule data collection. The baseline

Table 1. Results from the correlations analyses for the behavioural, normative and control beliefs for fruit and vegetable.

Beliefs	Global (β^1)	Intention (β^1)	Fruit and vegetable ($\beta 2$)
Behavioural		Attitude	
More energy	0.37***	0.36***	0.19**
Feel better	0.39***	0.38***	0.20***
Look better	0.30***	0.35***	0.21***
Not get sick	0.21***	0.25***	0.24***
Play sports better	0.37***	0.38***	0.24***
Lose or maintain weight	0.31***	0.33***	0.21***
Normative		Subjective norms	
Brother/sister	0.40***	0.38***	0.16**
Friends	0.44***	0.43***	0.21***
Parents/Guardians	0.48***	0.36***	0.31***
Teacher	0.36***	0.38***	0.14**
Control		Perceive behavioural control	
TV commercials	−0.17**	−0.18**	−0.12*
Preparation time	−0.16**	−0.25***	−0.28***
Availability at home	−0.09	−0.11*	−0.11*
Go to restaurants for lunch	−0.08	−0.19**	−0.23***
Expensive	−0.18**	−0.30***	−0.31***
Cafeteria fruit & vegetable choices	−0.09	−0.20***	−0.09
Teased for eating fruit & vegetable	−0.04	−0.14**	−0.17**

Notes: β^1 = adjusted for gender and grade; β^2 = adjusted for gender, grade and intention.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

characteristics of the sample was mostly white (79.5%), 13–14 years old (65%), with females (51%) and males (49%) being equally distributed in addition to the grade distribution (33% in grades 7–9).

Procedure

Upon receiving ethical approval by the school board and the University Research Ethics Board, a package containing an information letter and consent form was mailed to parents of students in grades 7–9. Parents were instructed to sign the consent and have their child return it to the school. Only students who had signed parental consents and who provided personal assent were invited to participate in the study. On the day of data collection, the research staff briefly explained the study to the students and answered any questions they had. Teachers provided alternative activities for students who did not participate in completing the baseline TPB questionnaire. Then, 1 month later, the same procedure was used to obtain behaviour measures.

Measures

Prior to completing the baseline questionnaire, the students were provided definitions and visual examples of the three behaviours to enhance the consistency

Table 2. Results from the correlations analyses for the behavioural, normative and control beliefs for physical activity.

Beliefs	Global (β^1)	Intention (β^1)	Physical activity (β^2)
Behavioural		Attitude	
More energy	0.32**	0.40**	0.27**
Feel better	0.49**	0.43**	0.34**
Be more healthy	0.43**	0.37**	0.23**
Keep in shape	0.43**	0.34**	0.21**
Be more awake	0.22**	0.24**	0.23**
Control my weight	0.35**	0.38*	0.24**
Normative		Subjective norms	
Brother/sister	0.42**	0.30**	0.23**
Friends	0.48**	0.47**	0.27**
Parents/guardians	0.46**	0.41**	0.21**
Gym teacher	0.35**	0.37**	0.18*
Coaches	0.37**	0.43**	0.26**
Control		Perceived behavioural control	
Too much homework	−0.07	−0.10	−0.05
Weather is bad	−0.08	−0.20**	−0.05
No access to equipment	−0.05	−0.04*	−0.05
Want to play on computer	−0.19*	−0.22**	−0.19**
Concerned others will see you Exercising	−0.25**	−0.06**	−0.05
Want to watch TV	−0.22**	−0.23**	−0.13*

Notes: β^1 = adjusted for gender and grade; β^2 = adjusted for gender, grade and intention.
*$p < 0.01$; **$p < 0.001$.

in their perception of the behaviour (e.g. what is a serving size? or what is moderate/vigorous physical activity?). Visual examples of single servings of fruit and vegetables were based on Canada's Food Guide (Health Canada, 1997). Regular physical activity was based on Canada's Physical Activity Guide for Youth (Public Health Agency of Canada, 2002); which was delineated as '30 minutes of vigorous activity everyday' (i.e. soccer, running, or similar aerobic activities) and/or '60 minutes of moderate activity everyday' (i.e. slow walking, skating leisurely or other similar activities).

