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Do Sedentary Motives Adversely Affect Physical Activity? Adding Cross-Behavioural Cognitions to the Theory of Planned Behaviour

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ABSTRACT

The purpose of this study was to explore whether sedentary behaviour cognitions explain physical activity intention and behaviour when integrated within the theory of planned behaviour framework (TPB). A random community sample of 206 adults and a sample of 174 undergraduate students completed measures of the TPB pertaining to physical activity and four popular leisure-time behaviours (TV viewing, computer use, sedentary hobbies, and sedentary socializing) and an adapted Godin Leisure-Time Exercise Questionnaire (community sample = cross-sectional, undergraduate sample = two-week prospective). Results using ordinary least squares regression provided evidence that TV viewing intention explains additional variance in PA behaviour, and affective attitude (community sample) and perceived behavioural control (undergraduate sample) towards TV viewing explains additional variance in physical activity intention even after controlling for physical activity-related TPB constructs. These results underscore the potential value of adding sedentary control interventions in concert with physical activity promotion.

Key Words: physical activity, exercise, theory of planned behaviour, sedentary behaviours, behavioural choice theory

INTRODUCTION

It has been well documented that physical activity (PA) has several short- and long-term health benefits. Short-term benefits include but are not limited to reductions in anxiety, depression and stress and long-term benefits include reduced risk of cardiovascular disease, some cancers and diabetes (Health Canada, 2002; U.S. Department of Health and Human Services, 1996a). Unfortunately, regular physical activity is plagued by low participation rates with at least 50% of the population failing to reach recommended levels of weekly activity (Canadian Fitness and Lifestyle Research Institute, 2002; U.S. Department of Health and Human Services, 2003). Therefore, effective PA interventions are warranted.

Interventions to promote PA are likely to be facilitated by a sound understanding of the correlates of PA. Social cognition theories are popular structures for predicting PA behaviour. The theory of planned behaviour (TPB) is one social cognition theory that has been used extensively to explain PA (Hagger, Chatzisarantis, & Biddle, 2002). The TPB (Ajzen, 1991, 2002) proposes that a person's intention to perform a behaviour is the key determinant of that behaviour. Intention represents the proximal summary motivation to perform a behaviour. Intention, in turn, is determined by three variables. The first determinant is attitude, which is reflected in an affective (e.g., enjoyable-unenjoyable) and instrumental (beneficial-harmful) evaluation of performing the behaviour. The second determinant, subjective norm, reflects the perceived social pressure that individuals may feel to perform or not perform the behaviour. The final determinant is perceived behavioural control (PBC), which represents the perceived ability of performing the behaviour when holding motivation as a positive constant (Rhodes & Courneya, 2003b, 2004). PBC may have both direct and indirect effects on behaviour, to the extent that perceived control represents actual control (Ajzen, 1991, 2002).

Overall, the TPB has performed well in explaining PA intentions (approximately 40% variance explained) and behaviour (approximately30% variance explained) (Hagger et al., 2002). Meta-analysis results suggest that intention has a large correlation with behaviour and that attitude and PBC are medium-large independent correlates of intention. More recently, research that has made distinctions between affective and instrumental attitude has shown that affective attitude may be the critical predictor of PA intention (e.g., Lowe, Eves, & Carroll, 2002; Rhodes & Courneya, 2003a).

Despite the strong performance of the TPB, additional variance remains to be explained in PA. Various TPB researchers have attempted to extend the theory with constructs outside its typical measurement domain (e.g., self-identity, anticipated regret, personality) with mixed or limited success (Ajzen & Fishbein, in press; Conner & Armitage, 1998). One conceptual aspect that the TPB does not directly address is the possibility of competing cognitions for other behaviours. The importance of cross-behaviour cognitions, however, is a central component in other theories such as Behavioural Choice Theory (Rachlin, Kagel, & Battalio, 1980; Vuchinich & Tucker, 1983). Given that preliminary evidence suggests that competing leisure-time goals can affect PA (Gebhardt & Maes, 1998; Salmon, Owen, Crawford, Bauman, & Sallis, 2003), incorporating this component into the TPB appears warranted.

Integrating cross-behaviour cognitions with the TPB seems a reasonable premise, with additional intervention possibilities. In terms of the cross-behaviour cognitions worth considering, sedentary leisure-time behaviours seem an obvious possibility. For example, an individual may intend to exercise regularly and intend to watch her favourite weekly TV shows, but the two intentions, under scarcity of limited/conflicting time will likely result in a behavioural choice. The behaviour with the most positive attitude, subjective norm, and control

cognitions should end up being the behaviour that the individual follows through with on her intentions. This similar logic could be equally applied to the original formation of the intention (see Figure 1).

No research on the TPB and cross-behaviour cognitions has been conducted[1], but research that has specifically focused on behavioural choice theory in the PA domain has some demonstrated support. For example, Television (TV)-PA correlations typically fall in the r = -.10 to -.20 size (Epstein & Roemmich, 2001; Gordon-Larsen, Nelson, & Popkin, 2004; Tucker, 1993). Only one published study has focused on an evaluation of the social cognitive variables related to other behaviours in a random adult population sample (Salmon et al., 2003). This study provided some support for the predictive efficacy of cross-behaviour cognitions; namely, preference for sedentary behaviour was a negative correlate of PA.

