Running Head: Sedentary Processes and Physical Activity

Exploring Cues to Sedentary Behaviour as Processes of Physical Activity Action Control

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Abstract

Objective: Understanding intention-behaviour relations is important in physical activity (PA) research given the large number of people who intend to be active but fail to translate these intentions into behaviour. The purpose of this study was to evaluate whether processes/cues for popular sedentary leisure-time behaviours and PA explain additional variance in PA behaviour after controlling for PA intention, and to evaluate whether these processes moderate PA intention-behaviour relations.

Methods: Participants were a random sample of 206 adults who completed measures of the processes of change 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.

Results: Results using hierarchical ordinary least squares regression provided evidence that cognitive TV processes explain additional variance in PA behaviour and moderate PA intention-behaviour relations.

Conclusions: These results extend the prior literature on relationships between sedentary cognitions and physical activity and underscore the potential value of adding sedentary control interventions in concert with physical activity promotion.

Keywords: processes of change, physical activity, exercise intentions, transtheoretical model, intention-behaviour gap

Introduction

The physical and psychological benefits of regular physical activity (PA) have been well-documented, but over half of the North American Population are insufficiently active to reap these benefits (CFLRI, 2002; USDHHS, 1996). As a result, the promotion of regular PA is a public health priority. The use of behaviour change theories has been highlighted as instrumental in planning promotion campaigns (Baranowski, Anderson, & Carmack, 1998). In many theories of health behaviour, the most important proximal influence on behaviour is intention (Fishbein et al., 2001). Intention represents the summary motivation to engage in a behaviour and is often considered the central mediator of motivational and informational antecedents (Fishbein et al., 2001).

Still, the intention-behaviour correlation is often modest in health behaviour (Sheeran, 2002) and physical activity research (Symons Downs & Hausenblas, 2005). Thus, explanations for moderators of intention-behaviour relations or post PA intention correlates are a current aim of several researchers (e.g., Lippke, Ziegelmann, & Schwarzer, 2004; Rhodes & Plotnikoff, 2006; Sheeran, 2002). Some of the most convincing evidence comes from the study of Gollwitzer's (1999) implementation intentions. Conceptually quite similar to goal-setting (Locke & Latham, 1990), implementation intentions represent volitional planning and contingency management of behaviour strategies that cue people to maintain their original intentions. Gollwitzer (1999) suggests that successful behaviour adherence may be facilitated via two phases: 1) a motivational phase where motives culminate in a behavioural intention, and 2) a volitional phase whereby strategies, such as implementation intentions, to translate the intention into behaviour are enacted.

Overall, initial evidence for this two-phase structure in the exercise domain has been supportive in most, but not all studies (Gollwitzer & Sheeran, 2006). Still, the pragmatic utility of promoting PA intention-behaviour translation is high. For example, 87% of Canadians hold an intention to be physically active but only 46% appear to actually engage in PA (CFLRI, 2004).

The concept of strategies to promote PA transitions from intent to behaviour is, of course, not limited to the theorizing of Gollwitzer (1999). For example, the transtheoretical model of behaviour change (Prochaska & DiClemente, 1982; Prochaska & Velicer, 1997) also posits that cognitive and behavioural processes of change are essential in moving from behavioural intention to action and the similarities of the processes of change to implementation intentions are duly noted (Armitage, 2004). The five cognitive processes are Consciousness Raising (gathering information), Self-Re-evaluation (considering the behavioural action on oneself), Dramatic Relief (experiencing affect), Environmental Re-evaluation (considering the consequences of the behaviour on others), and Social Liberation (attending to social norms). The five behavioural processes are Counter Conditioning (substituting new behaviours for old ones), Stimulus Control (controlling environmental cues), Reinforcement Management (rewards), Helping Relationships (social support), and Self-Liberation (committing to change). Research on the efficacy of the processes of change within the transtheoretical model is mixed (Marshall & Biddle, 2001) but the behavioural processes have shown some efficacy in distinguishing those who successfully translate intention into PA from those who do not (Rhodes & Plotnikoff, 2006). Still, the application of the processes of change to understanding intention-behaviour relations is understudied and requires further validation.

