Identifying belief-based targets for the promotion of leisure-time walking.

Rhodes, R. E., Blanchard, C. M., Courneya, K. S., & Plotnikoff, R. C.

2009

Running Head: Beliefs about Walking

Identifying Belief-Based Targets for the Promotion of Leisure-Time Walking

*Corresponding author.

Abstract Word Count: 275

Main Text Word Count: 4083

Tables: 4

Key Words: Theory of Planned Behaviour

Abstract

Objectives: Walking is the most common type of physical activity (PA) and the likely target of any public health effort to increase PA. No studies, however, have identified the belief-level correlates for walking using the well-validated theory of planned behaviour. The purpose of this study was to 1) elicit salient beliefs about walking, and 2) evaluate what beliefs may be the most important targets for walking promotion campaigns.

Methods: Participants in the elicitation study were a random sample (N= 55) of Canadian adults who listed behavioural, normative, and control beliefs about leisure-time walking. Seventeen beliefs were identified. Participants in the validation study (N = 358) completed measures of demographics, the beliefs from the elicitation study, and self-reported walking behaviour two months later.

Results: Evaluation of belief-behaviour relationships using hierarchical ordinary least squares regression procedures showed that almost all behavioural expectancies were correlates of intention and behaviour, but normative and control expectancies were more select correlates ($p < .01$). The value terms and expectancy x value interactions were generally not significant ($p > .01$). When belief-behaviour relations were evaluated by the proportion of participants meeting PA recommendations, however, only beliefs about feeling good, appearance, stress relief, and time were significant ($p < .01$).

Conclusions: Public health efforts to promote walking should focus on making time for regular walking and the advantages that walking can provide for weight control/appearance, stress relief, and to a lesser extent feeling good/affect. By contrast, focusing on overcoming other barriers (e.g., access, social support, cost), normative issues, or the fitness and physical health aspects of walking may be less effective. Future research should determine how best to change these expectancies in the population.

Introduction

Regular physical activity (PA) has established short- and long-term health benefits (Warburton, Nicol, & Bredin, 2006). Unfortunately, less than half of the North American population engage in enough PA to reap these benefits (Canadian Fitness and Lifestyle Research Institute, 2002; U.S. Department of Health and Human Services, 2003), and thus, promotion of PA is a public health priority. PA itself is a collection of behaviours and the promotion of specific modalities may be important. Walking behaviour has received recent attention based on its physical (Manson et al., 2002) and psychological (Blacklock, Rhodes, & Brown, in press) health benefits and its lower intensity, high accessibility, ease to physically perform, and low-cost in comparison to other PAs (Duncan & Mummery, 2005; Rhodes, Brown, & McIntyre, 2006). Also, walking is the most preferred PA across the population (Canadian Fitness and Lifestyle Research Institute, 2002). These aspects suggest that promotion of regular walking is a worthwhile focus in population-level PA initiatives.

The use of theory-based guidance in PA promotion is advocated and this should obviously transfer to walking research. One theory that has been extensively validated in the PA domain is Ajzen's (1991) theory of planned behaviour (TPB) (Symons Downs & Hausenblas, 2005). The TPB proposes that behaviour is largely determined by intention, one's overall motivation to perform the behaviour. Still, intention may be augmented by perceived control over behaviour (PBC)--the perception of capability to perform the behaviour when motivation is assumed (Rhodes & Courneya, 2004)—to the extent that perceived control represents actual control (Ajzen, 1991). Intention, in turn is thought to be influenced by affective (e.g., evaluation of the enjoyment of performing the behaviour) and instrumental (e.g., evaluation of the benefit of performing the behaviour) attitudes, subjective norm (e.g., evaluation of the perceived approval from others to perform the behaviour) and PBC. Overall, the TPB has performed well in explaining PA, with large

associations between intention and behaviour; and attitude and PBC in turn, with intention (Symons Downs & Hausenblas, 2005).

Despite the abundance of research testing the predictive efficacy of the TPB, few studies have used the theory to develop interventions (Sutton, 2002). Although some studies have used the TPB to evaluate interventions (Hardeman et al., 2002), they did not use the TPB to guide a priori intervention content. Ajzen (2002b) suggests that the content for TPB-based interventions is founded upon the underlying beliefs in the TPB constructs of attitude (i.e., behavioural beliefs), subjective norm (normative beliefs), and PBC (control beliefs). Thus, it is the beliefs about PA that serve as markers for promotion content that should be used in interventions. Belief targets are considered important if 1) they correlate with behaviour (Sutton, 2002), and 2) if there is enough variability in the belief to conceivably change behaviour (i.e., the absence of a ceiling effect) (Ajzen, 2002b; Fishbein, Von Haeften, & Appleyard, 2001).