Still, the Salmon et al. (2003) study did not evaluate the unique contribution of sedentary cognitions on behaviour after controlling for PA cognitions in a theoretical framework like TPB. It seems prudent to establish whether cognitions for other behaviours explain additional variance in PA behaviour or intent after controlling for basic PA motives (e.g., TPB constructs). From a theoretical standpoint, this would establish whether participants consider behavioural alternatives within social cognitions measured in standard TPB instrumentation. For example, perceived behavioural control may account for, and thus mediate, any relationship between cross-behaviour cognitions and PA. From a practical perspective, knowing whether motives for other behaviours adversely relate to PA has intervention implications. For example, if intention to watch TV is a negative correlate of PA independent of PA intentions, then interventions controlling TV viewing intentions may be beneficial to PA promotion. At present, this possibility has not been directly investigated.

Therefore, the purpose of this study was to evaluate whether competing motives for popular (Canadian Fitness and Lifestyle Research Institute, 1996) sedentary leisure-time behaviours (TV viewing, computer use, sedentary hobbies, sedentary socializing) explain additional variance in PA intention and behaviour after controlling for PA motives as measured using the constructs of the theory of planned behaviour. Analyses were performed using both a random community sample and a undergraduate student sample. We hypothesized, based on Salmon et al. (2003), that motives for sedentary behaviours, particularly enjoyment of TV viewing, would be negative correlates of both PA intention and behaviour. We considered the evaluation of a unique contribution of sedentary behaviour motives to PA intention and behaviour as exploratory. An additional purpose was to evaluate whether intentions to perform sedentary behaviours moderate PA intention-behaviour relations. Cross-behaviour conflict may be best studied in terms of moderation and this has not been evaluated in studies of the intention-behaviour gap (Sheeran, 2002).

METHOD

Participants and Design

Community Sample

Participants in the community sample were limited to residents of the Greater Victoria Capital Region District (CRD), BC, Canada between the ages of 18 and 94 years. Full recruitment procedures are available in a prior published study focused on the processes of change and physical activity (Rhodes, Blanchard, & Bellows, in press). Briefly, a random sample of 1000 addresses was obtained from the local telephone company and questionnaire mail-outs approved by the University of Victoria's Human Research Ethics Board were sent to potential participants. Of the original 1000 questionnaires, 45 envelopes were returned unopened because

the resident had moved or been recently deceased, and a total of 206 participants (22% response rate) completed and returned the questionnaire after adhering to the total design method of repeated reminder mail-outs (Dillman, 1983).

Of the 206 participants, 105 (51%) were males and 101 (49 %) were females with a mean age of 59.29 (SD = 17.72) and 49.42 (SD = 18.43) respectively. Of those reporting race (n = 197), the majority of the participants were Caucasian (95%). Respondents reported themselves more educated (63.5% had at least a Bachelors degree) than the CRD Census of 2001 (40.1%) (Statistics Canada, 2001). Other participant characteristics were similar to the general population of British Columbia, especially Vancouver Island (Statistics Canada, 2001). Specifically, Only 2% were unemployed, 36% were retired, 4% were attending College or University, and 58% were employed. Annual family income showed 59.7% had a household income over 40,000 CDN per year, which is the Victoria median (Statistics Canada, 2001). Finally, 57.6% of participants were married/common-law, 18.2% reported themselves as single/never married and 24% were separated/widowed.

Undergraduate Sample

One hundred and seventy-five undergraduate students volunteered to participate in the study during their primary and secondary Education courses. Informed consent was obtained from the participants. Participants attended large group sessions during January-March 2007, completing the questionnaire and 174 returned to complete a follow-up measure of self-reported physical activity two-week later. The mean age of the 174 participants was 22.73 (SD = 13.15 yrs), 74% were female, and the mean year in university for the sample was 2.75 (SD = 1.72).

Instruments

For the TPB items, physical activity was defined using Health Canada's position stand for recommended weekly PA among adults (Health Canada, 2002). Specifically, Health Canada recommends accumulating at least 30 minutes of PA a day of at least a moderate intensity. This definition is also commensurate with U.S. PA recommendations (U.S. Department of Health and Human Services, 1996b). Definitions of PA were provided that duplicated those found in Canada's Guide to Healthy Active Living and included endurance, strength, and flexibility components (Health Canada, 2002). Our only deviation was that we asked participants to consider PA done during leisure-time and not as a result of occupational duties, housework, or family care responsibilities. This caveat was included because the aims of this study were to predict competing motives during leisure-time.

No recommended duration and frequencies are published for sedentary activities (Salmon et al., 2003) so we sought to keep these congruent with PA. Specifically, sedentary activities were phrased as activities done during leisure times accumulating at least 30 minutes a day. Across all definitions of sedentary behaviours, we specified that participants only consider 1) leisure-time spent in these activities, 2) time where this activity is the primary focus, and 3) time spent on these activities that do not also include physical activity[2]. Participants were asked to use these definitions when answering all TPB questions. The sedentary activities chosen in this study were based on the most frequently reported leisure pursuits of Canadians (Canadian Fitness and Lifestyle Research Institute, 1996). These include TV viewing (approximately 70% of leisure-time - for this behaviour, we also included DVD/VHS viewing), reading, music and hobbies, sedentary socializing (Canadian Fitness and Lifestyle Research Institute, 1996), and computer use based on its rising prevalence (Statistics Canada, 2002).

All common TPB item stems (e.g. If I wanted to, I have control over) were organized with left alignment followed by the specific behaviour stems (e.g., watching TV/DVD/VHS movies 30+ minutes per day) below. The undergraduate sample was phrased in terms of time-frame (e.g., over the next 2 weeks) to correspond with its prospective design. Each behaviour stem was right aligned with a 5-point scale that ranged from 1 (strongly disagree) to 5 (strongly agree). This formatting has been used in similar TPB research (Rhodes, Blanchard, & Matheson, 2007), and an independent pilot study of 8 adults suggested that participants found it clear and simple to respond to the questions (i.e., face validity was established).