One conceptual aspect in PA intention-behaviour relations that no current research has addressed is the possibility of adverse effects from competing strategies/cues used to attain other

behaviours. Following the tenets of Behavioural Choice Theory (BCT), sometimes called behavioural economics, (Rachlin, Kagel, & Battalio, 1980; Vuchinich & Tucker, 1983), motivation and planning for other behaviours compete in the behavioural choices made during free time. Specifically, under the limits of free time, investments of time spent on one behaviour may affect the time that can be spent on another behaviour. In this capacity, one behaviour can impede another. BCT has immediate face validity in the study of PA because time spent on high frequency sedentary behaviours are often blamed for low activity rates. Preliminary evidence for this BCT tenet in the PA domain has been mixed, however, with support from lab-based research (Epstein & Roemmich, 2001) but less conclusive findings from population surveys (Biddle, Gorely, Marshall, Murdey, & Cameron, 2004; Rhodes & Blanchard, 2006; Salmon, Owen, Crawford, Bauman, & Sallis, 2003). Competing habits, however, have been found to negatively predict healthy food choice (Verplanken & Faes, 1999). Still, no study has explored whether volitional strategies or cued processes enacted for sedentary behaviours interfere with PA intention-behaviour relations.

Therefore, the purpose of this study was to evaluate whether 1) processes for popular sedentary leisure-time behaviours and PA correlate with PA intention and behaviour, 2) these processes explain additional variance in PA behaviour after controlling for PA intention, and 3) moderate intention-behaviour relations.

The processes/strategies were based on the transtheoretical model of behaviour change (Marcus, Selby, Niaura, & Rossi, 1992; Prochaska & DiClemente, 1982). Our use of the processes differs somewhat from transtheoretical model theory because the processes are typically used to facilitate difficult behaviours (e.g., smoking cessation, physical activity) whereas sedentary behaviours are often of high prevalence and thus actively sought-after. Still,

we theorize that people are likely to use processes in order to make time or facilitate these activities. For example, it seems common for people who have an interest in TV viewing/ movies to actively gather information related this behaviour and plan to watch TV.

Despite the exploratory basis of the study, we hypothesized, that the PA processes would correlate with PA intention, behaviour, and moderate intention-behaviour relations. This is based on prior work (Courneya & Bobick, 2000; Rhodes & Plotnikoff, 2006) and theorizing that the processes represent strategies to facilitate PA intentions into behaviour. Also based on prior work (Rhodes & Blanchard, 2006; Salmon et al., 2003), we hypothesized that processes for sedentary behaviours, particularly TV viewing, would be negative correlates of both PA behaviour and PA intention-behaviour relations. This theorizing was based on the BCT assumption that those participants reporting high sedentary processes would spend less time realizing PA intentions due to multiple behavioural goals during free time and their subsequent processes used to facilitate these goals. Thus, sedentary processes of change may derail physical activity intention-behaviour correspondence because people who have competing interests must choose which behaviours to engage in. We conceived these sedentary processes less as direct causes of PA through intentions and more as moderators of the intention-PA relationship or as factors that impact PA independent of original intentions. For example, planning to watch one's favorite TV shows probably has nothing to do with ones motivation in weekly physical activity (mediation route). However, the plan to watch those shows will mean that the individual will be dedicating leisure-time to this endeavor that may have been otherwise dedicated to acting ones physical activity intentions. Thus sedentary processes may interfere with physical activity-intention relationships and subsequent behaviour (moderation route).

Method

Participants and Design

Participants for this study were limited to residents of the Greater Victoria Capital Region District (CRD), BC, Canada between the ages of 18 and 94 years. A random sample of 1000 addresses within the CRD area was obtained from Dominion Directories (SuperPages Telephone Company). In August 2005, questionnaires approved by the University of Victoria's Human Research Ethics Board, were mailed out to the 1000 potential participants. Of the original 1000 questionnaires, 45 envelopes were returned unopened because the resident had moved or been recently deceased, and 138 questionnaires were returned completed. Of the possible 817 remaining participants, a second mailing of a post card reminder and questionnaire (Dillman, 1983) was sent out two weeks later in which an additional 68 questionnaires were returned. A total of 206 participants (22% response rate) completed and returned the questionnaire.