Currently, no research has focused on the TPB belief-level markers for walking. Thus, the purpose of this study was to 1) elicit salient beliefs about walking, and 2) identify what beliefs may be the most important targets for walking promotion. Belief analysis is a relatively exploratory, reductionism-based process (Ajzen, 2002b; Fishbein et al., 2001), but we hypothesized that only a select few beliefs from our elicitation study would emerge as important correlates of walking.

Method

Study 1: Belief Elicitation

Participants and Design

Participants for this study were residents of British Columbia (BC), Canada aged 18 or greater. In February 2004, 250 questionnaires, approved by the University of Victoria's Human Research Ethics Board, were mailed to BC residents using a random sample of addresses obtained from Dominion Directories. Fifty-five participants responded with completed questionnaires and an

additional 47 questionnaires were returned as undeliverable making the response rate 27% of the eligible respondents. Descriptives for the sample can be found in Table 1.

Instrumentation

The questionnaire used the belief elicitation procedures recommended by Ajzen (2002a) and focused on regular walking during free time for at least 30 minutes per time, four or more times per week, which is consistent with Canadian public health guidelines (Health Canada, 2002). Open-ended questions asked participants to write about the advantages and disadvantages of walking, important others who might approve or disapprove of them walking regularly, and the barriers to regular walking. Spaces (10 per question) were left for participants to write-in their beliefs.

Results

Responses for the beliefs were coded by two research assistants independently. Congruence was 100% on these beliefs when the two codings were merged. All beliefs were retained for the questionnaire used in the belief-evaluation study. Behavioural beliefs consisted of: feeling good, taking too much time, improved fitness, improved appearance, reducing chances of chronic disease, and relieving stress. Normative beliefs focused on family, friends, physician, and spouse/partner, and control beliefs included time, access to facilities, health, injury, social support, cost, and bad weather (see Table 2).

Study 2: Belief Validation

Participants and Design

For the main study, a random sample of 1500 addresses within BC was obtained using identical procedures to the elicitation study. In February 2005, questionnaires approved by the University of Victoria's Human Research Ethics Board were mailed to the 1500 potential participants. Of the original 1500 questionnaires, 222 envelopes were returned unopened because the resident had moved (n = 208) or was recently deceased (n = 14), and 232 questionnaires were

returned completed. Of the possible 1046 remaining participants, a second mailing of a post card reminder and questionnaire (Edwards et al., 2006) was sent out two weeks later in which an additional 126 questionnaires were returned. Thus, a total of 358 participants (28% of eligible participants) completed and returned the questionnaire. A second follow-up mail-out to these 358 participants was conducted two months after receipt of their completed survey. Of these participants, 203 individuals completed and sent back the follow-up questionnaire comprised of a measure of walking over the past two months (57% follow-up rate). Table 1 provides the sample descriptives.

Instruments

Theory of planned behaviour beliefs asked participants to consider regular walking during free time for at least 30 minutes per time, four or more times per week (Health Canada, 2002). The behavioural expectancies were asked using seven-point likert-type scales from 1 (extremely unlikely) to 7 (extremely likely) with the stem "for me, regular walking over the next two months would…" The corresponding value term was measured on a similar seven point scale by asking how important the outcome was for the participant over the next two months from 1 (extremely unimportant) to 7 (extremely important). Normative expectancies asked about whether each referent would approve of the participant engaging in regular walking over the next two months (i.e., injunctive norms) and whether participants believe that referents would engage in regular walking themselves (i.e., descriptive norms) from 1 (completely untrue) to 7 (completely true). These questions followed with corresponding value/motivation to comply questions about how important it is to do what the referent wants you to do in terms of walking from 1 (extremely unimportant) to 7 (extremely important). Finally, control expectancy questions asked participants to rate how easy they would find regular walking over the next two months if they wanted to despite the certain barriers. These items were evaluated on a seven point scale from 1 (extremely difficult) to 7

(extremely easy). Corresponding power (value) of the belief was measured by asking participants to rate the likelihood of these barriers occurring over the next two months from 1 (extremely unlikely) to 7 (extremely likely).