Attitude towards all behaviours was measured by four items. Two items were used to tap the *instrumental* (It is beneficial to…, It is wise to…) component and two items were used to tap the *affective* (It is enjoyable to…, It is pleasant to…) component. Of note, we deviated from typical semantic differential scaling that is often used in attitude assessment. We a priori decided to keep the scaling format the same across all questions. This is a strongly recommended procedure in random population surveys in order to simplify the response process for participants (Sudman & Bradburn, 1983). Given the complexity of the questionnaire formatting (e.g., both from a pagination perspective and the additional cognitive demands to answer different questions on various scales) for this research question, we believe this was a sound decision. Ajzen (2002) suggests that semantic differential scales are the most common for attitude assessment in the TPB, but points out that other scales are viable alternatives under certain situations. Additionally there is some evidence to suggest that scale range has negligible differences on the predictive efficacy of the TPB (Courneya, Conner, & Rhodes, 2006). Internal consistency was adequate for both the affective (community sample: TV $\alpha = .83$, Computer $\alpha = .88$, Hobbies $\alpha = .90$, Socialize $\alpha = .89$, PA $\alpha = .87$; undergraduate sample: TV $\alpha = .85$, Computer $\alpha = .87$, Hobbies α

= .78, Socialize α = .78, PA α = .73) and instrumental (community sample: TV α = .85, Computer α = .86, Hobbies α = .80, Socialize α = .80, PA α = .84; undergraduate sample: TV α = .84, Computer α = .82, Hobbies α = .85, Socialize α = .78, PA α = .63) measures.

Subjective norm was measured by items similar to those suggested by Ajzen (2002). Two items measured the *injunctive* component of subjective norm (People who are important to me would approve of me…, People who are important to me would want me to…). An additional item was included to measure the *descriptive* component of subjective norm (People who are important to me…). All three items were aggregated based on the suggestions of Ajzen (2002) and the findings of Rhodes and colleagues (Rhodes, Blanchard, & Matheson, 2006; Rhodes & Courneya, 2003a). Internal consistency was adequate/borderline for all behaviours in both the community (TV α = .77, Computer α = .70, Hobbies α = .79, Socialize α = .80, PA α = .69) and undergraduate student (TV α = .78, Computer α = .69, Hobbies α = .66, Socialize α = .75, PA α = .71) samples.

Perceived behavioural control was measured by two items recommended by Ajzen (2002) (If I wanted to, I have control over…, If I wanted to, I am confident I could…). Internal consistency was adequate/borderline adequate for all behaviours (community sample: TV α = .61, Computer α = .76, Hobbies α = .79, Socialize α = .70, PA α = .80; undergraduate sample: TV α = .64, Computer α = .69, Hobbies α = .67, Socialize α = .70, PA α = .72).

Intention was assessed by two items that underlie the intention construct (I plan to…, Generally, I am motivated to…). Internal consistency was adequate for all behaviours (community sample: TV α = .86, Computer α = .90, Hobbies α = .83, Socialize α = .85, PA α = .87; undergraduate sample: TV α = .84, Computer α = .82, Hobbies α = .62, Socialize α = .78, PA α = .79).

Physical activity behaviour was measured using the LSI index of the Godin Leisure Time Exercise Questionnaire (Godin, Jobin, & Bouillon, 1986; Godin & Shephard, 1985). This instrument contains open-ended questions covering the frequency of physical activity by intensity including activity and intensity descriptors. The instrument is quick to administer and straightforward to understand and compares favourably in reliability and validity to other self-reported PA measures (Jacobs, Ainsworth, Hartman, & Leon, 1993). Our adaptation of the instrument included changing the duration column from 15 min to 30 min in order to correspond to Health Canada/CDC recommendations. Moderate and strenuous intensity frequency categories were then aggregated to also correspond to these recommendations and the phrasing of the TPB questions.

Analyses

Our analysis plan included basic descriptives and bivariate correlations of the PA TPB variables followed by bivariate correlations of the sedentary TPB constructs with PA intention and behaviour[3]. For the main analyses, we used ordinary least squares regression and a path analytic approach to display the model presented in Figure 1. Because the TPB is a mediation-based model and one of our research questions concerned the potential additional variance contributions of sedentary cognitions, we also employed the suggestions of Baron and Kenny (1986). Specifically, only variables that correlated with the principle DV (PA behaviour) were carried forward into the path model. This was performed 1) to improve power, 2) to reduce the inevitable multicollinearity that would ensue from regressing PA behaviour and intention on so many possible constructs, and 3) because associations with PA behaviour is the critical focus of this research. That is, associations of constructs with intention that do not relate to behaviour do

not meet the mediation assumption (Baron & Kenny, 1986) and would ultimately be spurious to behaviour change initiatives (Sutton, 2002).

Finally, to examine whether any cross-behaviour intentions moderate the PA intention-behavior relationship, moderated regression analysis using mean centred variables was conducted. This analysis was achieved using forced entry of the linear effects variables followed by stepwise entry of any interaction terms in a subsequent block. For all analyses, we set the p level at .01 because these analyses are exploratory and we had a desire to protect against type 1 experimentwise error.