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. Respondents reported themselves as well-educated; 63.5% had at least a Bachelors degree, which is above the 40.1 % reported during the Census of 2001 (Statistics_Canada, 2004). Of those reporting race (n = 197), the majority of the participants were Caucasian (95%). Other participant characteristics were similar to the general population of British Columbia, especially Vancouver Island (BC_Stats, 1997). Only 2% were unemployed, with 36% being retired, 4% attending College or University, and 58% employed. Annual family income showed 59.7% had a household income over 40,000 per year, which is the Victoria median (Statistics_Canada, 2004). For co-habitation, 57.6% of participants were married/common-law, 24% were separated/widowed, and 18.2% reported themselves as single/never married. Finally, 42.5% of our sample did not meet Canada's physical

activity guidelines (Health-Canada, 2002), which is almost identical to the province average of 43% (CFLRI, 2002).

Instruments

For the intention and processes 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. Centers for Disease Control and Prevention PA recommendations (CDC, 1996). 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 are to explore leisure-time PA correlates.

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 does not also include physical activity. Participants were asked to use these definitions when answering all questions. The sedentary activities chosen in this study were based on the most frequently reported leisure pursuits of Canadians (CFLRI, 1996). Sedentary leisure-time behaviours are characterized by low energy expenditure and are best considered in specific behavioural profiles rather than as simple "physical inactivity" (Biddle,

Gorely, & Stensel, 2004). The dominant sedentary activity (approximately 70% of leisure-time) reported by Canadians is TV viewing (CFLRI, 1996). For this behaviour, we also included DVD/VHS viewing. This leisure-time behaviour is followed by reading, music and hobbies (approximately 15 % of leisure-time), and sedentary socializing (approximately 7% of leisure-time) (CFLRI, 1996). With the proliferation of internet access and the popularity of video games, the dynamics of leisure time behaviours of industrialized nations may also be changing. Limited Canadian data is available at present, but 64% of adults report having internet and computer access at home, a number that is up over 20% since 1999 (Statistics_Canada, 2002). It appears that computer/internet use is now a popular leisure pursuit along with TV, hobbies, and socializing. Therefore, we included computer use and video games as a fourth sedentary behaviour in the study.

All common item stems (e.g., my friends support me) were organized with left alignment followed by the specific behaviour stems (e.g., watching TV/DVD/VHS movies 30+ minutes per day) below. Each behaviour stem was right aligned with a 5-point scale that ranged from 1 (strongly disagree) to 5 (strongly agree). The behaviour stems were double-spaced, lettered (a, b, etc.), and alternated with shading in order for participants to clearly circle the appropriate row. This formatting has been used in similar research (Rhodes, Blanchard, & Matheson, in press), and an independent pilot study of 8 adults suggested that participants found it clear and simple to respond to the questions.

Processes of change towards all behaviours were based on the transtheoretical model and the PCQ questionnaire developed and validated by Marcus et al. (1992). The instrument used in this study was modified from a shorter version (Plotnikoff, Hotz, Birkett, & Courneya, 2001). The behavioural processes (e.g., my friends and family support me doing the activity) included

single item measures for counter-conditioning, contingency management, self-liberation, stimulus control, and helping relationships (TV α = .66, Computer α = .73, Hobbies α = .65, Socialize α = .72, PA α = .78). The cognitive processes (e.g., I often seek out information related to aspects of the activity) included single item measures for consciousness raising, dramatic relief, environmental re-evaluation, self-re-evaluation, and social liberation (TV α = .68, Computer α = .69, Hobbies α = .63, Socialize α = .67, PA α = .71)[2].

Physical Activity Intention was assessed by two items that underlie the intention construct (I plan to…, Generally, I am motivated to…). Internal consistency was adequate (α = .87).