Intention was measured using four items based on Rhodes, Blanchard, Matheson, and Coble (2006): 1) "I intend to engage in regular walking ____ times per week over the next 2 months."; 2) "I plan to engage in regular leisure-time walking over the next 2 months" from 1 (strongly disagree) to 7 (strongly agree); 3) "I am motivated to engage in leisure-time walking over the next 2 months," from 1 (completely unmotivated) to 7 (completely motivated); and 4) "I am determined to engage in leisure-time walking over the next 2 months," from 1 (completely undetermined) to 7 (completely determined). The items were standardized and then aggregated ($\alpha = .87$).

Walking behaviour was measured using a variant of the Godin Leisure Time Exercise Questionnaire (GLTEQ) (Godin, Jobin, & Bouillon, 1986). This measure has been used in a prior walking study (Blacklock et al., in press). Participants were asked to recall their average weekly walking during their free time over the past two months. The GLTEQ contains three open-ended PA questions pertaining to the average frequency of mild, moderate, and strenuous physical activities (with examples of each) during free time in a typical week. Mild, moderate and strenuous physical activities were changed to mild (slow walk), moderate (average pace) and strenuous (very brisk pace) walking respectively for the walking measure. We also modified the GLTEQ to include an open assessment of average duration walked. Frequencies of strenuous (20 minutes+), moderate (30 minutes+), and mild (60 minutes+) walking were aggregated to produce a total walking frequency score that corresponds to Health Canada's current PA recommendations (Health-Canada, 2002). To produce a dichotomous variable coded for meeting Health Canada PA recommendations, participants who walked 3 or less times a week were coded 0 (not meeting) and those who walked 4 or more times per week were coded 1 (meeting).

Analyses

Preliminary analyses

Although complete data was available at baseline, 155 participants did not complete the two month walking assessment. To determine the pattern of missingness surrounding walking, a dummy variable was created (0 = walking data absent; 1 = walking data present). Next, this variable was compared on the demographic and TPB variables via zero-order correlations and χ^2 analyses. Results showed that walking missingness was significantly ($p < .05$) related to being less educated, living alone, and reporting a lower income. Therefore, it was assumed that the data were missing at random (MAR: i.e., the probability of missing a walking data point was not related to its particular value, but was dependent upon other variables in the model)(Allison, 2002). Therefore, missing values were imputed using the expectation maximization algorithm in LISREL 8.8. Because of the attrition, however, we also included the listwise deletion results to compare with the imputed results.

Assessment of walking behaviour and intention for skewness and kurtosis showed normality. Still, income correlated with walking ($r = -.13$; $p < .05$), and age ($r = .16$; $p < .01$) and education ($r = -.11$; $p < .05$) correlated with walking intention. These variables were subsequently entered as covariates in the belief analyses.

Statistical Analysis

The analysis of TPB beliefs has no established method. Thus, several recommendations were considered (Ajzen, 2002b; Fishbein et al., 2001; Rhodes, Plotnikoff, & Spence, 2004; Sutton, 2002). From this literature, some key themes emerged that helped guide our analysis strategy. First, beliefs are considered multidimensional with a poorly understood causal structure, so a univariate profile analysis approach over a multivariate analysis is desirable. Therefore, our analyses followed a univariate assessment of each belief.

Second, analyses that focus on belief-intention associations are sometimes recommended (Fishbein et al., 2001), but other researchers have argued that the belief-behaviour relationship is considered fundamental to provide at least baseline evidence that targeting a belief for a behavioural intervention may have merit (Sutton, 2002; Weinstein, in press). As a result, each belief was evaluated with its relationship to walking intention and behaviour, but walking behaviour was considered the critical dependent variable.

Third, expectancy, value, and their interaction are important to consider (Ajzen, 2002b), but the value component and interaction often fail to provide predictive utility beyond the expectancy itself (Gagne & Godin, 2000). Thus, hierarchical ordinary least squares regression procedures were conducted after entry of covariates by entering 1) the expectancy and value terms, and 2) their interaction term. All beliefs were mean-centered to reduce multicollinearity (Aiken & West, 1991) and the subsequent F change and R^2 change values were used to assess the contributions.