RESULTS

Descriptives and correlations for the PA TPB constructs and behaviour can be found in Table 1 for both samples. Mean levels for all TPB constructs were high (e.g., > 4) and the standard deviations ranged from .31 to .99 of a unit on the five-point scales. Correlations among TPB constructs were also quite high but far short of potential unity (e.g., r > .90). Overall, all TPB constructs correlated with PA intention (r = .22 - .65; $p < .01$), but only affective attitude (community sample r = .27; undergraduate sample r = .25), PBC (community sample r = .22; undergraduate sample r = .23) and intention (community sample r = .42; undergraduate sample r = .44) correlated with PA behaviour ($p < .01$).

Results of the sedentary TPB coefficients as correlates of PA intention and behaviour and descriptives are presented in Table 2 for both samples. Only TV cognitions were negative correlates of PA intention and behaviour. For the community sample, TV affective attitude was a negative correlate of PA intention and PA behaviour (r = -.21), whereas TV intention (r = -.24) was a negative correlate of PA behaviour ($p < .01$). For the undergraduate sample, TV PBC and TV intention were negative correlates of PA intention (TV PBC r = -.20; TV intention r = -.20)

and PA behaviour (TV PBC r = -.23; TV intention r = -.31. Several sedentary cognitions were positively correlated with PA intention including TPB cognitions about hobbies, socializing, and the aggregates of all behaviours in the community sample, but this was not replicated in the undergraduate sample. Further, none of these constructs were associated with PA behaviour.

The main analyses that included the complete multivariate TPB model are presented in Figure 2 (community sample) and 3 (undergraduate sample). As only PA intention, affective attitude, and PBC, and TV intention or TV affective attitude (community sample)/TV PBC (undergraduate sample) were correlated with PA behaviour ($p < .01$), these are the constructs presented in the models. For the prediction of PA behaviour in both samples, PA intention (community sample = $\beta = .38$; $p < .01$; undergraduate sample $\beta = .39$; $p < .01$) and TV intention (community sample = $\beta = -.22$; $p < .01$; undergraduate sample $\beta = -.23$; $p < .01$) explained 22% of the variance ($F_{3,179} = 17.14$; $p < .01$) in the community sample and 25% of the variance ($F_{3,169} = 18.71$; $p < .01$) in the undergraduate sample respectively. A second hierarchical regression analysis (including TV intention in a second block after PA intention and PBC in the first block) indicated that TV intention explained an additional 5% variance in both samples. Follow-up hierarchical regressions also indicated that PA affective attitude (community sample F change $_{1,177} = 0.35$; $p > .05$; undergraduate sample F change $_{1,169} = 2.00$; $p > .05$) and PA PBC ($p > .05$ in Figures 2 and 3) relations with PA behaviour were mediated by PA intention and TV intention when employing Baron and Kenny (1986). Further, TV affective attitude (F change $_{1,180} = 2.53$; $p > .05$) and TV PBC (F change $_{1,169} = 1.96$; $p > .05$) were also mediated by PA intention and TV intention in the respective community and undergraduate samples.

For the prediction of PA intention, PA affective attitude ($\beta = .51$; $p < .01$), PA PBC ($\beta = .31$; $p < .01$) and TV affective attitude ($\beta = -.14$; $p < .01$) explained 50% of the variance in the

community sample. A follow-up hierarchical regression analysis indicated that TV affective attitude explained only an additional 2% variance (F change $_{1,189}$ = 6.23; $p < .01$) beyond the PA constructs. Further, regressing PA affective attitude and PA PBC on TV affective attitude indicated 1) that PA affective attitude and TV affective attitude were not related (β = -.05; $p > .05$) and 2) that PA PBC and TV affective attitude were related in a positive direction (β = .24; $p < .01$). These results do not provide support for a straightforward partial mediation of the relationship between TV affective attitude and PA intention (Baron & Kenny, 1986). Finally, a regression of TV intention on TV affective attitude indicated that TV affective attitude was a significant predictor (β = .59; $p < .01$) explaining 33% of the variance.

In the undergraduate sample, PA affective attitude (β = .18; $p < .01$), PA PBC (β = .39; $p < .01$) and TV PBC (β = -.19; $p < .01$) explained 25% of the variance in intention. A follow-up hierarchical regression analysis indicated that TV PBC explained an additional 3% variance (F change $_{1,169}$ = 7.76; $p < .01$) beyond the PA constructs. Regressing PA affective attitude and PA PBC on TV PBC indicated nonsignificant models ($p > .05$) A regression of TV intention on TV PBC indicated that TV PBC was a significant predictor (β = .36; $p < .01$) explaining 13% of the variance.

For the moderator analyses of PA intention-behaviour relations, no interaction terms entered into the regression equation in the second block ($p > .05$) for either sample. Thus, intentions to perform leisure-time sedentary behaviours did not moderate PA intention-behaviour relations. In addition, the sedentary intention aggregate did not moderate PA intention-behaviour relations ($p > .05$).

DISCUSSION

The purpose of this study was to evaluate whether cross-behaviour motives for sedentary leisure-time behaviours (TV viewing, computer use, sedentary hobbies, sedentary socializing) explained additional variance in PA intention and behaviour after controlling for PA motives as measured using the constructs of the TPB in both community and undergraduate student samples. We hypothesized, based on Salmon et al. (2003), that motives for sedentary behaviours would be negative bivariate correlates of both PA intention and behaviour. We considered the evaluation of a unique contribution of sedentary behaviour motives to PA intention and behaviour and as moderators of the PA intention-behaviour relationship as exploratory.