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 (mild, moderate, strenuous) 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 (CDC, 1996; Health-Canada, 2002). Moderate and Strenuous intensity categories were then aggregated to also correspond to these recommendations and the phrasing of the other questions.

Analyses

Our analysis plan included basic descriptives and bivariate correlations of the PA processes variables followed by bivariate correlations of the sedentary processes constructs with

PA intention and behaviour[3]. Processes were evaluated in their aggregate (i.e., behavioural, cognitive) and disaggregated (i.e., all 10 processes) forms as the higher-order hierarchical structure of these constructs is not fully supported (Marshall & Biddle, 2001; Rhodes, Berry, Naylor, & Wharf Higgins, 2004; Rhodes & Plotnikoff, 2006). For the main analyses, we used hierarchical ordinary least squares regression. We believe it is the most straightforward to answer the question (as opposed to structural equation modeling) of additional explained variance contributions given our sample size and the number of possible processes constructs. Specifically, to explain post-intentional PA, PA intent was entered into the regression at block 1 using forced entry. Stepwise entry was then used at blocks 2 and 3 to allow any additional unique variance from the processes. PA processes were considered priority and were allowed to enter in block 2. Finally sedentary constructs were allowed to enter in block 3. Stepwise entry is useful for exploratory research questions such as this one and it helps reduce the inevitable multicollinearity and power problems that would result from forced entry of so many possible sedentary processes coefficients.

Finally, to examine whether any processes moderate the intention-behaviour relationship, moderated regression analysis using mean centred variables was conducted. Because this procedure requires statistical control of the linear effects of variables before the interaction terms, we decided that the processes aggregates were optimal. The disaggregated processes may contain unique information, but the number of variables that would require statistical control and the ensuing multicollinearity would contaminate this analysis. Similar to the stepwise procedures above, this analysis was conducted using forced entry of the linear effects variables followed by stepwise entry of any interaction terms in a subsequent block. Interaction effects were further inspected using slope analysis suggested by Aiken and West (1991). For all analyses, we set the

p level for entry 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 processes constructs and behaviour can be found in Table 1. Mean levels for all processes constructs were generally high (2.90 – 4.34) and the standard deviations ranged from 0.94 to 1.36 of a unit on the five-point scales. Correlations among constructs were also quite high but far short of potential unity (e.g., r > 0.90). Overall, all processes constructs, with the exception of social liberation, correlated with PA intention (r = .36 to .62; $p < 0.01$), and all processes but helping relationships, social liberation, and environmental liberation correlated with PA behaviour (r = .16 to .29; $p < 0.05$). For the aggregate PA processes, the cognitive and behavioural processes had a large correlation (r = .75; p <0 .01) and both correlated with PA intention (cognitive r = .63, behavioural r = .65; $p < 0.01$) and behaviour (cognitive r = .23, behavioural r = .29; p <0 .01).

Results of the aggregate sedentary processes as correlates of PA intention and behaviour are presented in Table 2. Only the TV processes were correlates of PA behaviour (cognitive r = -.27, behavioural r = -.24; $p < 0.01$). These processes, however, did not correlate with PA intention. Interestingly, sedentary processes for socializing and hobbies were positively correlated with PA intention ($p < 0.01$). None of these constructs were associated with PA behaviour.

To further discern the TV processes relations with PA, Table 3 includes correlations of the disaggregated TV processes constructs with PA intent and behaviour. Three of the cognitive processes (dramatic relief, self re-evaluation, environmental re-evaluation) and two of the

behavioural processes (helping relationships, counter-conditioning) had significant ($p < 0.01$) negative relationships with PA behaviour. Like the aggregate analysis, no TV processes had a relationship with PA intention.

The main analyses that tested for correlates of PA behaviour after controlling for intention are presented in Tables 4 and 5. For the prediction of PA behaviour using the aggregate processes (Table 4), block 1 with intention explained 18% of the variance ($\beta = .41$; $p < 0.01$). Block 2 included the option for PA processes to enter the regression equation. The results, however, demonstrated that PA cognitive and behavioural processes would not make a significant ($p > 0.05$) contribution to the model beyond intention as neither entered the equation. TV cognitive processes, however, did enter into the model in block 3 and it explained an additional 7% variance in PA behaviour ($p < 0.01$). No other sedentary processes entered into the model ($p > 0.01$).