Finally, from a pragmatic perspective, beliefs that have a relationship with behaviour still need to have enough variance to theoretically change in a substantive way (i.e., the absence of a ceiling effect in its relationship with behaviour) (Ajzen, 2002b; Fishbein et al., 2001). To evaluate this issue, any significant belief-behaviour correlations were inspected across the belief scale by employing similar procedures to Rhodes and Courneya (2005), whereby a χ^2 analysis is used to evaluate the proportion of participants meeting PA recommendations at each scale response. If significant asymmetry in the proportion of participants meeting PA recommendations across scale responses was found, we then sought to identify the highest threshold for this asymmetry. In theory, the threshold of the scale is reached when the proportion of participants meeting recommendations no longer increases with a move to the next scale response option (e.g., a move from 6 to 7 on a 7-point scale). Thus, the proportion of participants who are not meeting recommendations below this threshold represent the maximum target population for an intervention

based on this belief. Because of the number of analyses and potential for experimentwise type one error, alpha was held at a more conservative .01 for all statistical tests.

Results

The hierarchical regression results are presented in Table 3. After controlling for their respective sociodemographic covariates, the behavioural and normative beliefs all explained significant variance in intention (R^2 = .07 to .25), but only control beliefs about time, recreation facility access, social support, and bad weather were found significant (R^2 = .03 to .09). In terms of explaining walking behaviour, all the behavioural beliefs (R^2 = .09 to .03) with the exception of beliefs about reducing disease were significant. Normative beliefs about one's physician and descriptive norms about friends, family, physician, and one's partner also explained significant variance in walking (R^2 = .06 to .03). Finally, among control beliefs, only time explained walking behaviour (R^2 = .04).

When comparing the specific coefficients in these models, all the behavioural expectancies predicted both intention (βs = .33 to .51) and behaviour (β = .15 to .28) with the exception of reducing disease. By contrast, only the value of increased fitness (β = .16) predicted intention and no behavioural values predicted behaviour independent of their respective expectancies. The results of the normative and control expectancies were belief-specific. For injunctive norm expectancies, all predicted intention (β = .31 to .40) but only spouse/partner predicted behaviour (β = .17). All descriptive norms predicted intention (β = .24 to .31) and behaviour (β = .18 to .23) with the exception of physician descriptive norm, but the value of one's physician was the only motivation to comply term that predicted intention (β = .18) and behaviour (β = .18). For control expectancies, time (β = .29), recreation access (β = .18), social support (β = .19), and bad weather (β = .16) predicted intention but only time (β = .19) predicted behaviour. None of the value terms contributed to the explanation of intention or behaviour.

The interactions of beliefs and their respective values were not significant across any belief with the exception of injury. This interaction was subsequently interpreted using simple slopes analysis procedures with groupings of low likelihood (<1SD), medium likelihood (±1SD) and high likelihood (>1SD) for its relationship with behaviour (Aiken & West, 1991). The results suggest that control over injury is a correlate of walking under low probability for injury ($\beta = .35$; $p < .01$), but not for medium probability ($\beta = -.07$; $p > .05$) or high probability ($\beta = -.21$; $p > .05$).

Inspection of the difference between imputed missing values and listwise deletion of missing values for walking suggested comparable findings. Minor differences were present in the detection of statistical significance, but generally not from differences in effect size. This is to be expected in MAR data, because listwise deletion had a smaller n (Allison, 2002).

Belief-behaviour correlates were assessed by response category in their relationship with meeting Health Canada PA recommendations in Table 4. The low end of the scales contained generally small n. Because this is a pragmatic assessment, we opted to aggregate responses 1-3 on all beliefs in this analysis. The low-end of the scale is 1) unlikely to contain the highest threshold for meeting recommendations and 2) the grouped n aids in the power of this nonparametric test. Based on Cohen's (1992) small effect size values, the criterion for meaningful differences in proportions across responses was considered 10%. Thus, at least 10% more respondents needed to be reporting meeting recommendations to consider the next response option as a meaningful difference. Results indicated that behavioural expectancies about feeling good, appearance/weight control, stress relief, walking taking too much free time, and the control belief regarding time were asymmetrical in their proportion meeting Health Canada's PA recommendations. The threshold for all expectancies was from 5 (slight advocacy) to 6 (moderate advocacy) with the exception of the belief about taking too much time, which was between 4 (neutral) and 5 (slight advocacy). The target population (% not meeting recommendations that were below the threshold), however, that

could potentially be affected by a belief-based intervention, differed. Appearance/weight control, walking taking too much time, and the time control belief all had a maximum target population between 20% and 22%, while stress relief was 16% and feeling good was 9% of the sample.

Discussion

This study advances the literature on leisure-time walking by applying a belief-based TPB model to identify potentially important belief targets for intervention. Prior research with the TPB and walking had either not focused on belief-level constructs (Eves, Hoppe, & McLauren, 2003; Rhodes, Brown et al., 2006), or had used general exercise-related TPB beliefs to create an intervention (Reger, Cooper, Booth-Butterfield, Smith, & Bauman, 2002).