Our results extended the prior literature on relationships between sedentary cognitions and PA and underscore the potential value of adding sedentary control interventions in concert with PA promotion. First, the results of bivariate correlations supported our hypothesis that certain TV motives adversely correlate with PA intention and behaviour. This is in agreement with our hypothesis and prior research on the topic (Salmon et al., 2003). The finding suggests that TV and PA behaviours are considered in concert during leisure-time. The correlations can be considered a small-medium effect size (Cohen, 1992), which is meaningful in behavioural health initiatives (Rutledge & Loh, 2004).

Interestingly, no other sedentary behaviour cognition had a negative correlation with PA intent and behaviour in both undergraduate and community samples. Positive correlations between other sedentary behaviour motives and PA intent were observed in the community sample, suggesting that leisure-time activities may be clustered in the population or, alternatively, that participants did not consider these activities distinct from PA as suggested in the instructions.

Our most important finding of the study was that intention to watch TV explained additional variance in PA behaviour even after controlling for PA cognitions and intention as measured by the TPB in both samples. In turn, PA intention had additional variance explained by affective attitude (community sample) or PBC (undergraduate sample) towards TV even after controlling for PA cognitions. Although we used a restricted TPB model in the main analyses that included only PA affective attitude and PBC, it should be noted that exploratory follow-up analyses showed that these TV cognitions were still significant predictors of PA intention after PA instrumental attitude and subjective norm were added. Further, the TV cognitions did not appear to be mediated by PA cognitions and sedentary intentions did not interact with PA intention-behaviour relations. These results suggest that integrating cross-behaviour cognitions and the TPB has some merit because the constructs appear relatively independent from PA motives.

Of note, the cross-behaviour predictors of PA intention differed between our samples with TV affective attitude in the community sample and TV PBC in the undergraduate sample. The reinforcing value (e.g., affective attitude) and availability of other behaviours (e.g., PBC) both have theoretical support in behavioural choice theory (Epstein & Roemmich, 2001), supporting the efficacy of these constructs. Still, we are unsure why the findings were different between these samples. Future research is needed to validate these findings.

From a theoretical standpoint, the findings suggest that participants may not consider leisure-time behaviours in a comparative nature, even within the construct of PBC, when responding to standard social cognitive PA measures. From an applied perspective, the findings suggest that TV control strategies, perhaps focusing on behavioural control strategies and affective attitude management, may have an independent effect on promoting PA. Past research

suggests that most Americans and Canadians have considerable leisure-time (Canadian Fitness and Lifestyle Research Institute, 1996; Sturm, 2004), yet time is the most cited barrier to PA participation (Canadian Fitness and Lifestyle Research Institute, 2002); a relative conundrum in the literature. Perhaps leisure-time is construed more in terms of leisure-time behavioural economics (i.e., no free time for PA after considering time allotted to preferred leisure-time pursuits) than in absolute free time. This possibility is commensurate with the theorizing that lack of time for physical activity may be more of an attribution or excuse than an actual barrier (Brawley, Martin, & Gyurcsik, 1998).

In terms of intervention, our results suggest that people may need to consider giving up some portion of TV time in order to accommodate PA. Still, substitution of PA for sedentary behaviours has mixed evidence in children and adolescents (Epstein & Roemmich, 2001). Future research employing experimental designs is warranted to tease out the causality of these associations between TV intent and PA behaviour. For example, although it may be that some people form intentions to be active only after consideration of their intentions to perform other leisure behaviours (e.g., the notion that sedentary behaviour intention is considered as an antecedent of physical activity motivation), the opposite scenario is also possible for many people (e.g., no TV plans until I plan to do my exercise). Our current conceptualization takes the neutral ground on this issue at present, whereby intentions are formed based on within-behaviour and across-behaviour TPB constructs, while physical activity behaviour is primarily influenced by within-behaviour intentions and across-behaviour intentions.

These results also need to be interpreted with the appropriate caution. The additional explained variance can be considered a small effect size (Cohen, 1992; Rutledge & Loh, 2004), which suggests it is meaningful but far short of a “smoking gun” explanation for physical

inactivity during leisure-time. Placing the blame on sedentary activities for physical inactivity and public health is common, but often contrary or linked weakly to the available evidence (Biddle, Gorely, & Stensel, 2004; Crawford, 1999; Sturm, 2004). Indeed, the most consistent correlates of physical activity intent across both samples were clearly affective attitude towards PA and perceived behavioural control over PA. This is in agreement with prior research (Eves, Hoppe, & McLauren, 2003; Lowe et al., 2002; Rhodes & Courneya, 2003a). Thus continued promotion of a positive affective experience with PA and control over PA participation still appear the most important intervention targets. As with most prior research (Hagger et al., 2002; Lowe et al., 2002), subjective norm and instrumental attitude were not associated with PA behaviour and, therefore, it appears that promotion of these aspects would result in limited utility.

The results of this study must be considered in the context of a few limitations that prompt directions for future research. First, the results are limited in generalizability to urban populations with similar weather patterns and similar demographics (i.e., ethnicity) as the South Vancouver Island region of British Columbia, Canada. Still, our findings supporting TV cognitions as correlates of PA are similar to previous research (Salmon et al., 2003). Thus, extended generalizability to other regions may be acceptable. Second, our data were self-report. Objective monitoring of physical activity would be desirable and may yield different results. Third, our framing of the TPB and behaviour questions may have affected the results. For example, specific time framing (2 weeks), and scaling style and correspondence between TPB constructs and behaviour may change the magnitude of the correlations. Still, both the PA and sedentary questions were framed and scaled similarly so this may not affect the overall findings. The framing of sedentary behaviour at accumulating 30+ minutes may also affect the results. A

behaviour like TV viewing, for example, may be so pervasive in the population that higher duration framing is needed to create variability among respondents. Assessing these behaviours as habits may be even more telling. Our results, however, still demonstrated that this framing was adequate to produce a correlation with PA.