For the prediction of PA behaviour using the disaggregated processes (Table 5), block 1 with intention was identical, of course, to Table 4. Also similar to Table 4, none of the 10 PA processes entered the regression equation in the opportunity to do so in block 2 ($p < 0.01$). Finally, the cognitive TV process of self re-evaluation entered into the model in block 3 and explained an additional 6% variance in PA behaviour ($p < 0.01$). No other sedentary processes entered into the model ($p < 0.01$).

Our test of whether PA and sedentary processes moderate the intention-behaviour relationship yielded only one significant finding. Specifically, TV cognitive processes moderated the intention-behaviour relationship (F_{change} 1,177 = 6.29; $p < 0.01$). Slope analysis revealed that individuals with high (i.e., > 1 SD) TV processes ($\beta = .18$) differed from those individuals with

low (i.e., < 1 SD; β = .58) and medium (i.e., within 1 SD; β = .49) TV processes in intention-behaviour relations (see Figure 1).

Discussion

The purpose of this study was to evaluate whether 1) processes for popular sedentary leisure-time behaviours and PA correlate with PA intention and behaviour, 2) these processes explain additional variance in PA behaviour after controlling for PA intention, and 3) moderate intention-behaviour relations. While the notion that high-frequency sedentary behaviours may interfere with PA behaviour is hardly novel (see Epstein & Roemmich, 2001 for a review), the examination of whether sedentary behaviour processes act as PA correlates after controlling for intention or moderators of the PA intention-behaviour relationship had not been examined. Results from this sample of community dwelling adults provide baseline evidence that TV processes may act as cues that adversely correlate with PA behaviour and PA intention-behaviour translation.

As hypothesized, the PA processes had significant correlations with PA intention (medium to large effect size) and behaviour (small to medium effect size) (Cohen, 1992). The only exception was the process of social liberation (i.e. societal changes), which was not significant to the PA outcomes and replicates prior work in the PA domain (Plotnikoff et al., 2001). The results also support prior work by Courneya and Bobick (2000) demonstrating that the PA processes of change are correlates of intention and behaviour. Unique to this study, however, were the analyses of sedentary processes and PA outcomes (see Table 2). Results indicated that only the TV processes were correlated with PA behaviour (small to medium effect size). A more specific analyses of the ten processes (see Table 3) showed that five of the ten TV

processes (dramatic relief, self-re-evaluation, environmental re-evaluation, helping relationships, counter-conditioning) were statistically significant and an additional three processes (consciousness raising, contingency management, stimulus control) were within the range of a small effect size. Small effect sizes are important when findings are translated to population-level health promotion initiatives (Rutledge & Loh, 2004). Thus, this finding is interesting and novel by indicating that sedentary processes are negatively related to PA behaviour. Although the findings are preliminary and require longitudinal follow-up and experimental testing, they are in-line with similar work (Rhodes & Blanchard, 2006; Salmon et al., 2003) and suggest that controlling sedentary processes may represent an additional strategy in the promotion of PA.

Two other interesting findings emerged from the bivariate correlation analyses. First, the TV processes correlated with PA behaviour but not PA intention. This provides some evidence for Gollwitzer's (1999) two phase theorizing and our theorizing that sedentary processes do not have a causal route on PA via intentions. This is contrary to the PA processes; these correlated with PA intention more than behaviour. Second, the only sedentary processes that correlated with PA behaviour were the TV processes. Thus it appears that computer use, sedentary socializing, and other hobbies do not adversely affect PA intent or behaviour. Indeed, processes for socializing and hobbies even positively correlated with PA intent, suggesting that free time processes and behaviour may be clustered in the population. The finding for TV only, however, should not be considered particularly surprising because this is the dominant leisure-time activity (CFLRI, 1996) and therefore poses the most opposition for PA in terms of leisure-time decision making. These findings, therefore, support the basic tenets of competing behaviours for free-time in BCT.