Demographics consisted of self-reported age, sex and race. *Attitude* was measured by two items (Ajzen, 2004) asked separately for each of the three behaviours for a total of six items. Specifically, students were asked, 'During the next 4 weeks, for me to (eat five servings of fruits and vegetables each day; for me to be smoke free each day...; for me to participate in regular physical activity) will be....' First, students responded to a semantic differential scale assessing affective attitude using the anchors 1 = extremely un-enjoyable and 7 = extremely enjoyable. Second, students responded to a 7-point semantic differential scale assessing instrumental attitude using the anchors 1 = extremely good and 7 = extremely bad. Inter-item correlations ranged from 0.35 to 0.51 across the three health behaviours.

Subjective norm was measured via one item for each health behaviour. Specifically, students were asked, 'During the next 4 weeks, most people important

Table 3. Results from the correlations analyses for the behavioural, normative and control beliefs for being smoke-free.

Beliefs	Global (β^1)	Intention (β^1)	Smoke free (β^2)
Behavioural		Attitude	
Prevent yellow fingers	0.30***	0.51***	0.36***
Achieve better health	0.37***	0.49***	0.32***
Play sports at best of abilities	0.37***	0.48***	0.32***
Prevent gross lungs	0.38***	0.46***	0.30***
Easier to make friends	0.33***	0.39***	0.27***
Allow for more physical activity	0.36***	0.49***	0.26***
Normative		Subjective norms	
Brother/sister	0.44***	0.44***	0.14**
Friends	0.43***	0.42***	0.11*
Parents/guardians	0.39***	0.44***	0.18***
Teacher	0.40***	0.22***	0.05
Control		Perceived behavioural control	
Smoking looks gross	−0.15	−0.27*	−0.06
Suspension if caught smoking	−0.19	−0.37**	−0.10
Sent to office if caught smoking	−0.15	−0.36**	−0.11
Can't smoke on school property	−0.26*	−0.32**	−0.12
Anti-smoking ads on TV	−0.25*	−0.33**	−0.07

Notes: β^1 = adjusted for gender and grade; β^2 = adjusted for gender, grade and intention.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

to me think I should (a) eat 5 fruits and vegetables each day, (b) be smoke free, and (c) engage in regular physical activity' rated on a scale from 1 (strongly disagree) to 7 (strongly agree). This item was repeated separately for each of the behaviours and for each of the following people: brother or sister; friends, parents/guardians for a total of eight items (Ajzen, 2004). For participating in regular physical activity, coaches and gym teacher were added to this item for a total of six items.

Perceived behavioural control was measured by two items (Ajzen, 2004) asked separately for each health behaviour for a total of six items. The first question asked 'During the next 4 weeks, I am confident that I will be able to (a) eat five servings of fruits and vegetables each day, (b) be smoke free, and (c) engage in regular PA' rated on a scale of 1 = extremely not confident to 7 = extremely confident. The second question asked, 'During the next 4 weeks, it is completely up to me whether or not I (a) eat five servings of fruits and vegetables each day (b) be smoke free and (c) engage in regular PA' rated on a scale of 1 = strongly disagree to 7 = strongly agree. Inter-item correlations ranged from 0.26 to 0.31 across the three health behaviours.

Intention was assessed by two items (Ajzen, 2004) asked separately for each behaviour. The first question asked, 'During the next 4 weeks, I intend to (a) eat 5 servings of fruits and vegetables each day, (b) be smoke free, and (c) engage in regular PA' rated on a scale from 1 = strongly disagree to 7 = strongly agree. The second question asked, 'During the next 4 weeks, I intend to (a) eat five servings of fruits and vegetables each day, (b) be smoke free, and (c) engage

in regular PA___days per week (please insert a number from 0 to 7 for each behaviour)'. Inter-item correlations ranged from 0.69 to 0.71 across the three health behaviours.