In summary, the purpose of this study was to explore the integration of cross-behaviour cognitions within the TPB framework in order to evaluate whether sedentary behaviour cognitions explain PA intention and behaviour. Our results provided evidence that TV viewing intention explains additional variance in PA behaviour and TV viewing cognitions also explain additional variance in PA intention even after controlling for PA motives. Our results extended the prior literature on relationships between sedentary cognitions and PA and underscore the potential value of adding sedentary control interventions in concert with PA promotion.

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Footnotes

1. Some research and theorizing in the early development of the Theory of Reasoned Action, a predecessor of the TPB, about “conditional intentions”, attempted to account for preference of one behaviour over another (Ajzen & Fishbein, 1980). Despite support for preference effects in these studies, little research has been conducted since that time.

2. Our definition of each sedentary activity was described in detail for participants separated by illustrations of the activities. For the sake of brevity the full descriptions have not been included in the manuscript. These are available, however, from the first author.
3. Because of our large age range in the community sample, we were initially concerned that age-related issues may confound our analyses. Age, however, did not correlate with our dependent variables of interest (PA intention r = .04, $p > .05$; PA behaviour r = -.13, $p > .05$).

Figure Caption

Figure 1. Proposed model that incorporates the theory of planned behaviour and cross-behaviour cognitions.

Figure 2. Integration of the theory of planned behaviour and television viewing cognitions when predicting physical activity in a community sample. Note ——▶ $p < .01$ - - - -▶ $p > .01$. TV = television viewing. PBC = perceived behavioural control.

Figure 3. Integration of the theory of planned behaviour and television viewing cognitions when predicting physical activity in a undergraduate sample. Note ——▶ $p < .01$ - - - -▶ $p > .01$. TV = television viewing. PBC = perceived behavioural control.

Table 1.

Descriptives and Correlations for the Theory of Planned Behaviour and Physical Activity in Community (N=206) and Undergraduate Student (N=174) Samples

	2	3	4	5	6	Mean	SD
1. Affective Attitude	.58* (.39*)	.48* (.25*)	.47* (.29*)	.65* (.31*)	.27* (.25*)	4.21 (4.45)	0.90 (0.59)
2. Instrumental Attitude		.64* (.33*)	.55* (.18)	.45* (.23*)	.10 (.08)	4.60 (4.84)	0.68 (0.31)
3. Subjective Norm			.52* (.14)	.46* (.22*)	.08 (.09)	4.07 (4.23)	0.69 (0.63)
4. Perceived Control				.53* (.43*)	.22* (.23*)	4.33 (4.49)	0.80 (0.67)
5. Intention					.42* (.44*)	3.98 (4.25)	0.99 (0.83)
6. Physical Activity Frequency						4.62 (5.26)	2.64 (2.11)

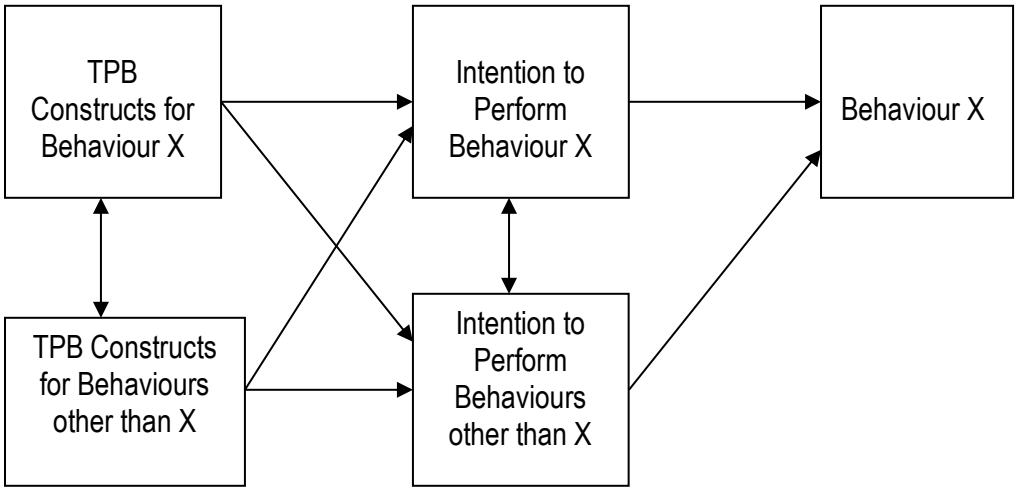
Note: * $p < 0.01$. Coefficients in parentheses represent the undergraduate student sample and coefficients without parentheses represent the community sample.