Our second analysis focused on whether any of the processes could be considered as correlates of PA behaviour independent of intention. Our results demonstrated that the cognitive TV processes entered the regression equation to significantly predict PA behaviour after controlling for PA intention (see Table 4). A more specific analysis of the five cognitive TV processes revealed TV self re-evaluation (i.e., considering TV viewing as part of one's identity) as the most prominent post-intentional correlate of PA behaviour (see Table 5). The additional explained variances (.07 for aggregate cognitive TV; .06 for TV self re-evaluation) were of small to medium effect size and notable when considering typical extensions to intention-behaviour relations (Conner & Armitage, 1998). Overall, this suggests that TV cognitions may adversely correlate with PA behaviour independent of intent. The processes of TV self-re-evaluation may underscore the behavioural choice process. Specifically, people who consider TV viewing as important to their identity may be most likely to place it first among their leisure-time pursuits, and cast-off initial PA intentions under the scarcity of time. If this is the case, our findings support BCT and compliment the prior work (Rhodes & Blanchard, 2006; Salmon et al., 2003) that has shown that preference for TV viewing was a negative correlate of PA behaviour.

Finally, our analyses of whether the processes of change moderate PA intention-behaviour relations revealed that the TV processes of change moderated the intention-behaviour relationship. Specifically, those who were high in these processes had lower correlations than those who were low or moderate in these processes. Like the prior analyses, this suggests that cognitions about TV viewing may adversely affect PA-intention relations. From an intervention perspective, active problem solving on how to fit PA around TV viewing (e.g., pre-record viewing material, plan PA at times that do not conflict with TV, etc.) may be beneficial to those

who have formed PA intentions but possess difficulty realizing this intent. Obviously, this requires experimental and longitudinal investigation.

An additional finding from these analyses also warrants mention. Specifically, PA processes did not explain additional variance in PA behaviour after controlling for PA intention or act as moderators of the PA intention-behaviour relationship. The finding suggests that processes of sedentary behaviour are more predictive of PA behaviour than processes of PA behaviour itself. This is a novel and interesting finding with intriguing PA campaign implications. Although replication and experimental extension is needed, it suggests that PA action control may be better accomplished by reducing the cues to sedentary TV viewing rather than focusing of PA strategies. Prior literature on the intention-behaviour gap has noted that few within-behaviour constructs (e.g., PA constructs used to predict PA intention-behaviour relations) predict intention translation (Sheeran, 2002). Perhaps between-behaviour constructs, such as those proposed in behavioural choice theory are more important at this phase.

The results of this study must be considered in the context of a few limitations. 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. This is the most physically active city in Canada (Statistics_Canada, 2004) and our mean PA results reflect this. 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 and the processes measures were created for this study. Objective monitoring of physical activity would be desirable to improve measurement accuracy and further reliability/validity testing of the sedentary processes measures, including multi-item measures and more sophisticated analysis techniques would be

prudent. Third, although cross-sectional designs are acceptable in the early stages of a literature because they establish baseline relations, they are limited severely in determining causality and there is a need for experimental or longitudinal change designs. 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. Finally, we had an excellent gender split, and a sample relatively representative of the ethnicity, age, and PA participation of the Capitol Region District (Statistics_Canada, 2001), but our 22% response rate was disappointing and our sampling frame was limited to those individuals with a public telephone number. If the population that did not respond are different from the population that did, we could have unknown biases in the data set. The length, detail, topic of the questionnaire, and lack of remuneration may be responsible for this low response (Edwards et al., 2006) but prior surveys of ours in the Capitol Region District have also yielded similarly low response numbers (Brown & Rhodes, 2006; Kliman & Rhodes, in press).