The results suggested that 17 walking-related beliefs were salient to the BC population. All behavioural expectancies predicted intention and behaviour with the exception of the expectation that walking could reduce chances of disease. Normative and control beliefs, however, were more select predictors. For example, only injunctive beliefs about one's spouse/partner, descriptive norms for friends, family, and spouse/partner and the control belief about time predicted behaviour. These findings are consistent with the hypothesis that walking may have fewer barriers overall than other physical activities because of its ease to perform (skill, intensity, and access), and low cost. This supports the pragmatics of tailoring for walking promotion specifically.

Of interest, the value and interaction terms associated with each belief expectancy did not add to the prediction of walking behaviour or even intention with two marked exceptions. Thus, 95% of these tests yielded null findings. From a theoretical perspective, these results do not support the utility of expectancy x value formulations which is congruent with prior work (Gagne & Godin, 2000). The practical outcome of this finding would suggest that walking promotion need not focus on the value-systems of participants in terms of the salient walking outcomes identified in this study.

These findings also highlight the importance of using behaviour as a criterion measure in belief analyses (Sutton, 2002). The correlations with intention suggest that all behavioural and normative beliefs, and over 50% of the control beliefs may be important markers, but the correlations with walking behaviour reduce these beliefs considerably. Belief-intention correlates that are different from belief-behaviour correlates suggest that these particular beliefs may not hold utility in a behavioural intervention.

The second analysis featured a more critical appraisal of each belief's variability and its relationship to meeting PA recommendations by scale response. This is considered an important practical assessment of whether enough variability within the belief is present to even consider it for intervention (i.e., ceiling effects and thresholds) (Ajzen, 2002b; Fishbein et al., 2001). Several interesting findings emerged from these analyses. First, only behavioural beliefs about participants feeling good, improving appearance, relieving stress, and the disadvantage of walking taking too much time were identified as having significant differences in the proportions of individuals meeting PA recommendations across their scale responses. Thus, focusing on fitness and reducing chances of chronic disease do not appear to be important intervention targets. In some ways this parallels other TPB work that has shown that instrumental attitude is less predictive of PA and contains a higher mean and less variability than affective attitude (e.g., Rhodes, Blanchard, & Matheson, 2006; Rhodes & Courneya, 2003). Clearly, beliefs about stress relief and feeling good are more affective in nature than fitness and chronic disease, which are more instrumental.

Similar to the reduction in behavioural beliefs, spouse/partner injunctive norms and descriptive norms did not emerge as significant targets with asymmetry in meeting PA recommendations across scale responses. Part of this finding is certainly due to restricted range. These norms had well over half of the sample reporting moderate or extreme advocacy. The results

mimic direct or global-level TPB findings generally. Subjective norm is usually not a significant independent correlate of PA in the TPB (Symons Downs & Hausenblas, 2005).

The control belief about time for walking emerged with significant asymmetry in meeting PA recommendations across scale responses. Thus, two time-related belief constructs were significant in the analyses. Although these constructs could be construed as conceptually different (i.e., time as a control barrier vs. time as a priority-based behavioural belief), the correlation between the control belief and the behavioural belief was $r = .50$ suggesting overlap. Furthermore, the two beliefs did not make independent contributions to behaviour when this was explored in multiple regression (time as behavioural belief $\beta = -.26$, $p < .01$; time as control belief $\beta = .07$, $p > .05$). Time is the most frequently reported barrier to PA in Canada (Canadian Fitness and Lifestyle Research Institute, 2002), but the construct itself is often difficult to disentangle from motivation, priorities, attributions, and excuses (Brawley, Martin, & Gyurcsik, 1998). From these data, we would suggest that the behavioural belief about time may be the more direct belief-based correlate with walking, and the control belief could be one of the contributing factors for this appraisal. Thus, simply intervening on time management may not be as useful as targeting priorities and active living strategies. Future detailed and focused research on beliefs about time and PA is warranted in order to better understand these possible relationships.

One of the most interesting findings from the analysis across response scales was that an advocacy of six on the scale (moderate advocacy) was the threshold of differentiation for meeting PA recommendations in all beliefs but the behavioural belief about time (which was 5 – slight advocacy). This demonstrated the importance of threshold assessments within PA research (Rhodes & Courneya, 2005), but also suggests that intervention efforts need only focus on participants agreeing to moderate advocacy of these beliefs. Indeed, extreme advocacy showed some decreases in walking activity, which may be reflective of bias.