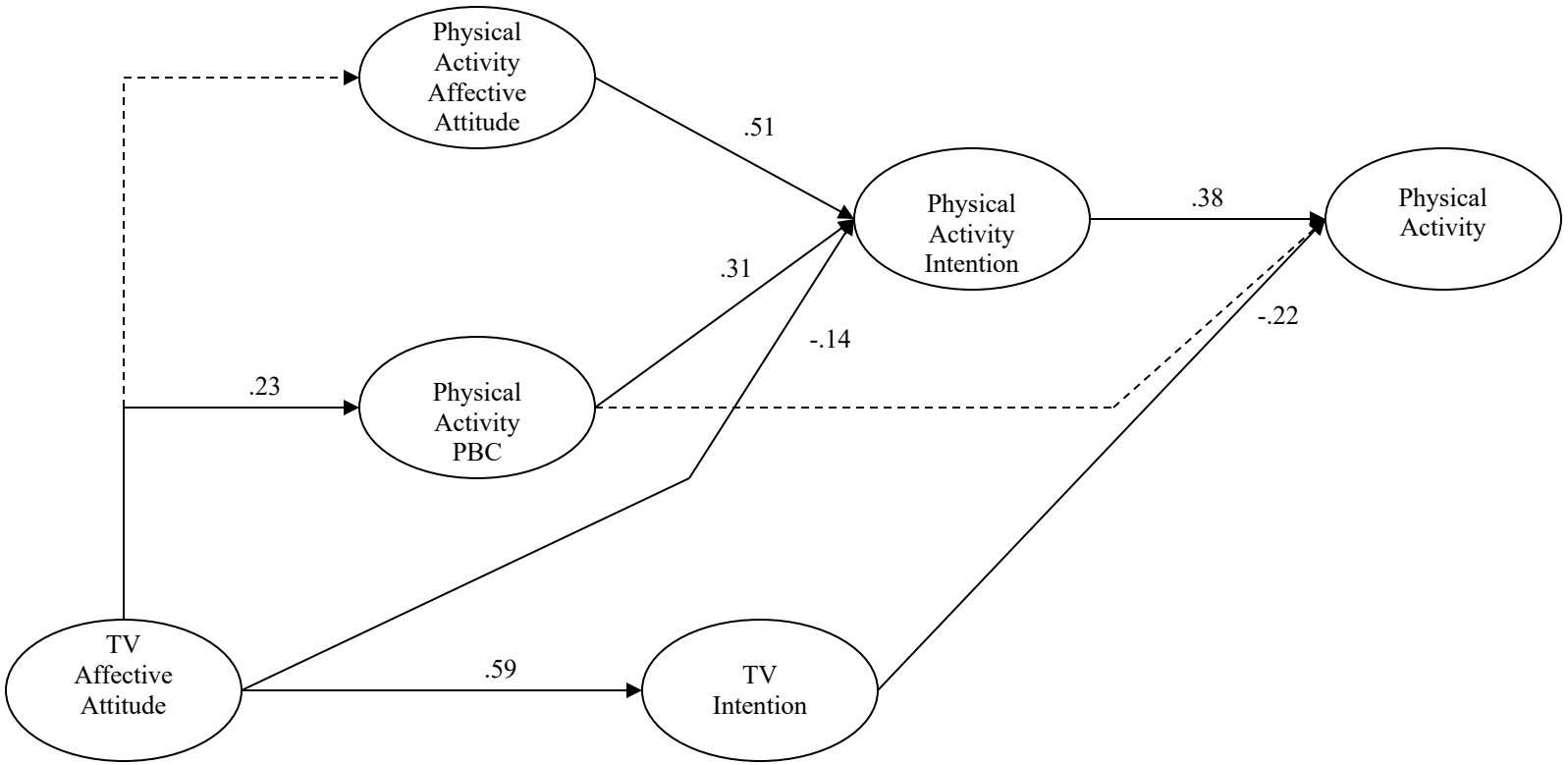
Table 2.

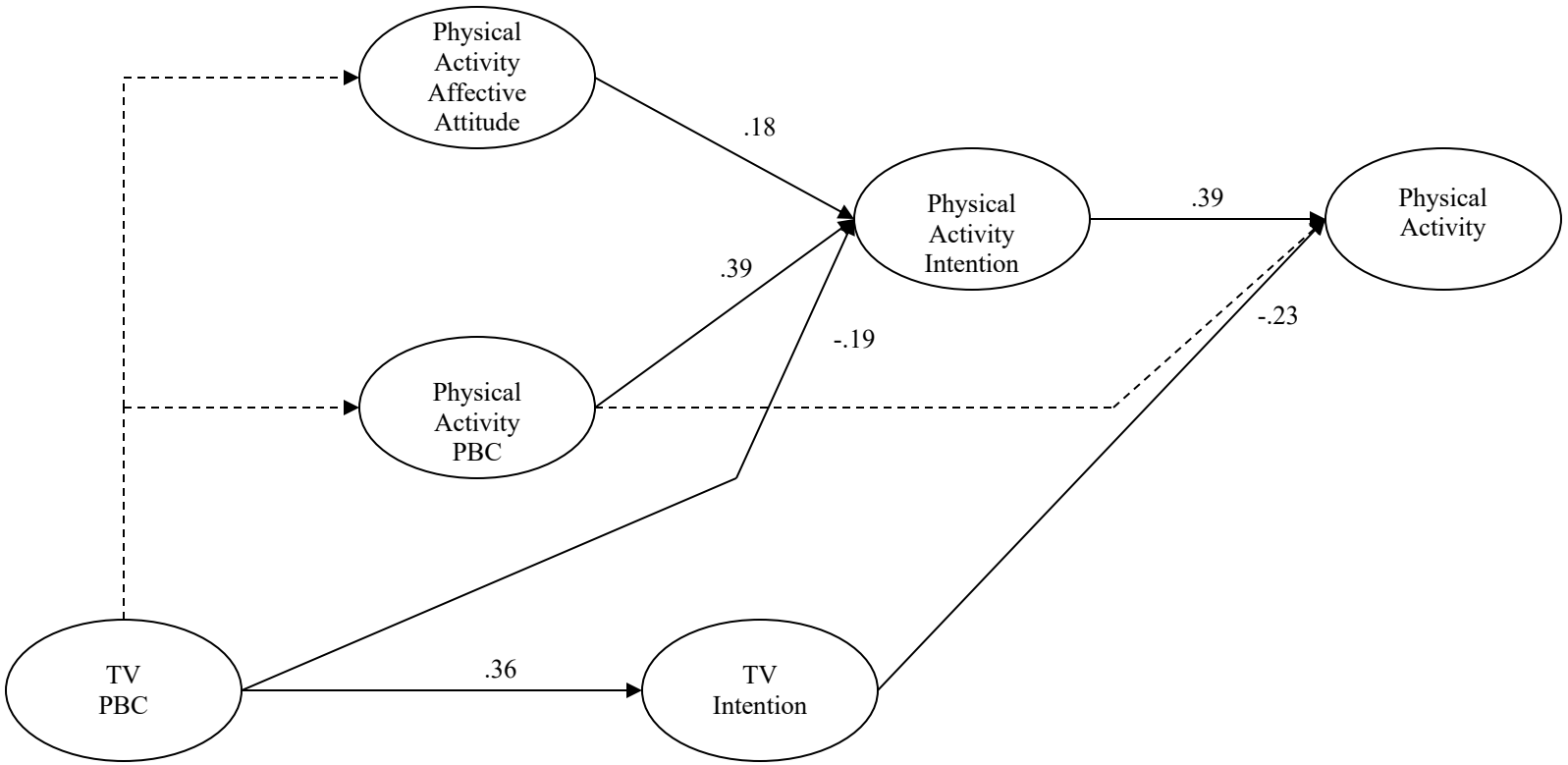
Descriptives and Bivariate Correlations of Sedentary Cognitions and Physical Activity Intention and Behaviour in Community (N = 206) and Undergraduate (N = 174) Samples