In summary, cognitive and behavioural TV processes were negative correlates of PA behaviour but not intention. Additionally, the cognitive TV processes acted as a correlate of PA behaviour independent of PA intention and as a moderator of PA intention-behaviour relations. These preliminary findings suggest that sedentary cognitions and cues may adversely affect the translation of PA intentions into behaviour. Although replication and more rigorous designs are needed, the results suggest that control of sedentary cues and cognitions may be a successful PA promotion strategy for those who intend to be active but often fail to realize their intentions.

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Figure Caption

Figure 1. Television viewing cognitive processes as a moderator of the physical activity intention-behaviour relationship.

Footnotes

1. 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.
2. Full instrumentation is available from the first author upon request.
3. Because of our large age range in the 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, $p > .05$)

Table 1.
Descriptives and Correlations for the Physical Activity Processes, Intention, and Behaviour (N=206)

	2	3	4	5	6	7	8	9	10	11	12	Mean	SD
1. Consciousness Raising	.44*	.54*	.47*	.13	.52*	.46*	.54*	.44*	.55*	.54*	.27*	3.43	1.12
2. Dramatic Relief		.57*	.50*	.06	.51*	.40*	.46*	.29*	.38*	.62*	.18*	3.89	1.04
3. Self-Reevaluation			.56*	.05	.63*	.38*	.56*	.33*	.51*	.59*	.28*	3.98	1.07
4. Environmental Re-evaluation				.15*	.44*	.49*	.38*	.28*	.44*	.36*	.11	4.34	0.89
5. Social Liberation					.08	.17*	.08	-.01	.13	.08	-.06	3.44	1.04
6. Self-Liberation						.34*	.59*	.38*	.49*	.57*	.29*	3.87	1.19
7. Helping Relationships							.40*	.37*	.41*	.36*	.11	3.94	0.94
8. Counter-conditioning								.41*	.44*	.53*	.29*	3.41	1.24
9. Contingency Management									.38*	.37*	.16*	2.90	1.36
10. Stimulus Control										.54*	.26*	3.54	1.14
11. Intention											.41*	3.98	0.99
12. Behaviour												5.96	4.61

Note: * p <01

Table 2.
Descriptives and Bivariate Correlations of Sedentary Processes and Physical Activity Intention and Behaviour

Construct	M	SD	Physical Activity	
			Intention	Behaviour
TV				
Cognitive Processes	2.67	0.72	-0.03	-0.27*
Behavioural Processes	2.48	0.75	-0.06	-0.24*
Computer				
Cognitive Processes	2.77	0.83	0.08	-0.10
Behavioural Processes	2.39	0.81	0.02	-0.14
Hobbies				
Cognitive Processes	3.69	0.63	0.31*	0.12
Behavioural Processes	3.31	0.67	0.20*	0.12
Socializing				
Cognitive Processes	3.60	0.64	0.24*	-0.01
Behavioural Processes	3.33	0.70	0.21*	0.02

Note: * $p < 0.01$, two-tailed.

Table 3.
Descriptives and Bivariate Correlations of Television Viewing Processes and Physical Activity Intention and Behaviour

Construct	M	SD	Physical Activity	
			Intention	Behaviour
Cognitive Processes				
Consciousness Raising	2.73	1.33	.12	-.10
Dramatic Relief	2.31	1.19	-.13	-.29*
Self-Reevaluation	2.15	1.12	-.07	-.24*
Environmental Re-evaluation	1.99	1.01	.01	-.22*
Social Liberation	4.17	1.00	.00	.04
Behavioural Processes				
Self-Liberation	3.02	1.29	.03	.07
Helping Relationships	2.69	1.12	-.13	-.27*
Counter-conditioning	2.18	1.12	-.18	-.27*
Contingency Management	1.58	0.72	-.07	-.13
Stimulus Control	2.89	1.25	-.01	-.16

Note: * $p < 0.01$ two-tailed.

Table 4

Processes constructs augmenting intention when predicting physical activity.

	F_{change}	df	R^2_{change}	β^1	β^2
(Block #1) PA Intention	36.33*	1,182	.18	.41*	.41*
(Block #2) No PA processes entered					
(Block #3) Cognitive TV processes	16.94*	1,181	.07		-.27*

Note: * $p < .01$. $\beta^{1\text{-}2}$ = standardized regression coefficients for equations #1 and #2. df = degrees of freedom.