Behavioural/normative/control beliefs. The underlying accessible beliefs generated in the first study were used (Tables 1–3). The behavioural beliefs included: 'If I was to (a) eat five servings of fruits and vegetables each day over the next 4 weeks, I would . . . have more energy; not get sick; lose or maintain my weight; feel better; look better' rated on a scale from 1 (strongly disagree) to 7 (strongly agree); 'If I was to participate on regular physical activity over the next 4 weeks, I would . . . feel better; have more energy; be more healthy; keep in shape; be more awake' rated on a scale from 1 (strongly disagree) to 7 (strongly agree); 'Being smoke free for the next 4 weeks would . . . prevent me from getting yellow teeth and fingers; help me achieve better health; let me continue to play sports to the best of my capabilities; prevent me from getting really gross lungs; make it easier for me to make friends; allow me to be more physically active' rated on a scale from 1 (strongly disagree) to 7 (strongly agree). The normative beliefs were preceded by the statement, 'The following people think I should (a) eat five servings of fruits and vegetables each day, (b) be smoke free, and (c) engage in regular PA over the next 4 weeks' using the same 7-point scale. Finally, the control beliefs were preceded by the statement, 'Would it be more easy or more difficult for you to (a) eat five servings of fruits and vegetables each day, (b) be smoke free, and (c) engage in regular PA over the next 4 weeks . . .' rated on a scale from 1(extremely difficult) to 7(extremely easy).

Behaviour. Smoking behaviour was measured by one item taken from the School Health Action, Planning and Evaluation System (Cameron, et al., 2007; Centre for Behavioural Research and Program Evaluation, 2007): 'On how many days in the past 30 days were you smoke-free? Place a number between 0 and 30 in the blank.' Fruit and vegetable consumption was measured by one item derived by the research team to be in concordance with the smoking item: 'During the last 30 days, I ate at least five servings of fruits and vegetables on (insert a number between 0 and 30) days.' Moderate and vigorous physical activity was measured by two items from the 2003 Youth Risk Behaviour Surveillance System (Centers for Disease Control and Prevention, 2003). First, students were asked: 'On how many days in the past 7 days did you participate in moderate physical activity for 60 min a day?' Second, students were asked: 'On how many days in the past 7 days did you participate in vigorous physical activity for 30 min a day?' Both questions required students to insert a number between 0 and 7 in the blank. These two items were summed to obtain a physical activity measure.

Statistical Analyses

The pattern of missing data was analysed using the SPSS missing value analysis procedure first and the appropriate imputation procedure was then calculated. Zero-order correlations among the TPB constructs were then calculated for each of the health behaviours, which were followed by a series of zero-order correlations between the demographic variables and each of the health behaviours to identify potential covariates for the final analyses. Separate path analyses using maximum likelihood procedures in LISREL 8.8 were then conducted for each of the health

behaviours to test the tenets of the global TPB constructs (Purpose 2) controlling for potential covariates. For latent concept specification (i.e. attitude, subjective norm, PBC, intention and a given behaviour), the loading for each concept's indicator was fixed to 1.0 and the indicator's error was fixed to 0%. Finally, in order to examine the relationships between the beliefs and the TPB global constructs, a series of multiple regression analyses were conducted for each of the health behaviours (Purpose 3). Specifically, each belief was regressed onto (1) its respective global construct for a given health behaviour (i.e. attitude, subjective norm or PBC) and (2) intention for a given health behaviour controlling for potential covariates and (3) each health behaviour controlling for potential covariates and intention.

Results

The missing value analysis showed that the data were missing at random (i.e. the probability of missing a time two data point was not related to its particular value, but was dependent upon other variables in the model) (Allison, 2002). Unfortunately, using listwise deletion when one has data Missing At Random (MAR) may lead to biased estimates. Therefore, missing values were imputed using the expectation maximisation algorithm in LISREL 8.8. The zero-order correlations among the TPB constructs are presented in Table 4. As can be seen, the vast majority of the TPB correlations were in the moderate (i.e. $\geq$0.3) to large (i.e. $\geq$0.5) range. The preliminary analyses showed that there were significant effects of gender and grade on all three health behaviours, which were controlled in our main path analyses.

Table 4. Zero-order correlations among the theory of planned behaviour model constructs for each health behaviour.