Construct	Mean	SD	Physical Activity Intention	Physical Activity Behaviour
TV				
Affective Attitude	3.68 (3.75)	0.96 (0.94)	-.21* (-.13)	-.21* (-.12)
Instrumental Attitude	2.59 (2.02)	0.99 (0.85)	-.05 (-.02)	-.10 (-.04)
Subjective Norm	3.13 (3.00)	0.86 (0.87)	-.02 (-.01)	-.14 (-.11)
Perceived Control	4.27 (4.28)	0.77 (0.79)	.23* (-.20*)	.08 (-.23*)
Intention	3.01 (2.63)	1.23 (1.20)	-.06 (-.20*)	-.24* (-.31*)
Computer				
Affective Attitude	3.24 (3.60)	1.07 (1.02)	.06 (-.04)	.03 (.14)
Instrumental Attitude	2.95 (2.77)	1.00 (0.96)	-.02 (.06)	-.05 (.12)
Subjective Norm	3.25 (3.25)	0.80 (0.80)	.08 (-.10)	-.03 (-.10)
Perceived Control	4.18 (4.27)	0.84 (0.70)	.24* (.00)	.08 (-.05)
Intention	2.86 (3.28)	1.24 (1.11)	.02 (-.02)	-.03 (-.05)
Hobbies				
Affective Attitude	4.45 (3.97)	0.66 (1.02)	.35* (.08)	.06 (.07)
Instrumental Attitude	4.42 (4.83)	0.64 (0.38)	.30* (.15)	.02 (.03)
Subjective Norm	3.70 (4.21)	0.65 (0.60)	.24* (.19)	-.07 (-.09)
Perceived Control	4.36 (4.46)	0.75 (0.67)	.31* (.18)	.08 (.17)
Intention	4.00 (4.15)	0.84 (0.81)	.41* (.25*)	.04 (-.05)
Socializing				
Affective Attitude	4.26 (4.58)	0.80 (0.58)	.29* (-.10)	.08 (-.04)
Instrumental Attitude	4.31 (3.95)	0.75 (0.75)	.27* (-.07)	.03 (-.09)
Subjective Norm	4.11 (4.22)	0.69 (0.67)	.30* (-.07)	.03 (-.12)
Perceived Control	4.21 (4.28)	0.79 (0.67)	.30* (.02)	.11 (-.03)
Intention	3.86 (4.01)	0.86 (0.79)	.38* (.18)	.01 (.07)
Aggregate of All Behaviours				
Affective Attitude	3.90 (3.93)	0.58 (0.56)	.21* (-.06)	-.03 (.03)
Instrumental Attitude	3.55 (3.39)	0.55 (0.47)	.13 (.02)	.00 (.02)
Subjective Norm	3.53 (3.66)	0.58 (0.52)	.17* (-.01)	-.05 (-.15)
Perceived Control	4.28 (4.35)	0.69 (0.52)	.31* (.03)	.13 (.01)
Intention	3.40 (3.52)	0.67 (0.53)	.21* (.04)	-.05 (-.19)

Note: * $p < 0.01$, two-tailed. Coefficients in parentheses represent the undergraduate student sample and coefficients without parentheses represent the community sample.


TPB Constructs for Behaviour X
Intention to Perform Behaviour X
Behaviour X
TPB Constructs for Behaviours other than X
Intention to Perform Behaviours other than X


Physical Activity Affective Attitude
.51
Physical Activity Intention
.38
Physical Activity
.31
-.14
-.22
.23
Physical Activity PBC
TV Affective Attitude
.59
TV Intention


Physical Activity Affective Attitude
.18
Physical Activity Intention
.39
Physical Activity
.39
-.19
-.23
Physical Activity PBC
TV PBC
.36
TV Intention