Table 5

Specific processes constructs augmenting intention when predicting physical activity.

	F_{change}	df	R^2_{change}	β^1	β^2
(Block #1) PA Intention	36.33*	1,182	.18	.41*	.41*
(Block #2) No PA processes entered					
(Block #3) TV Self-Reevaluation	12.89*	1,167	.06		-.24*

Note: * $p < .01$. $\beta^{1\text{-}2}$ = standardized regression coefficients for equations #1,and #2. df = degrees of freedom.

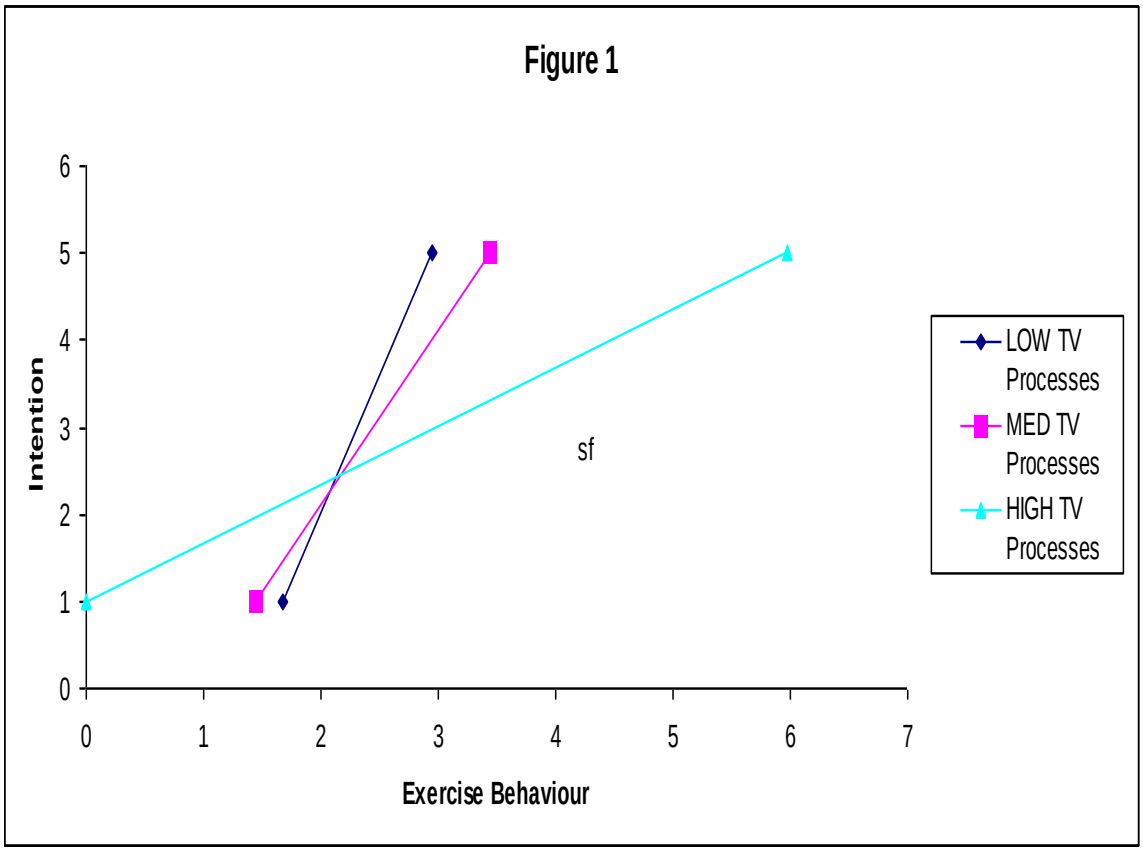
Figure 1
Intention
Exercise Behaviour
sf
LOW TV Processes
MED TV Processes
HIGH TV Processes
0
1
2
3
4
5
6
7