Construct	2	3	4	5	Mean	SD
Fruit & Vegetable						
1. Attitude	0.46***	0.43***	0.59***	0.54***	5.28	1.27
2. Subjective norm		0.35***	0.53***	0.33***	5.46	1.48
3. PBC			0.54***	0.38***	5.44	1.14
4. Intention				0.61***	5.16	1.58
5. Fruit & vegetable				–	17.52	8.28
Physical Activity						
1. Attitude	0.48***	0.51***	0.60***	0.42***	6.12	1.27
2. Subjective norm		0.49***	0.57***	0.36***	6.20	1.13
3. PBC			0.64***	0.45***	6.21	0.96
4. Intention				0.63***	6.10	1.19
5. Physical activity				–	9.06	3.44
Smoke Free						
1. Attitude	0.39***	0.33***	0.47***	0.29***	6.10	1.54
2. Subjective norm		0.39***	0.56***	0.43***	6.32	1.27
3. PBC			0.64***	0.25***	6.21	1.17
4. Intention				0.46***	6.11	1.22
5. Smoke free					25.80	8.67

Note: ***$p < 0.001$.

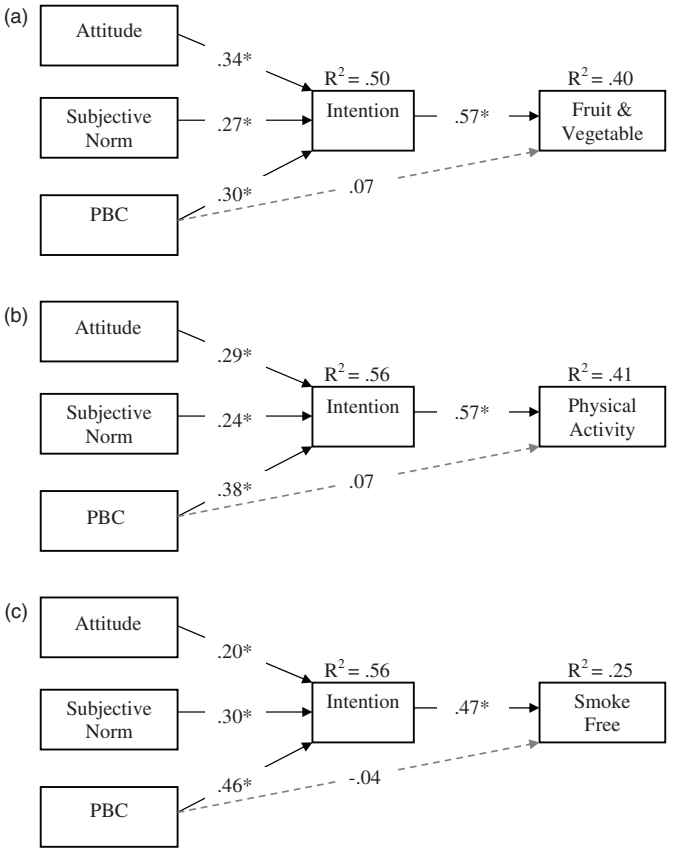

Figure 1. Baseline theory of planned behaviour constructs predicting 1 month (a) fruit and vegetable consumption; (b) physical activity; (c) smoke-free behaviour. (Note: All standardised betas are adjusted for grade and sex.)

Path Analyses (Purpose 2)

As can be seen from Figure 1(a–c), results showed that attitudes, subjective norm and PBC were significant predictors of intention for all three health behaviours and accounted for 50–56% of the variance in intention. Furthermore, intention significantly predicted each of the health behaviours and accounted for 25–41% of the variance in behaviour. Importantly, examination of the indirect effects (e.g. the effect of attitude on 1 month fruit and vegetable consumption after it proceeds through intention) on fruit and vegetable consumption showed that they were significant for attitude ($\beta = 0.19, p < 0.05$), subjective norm ($\beta = 0.15, p < 0.05$) and PBC ($\beta = 0.24, p < 0.05$). This was also the case for physical activity [attitude ($\beta = 0.16, p < 0.05$), subjective norm ($\beta = 0.14, p < 0.05$) and PBC ($\beta = 0.21$, $p < 0.05$)] and being smoke free [attitude ($\beta = 0.10, p < 0.05$), subjective norm ($\beta = 0.14, p < 0.05$) and PBC ($\beta = 0.22, p < 0.05$)].

Belief analyses (Purpose 3)

Tables 1–3 showed that common and behaviour-specific behavioural, normative and control beliefs were related to their respective global constructs, intentions and

all three health behaviours. More specifically, 39 out of the 49 (i.e. 80%) correlations between the beliefs and their respective global constructs were significant, 48 out the 49 (i.e. 98%) correlations between the beliefs and intention were significant and 38 out the 49 (i.e. 77%) correlations between the beliefs and behaviour were significant.

While the behavioural and normative beliefs across all three behaviours were strongly related to both intention and behaviour, the control beliefs were strongly associated with intention, but weak for physical activity and smoking behaviour. For fruit and vegetable consumption, the identified behavioural beliefs and subjective norms had a large direct effect on fruit and vegetable consumption. For control beliefs preparation time, going to restaurants for lunch, food being expensive and being teased for eating fruits and vegetables had a negative effect on fruit and vegetable intention and consumption. Choice of fruits and vegetables in the cafeteria was identified as having a strong influence on students' intention to eat fruits and vegetables; however it did not have any effect on fruit and vegetable consumption 1 month later.

For physical activity, the identified behavioural and normative beliefs had a significant effect on intention and behaviour to be physically active. However, for the control beliefs, PBC, too much homework, weather, no access to equipment and concern about others seeing you exercise were not important to these students choosing to be physically active. However, wanting to play on the computer and watching television were both negatively associated with being physically active.

For staying smoke free, subjective norms (i.e. friends and teachers) were not as important as family (brothers/sister; parents/guardians) on students choosing to stay smoke free. The control beliefs were strongly associated with students' intentions to stay smoke free in the expected direction. Further, no significant perceived control beliefs were found to be associated with being smoke free.

Discussion

This study examined the TPB predictors and related underlying beliefs of physical activity, fruit and vegetable consumption and remaining smoke free in a sample of 12–16-year-old middle-school students. After generating the underlying accessible beliefs in a pilot study (i.e. Purpose 1), the main study's purpose was to determine whether the TPB explained significant variation in each of the three behaviours over a 1 month period. Results showed that the attitude/intention relationship was moderately large (Cohen, 1992) for fruit and vegetable consumption and physical activity and small to moderate (Cohen, 1992) for being smoke-free. PBC had a large effect on being smoke-free and a moderately large effect for fruit and vegetable consumption and physical activity. Finally, intention was shown to have a large direct effect (Cohen, 1992) on all three health behaviours.

These findings are mostly consistent with previous research and our hypotheses (Armitage & Conner, 2001; Godin & Kok, 1996). One slight difference is the magnitude of the subjective norms/intention relationships observed here. Subjective norms typically have the weakest (ranging from small to medium effects compared to the typical medium to large effects observed for the other variables) relationships with behavioural intention (Conner & Sparks, 2005; Sutton, 1998). However, one reason for the stronger influence of subjective norms in the current study may be the

population under study. Adolescents are known to be particularly responsive to the social influence of peers, as well as other individuals they are eager to impress. It is possible that social influences are more critical in adolescence (which also happens to be the formative period of these and other important health behaviours) than they are at other life stages. Whereas subjective norms are sometimes discounted as the least powerful predictor among the TPB variables, the present data suggest that the social context of the behaviour and developmental characteristics of the target population may need to be considered. Very few studies have examined the TPB for adolescents, and the majority of these have examined exercise (cf. Hagger et al., 2002). The present findings suggest the need for a stronger focus of research using the TPB on adolescent health behaviours. These findings extend past research to adolescents in a school setting. Additionally, they support the idea of manipulating attitudes, subjective norms and PBC in order to change intentions to engage in healthy behaviours. The next question, then, is how do we target the determinants of the three health behaviours? Ajzen (1991) suggests that identifying the beliefs that guide the performance of each of the behaviours is critical.

The third purpose of the present study was to examine the association between the underlying accessible beliefs and the TPB global constructs. Interestingly, there were several normative influences (e.g. family, friends, teachers, etc.) common across the three health behaviours. However, the behavioural and control beliefs tended to be more behaviour-specific illustrating that the belief systems underlying each of the behaviours do not necessarily overlap. This supported our hypothesis and the tenets of the TPB (Ajzen, 1991).

Normative beliefs

These beliefs, about the relevant sources of social pressure, were the most consistent across behaviours. Friends were sources of social pressure most strongly related to behavioural intentions for all three behaviours, closely followed by siblings and parents (particularly for remaining smoke free). Parents had the second strongest relationship to intentions for physical activity and the weakest influence on fruit and vegetable consumption. Therefore, whereas the sources of subjective norms were quite consistent and quite positively related to intentions across behaviours, there are still some unique relationships worthy of further consideration. Additionally, whereas we see strong relationships between subjective influences from various adults on intentions, there are much weaker relationships observed with self-reported behaviour. One possible explanation for this might come from the prototype willingness model (Gibbons & Gerrard, 1995, 1997). Gibbons and Gerrard argue that there are three main assumptions of the prototype willingness model: (a) that many health-risk behaviours performed by youths are neither intentional nor planned; (b) health-related (risk) behaviours are typically performed with others present; and (c) youths are highly concerned about their social images, and, as such, are very vulnerable to proximal social influences. For example when we examine the present data, and think about the behaviours in school (even if a parent packs fruit and vegetables in the lunch of the student); if the proximal social influence (reflected in the control beliefs) is being teased then the immediate response will be to avoid the fruit. Similarly, unless the parents are smokers and endorse smoking at home, students are likely to find themselves in a peer-pressured situation to smoke where,

according to Gibbons and Gerrard, they are likely to succumb to peer pressure even if they did not intend to do that. Physical activity, on the other hand, is far more frequently done in the presence of parents and coaches, and those two groups retain a strong influence for behaviour of physical activity. It appears that the social context of the actual behavioural performance has to be considered. It also appears that parents and teachers have a strong influence on intentions, which is encouraging from a TPB perspective, but other theoretical approaches might be needed to better understand the intention-behaviour gap in adolescents (Sheeran, Milne, Web & Gollwitzer, 2005).

Behavioural beliefs

Behavioural beliefs reflect the cognitions underlying an overall positive or negative evaluation of the behaviour in question (i.e. attitudes). In this study, there was considerable overlap in the behavioural beliefs associated with fruit and vegetable consumption and physical activity when compared with remaining smoke-free. All of the behavioural beliefs had strong associations with both intentions and behaviour (although reliably weaker for behaviour). All three sets reflect relatively general constellations of 'it's good for me' health-related beliefs. Interestingly, for physical activity, there are no real affective beliefs such as 'it's fun' and 'I like it' that have been seen in other research examining only physical activity in youths. This might reflect a generalised effect of the students having considered all three health behaviours together. Future studies might endeavour to study belief based work for each of the behaviours separately to avoid such effects. Interestingly, only smoking was associated with the instrumental belief 'easier to make friends'. Given that in this sample, and presumably in this population, the students do not smoke or do not smoke much, they already see smoking as a social vehicle more so than they do the other behaviours. Future research might also want to focus on encouraging elicitation of more instrumental behavioural beliefs. A limitation of the current study might be the delimit to addressing only remaining smoke-free because it does not allow for comparison of the behavioural beliefs associated with smoking that might be weighed against the behavioural beliefs of not-smoking in a situation when a student is confronted with an unexpected opportunity to smoke (cf. Gibbons & Gerrard, 1997).

Control beliefs

The greatest disparity between the three behaviours was observed for the beliefs believed to underpin perceptions of control. Clearly, the factors influencing students' perceptions of whether they can or can not engage in fruit and vegetable consumption, physical activity and remaining smoke free are different. Furthermore, except for fruit and vegetable consumption, where the control beliefs identified are negatively associated with fruit and vegetable consumption, the control beliefs have relatively weak influences on physical activity behaviour and remaining smoke free. From an intervention perspective, it is clear from these results that different sets of barriers need to be addressed to achieve change in each of the three behaviours. For fruits and vegetables, the main barriers appear to be preparation time, eating in restaurants, expense and teasing (although this is considerably weaker

than the others). The strongest indicators were expense and preparation. These are potentially controllable in the school environment (Veugelers & Fitzgerald, 2005). The belief about eating lunch in restaurants probably speaks to other influences in the proximal environment that might include fast-food that requires no preparation, that is not expensive and that does not incite teasing. Thus, a broader consideration of the social environment (cf. Emmons, 2000) might reveal non-behavioural specific belief systems that support non-preferred behaviours. In the case of physical activity behaviour, competing attractive alternative behaviours of watching television and playing on the computer did turn up reflecting the influence of other opportunities in the environment on the target behaviour. In the case of physical activity, as expected, the attraction of the sedentary activities is negatively associated with physical activity behaviour. In the case of remaining smoke-free, none of the control beliefs were significantly related to behaviour. This is possibly because these factors were not the crucial ones leading to a decision to smoke and suggest that control beliefs for smoking might differ for the formation of an intention and for actually engaging in the behaviour. Again, different retrospective belief elicitation processes and openly discussing the distinction between intention and behaviour might be useful to elucidate this gap.

These findings are generally consistent with previous research (Armitage & Conner, 2001; Godin & Kok, 1996), except we found subjective norm had a moderately large association with intention for all three behaviours. This novel finding may be due to sample differences (e.g. different age groups and school contexts) and the measurement of multiple behaviours in a single sample (i.e. TPB responses to one health behaviour may have influenced the students' judgments on the other two behaviours) compared to previous studies. However, the above results suggest that attitudes, subjective norm and PBC all need to be considered in the modification of adolescents' intentions to engage in multiple health behaviours. The beliefs level analysis also points to specific targets for intervention, although some of them are easier to address than others (e.g. availability and cost of fruits and vegetables in schools compared to developing TV advertisements about healthy eating or smoking and children's TV viewing behaviours).

Given that several behaviour-specific behavioural, normative and control beliefs emerged, it was encouraging to observe that the majority of these beliefs were also significantly related to each of the three health behaviours and that the belief/behaviour relationships were mediated by intention as was hypothesised. Therefore, the belief-level findings may provide guidance for multi-behavioural interventions within schools, yet a consistent challenge is to consider the importance of school context to their successful implementation (Carter, Bennetts, & Carter, 2003; Sandford, Armour, & Warmington, 2006; Pearson et al., 2006).

There are some important limitations to consider in the interpretation of these results. First, the sample is relatively small and representative of one region in Eastern Canada. The results may not specifically generalise to other groups of adolescents in different social and geographical situations. As well, the behavioural data were self-report, which has known limitations. The current findings need to be corroborated with objective indicators of smoking, physical activity and fruit and vegetable consumption. Finally, there is some interest in the TPB literature regarding the extent to which past behaviours account for future behaviour after the inclusion of the TPB variables in the prediction model (cf. Conner & Sparks, 2005). Whereas it has been argued that past behaviour does not explain future behaviour, future

researchers may want to also address past behaviour and include it in their predictor models.

In conclusion, the results of this study are encouraging. The use of theoretically recommended procedures for belief elicitation added clarity to our understanding of the underpinnings of the three health behaviours in youth. However, how to integrate theory based interventions into the fabric of the school environment requires additional study. The belief elicitation procedure generated different beliefs that adolescents have on the three behaviours, but also revealed patterns of the relationships among the beliefs, the global TPB constructs and the behaviours that point to specific avenues for intervention. All the relationships observed were none-the-less supportive of the theoretical postulates of TPB. The findings from this study can contribute to the development of policies and programs to guide school-based interventions. The findings do, however, suggest that multiple-behaviour interventions require specific attention to each of the behaviours in question in order that, even if from the same theoretical foundation, important unique characteristics of each of the behaviours are adequately considered and addressed.

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