This study needs to be interpreted within the context of its limitations. First, the sampling frame of BC may not generalize to other regions. BC is the most active province in Canada (Canadian Fitness and Lifestyle Research Institute, 2002) and its two major cities feature mild climates. Second, although the samples obtained for this research were representative of the BC adult population in terms of sociodemographics (Statistics Canada, 2002) and PA (Canadian Fitness and Lifestyle Research Institute, 2002), the baseline survey response rate was modest and the subsequent attrition rate was high. If differences in terms of PA cognitions and behaviour exist between those who completed the questionnaire and those who did not, it will bias our results. Third, the walking measure was self-report and future research using objective measures (e.g., pedometry, accelerometry) would be desirable. Finally, the beliefs used in this study may not be representative of all salient beliefs about walking. These beliefs were derived from elicitation work, but other beliefs not measured in this study may also be important.

Implications for Practice

Analyses of belief-level targets for walking interventions suggests that a focus on making time for regular walking, and the advantages that walking can provide for weight control/appearance, stress relief, and to a lesser extent feeling good/affect would be prudent. By contrast, focusing on overcoming other barriers (e.g., access, social support, cost), normative issues, or the fitness and physical health aspects of walking may result in limited behaviour change. Practitioners may need to operationalize these findings by designing strategies/messages to directly promote these specific significant constructs in enhancing salience, awareness, and knowledge related to walking. The implementation of educational materials (pamphlets, videos) on the affective and weight control outcomes of walking in combination with strategies to free-up leisure-time and support the choice to be a regular walker will likely aid in this endeavour.

Acknowledgements:

Ryan E. Rhodes is supported by a scholar award from the Michael Smith Foundation for Health Research, a new investigator award from the Canadian Institutes of Health Research, and with funds from the Social Sciences and Humanities Research Council of Canada, the Canadian Diabetes Association and the Human Early Learning Partnership. Chris M. Blanchard is supported by the Canada Research Chair Program. Kerry S. Courneya is supported by the Canada Research Chairs Program and a Research Team Grant from the National Cancer Institute of Canada with funds from the Canadian Cancer Society and the NCIC/CCS Sociobehavioral Cancer Research Network. Ronald C. Plotnikoff is supported from Salary Awards from the Canadian Institutes of Health Research and the Alberta Heritage Foundation for Medical Research. We also acknowledge the hard work of data collection and entry for this project by Carolyn A. McIntyre.

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179-211.

Ajzen, I. (2002a). *Constructing a TPB questionnaire: Conceptual and methodological considerations*. Retrieved April 7, 2007, from http://www-unix.oit.umass.edu/~aizen/

Ajzen, I. (2002b). *Construction of a theory of planned behavior intervention.* Retrieved April 4, 2007, from http://www-unix.oit.umass.edu/~aizen/pdf/tpb.measurement.pdf

Allison, P. D. (2002). *Missing Data.* Thousand Oaks: Sage Publications.

Blacklock, R. E., Rhodes, R. E., & Brown, S. G. (in press). Relationship between regular walking, physical activity and health-related quality of life. *Journal of Physical Activity and Health*.

Brawley, L. R., Martin, K. A., & Gyurcsik, N. C. (1998). Problems in assessing perceived barriers to exercise: confusing obstacles with attributions and excuses. In J. L. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp. 337-350). Morgantown, WV: Fitness Information.

Canadian Fitness and Lifestyle Research Institute. (2002). *2002 Physical Activity Monitor*. Retrieved August, 2004, from http://www.cflri.ca/cflri/pa/surveys/2002survey/2002survey.html

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 155-159.

Duncan, M., & Mummery, W. K. (2005). Psychosocial and environmental factors associated with physical activity among city dwellers in regional Queensland. *Preventive Medicine, 40*, 363-372.

Edwards, P., Roberts, I., Clarke, M., DiGuiseppi, C., Pratap, S., Wentz, R., et al. (2006). *Methods to increase response rates to postal questionnaires (Review)*. The Cochrane Library: John Wiley and Sons.

Eves, F., Hoppe, R., & McLauren, U. (2003). Prediction of specific types of physical activity using the theory of planned behavior. *Journal of Applied Biobehavioral Research, 8*, 77-95.

Fishbein, M., Von Haeften, I., & Appleyard, J. (2001). The role of theory in developing effective interventions: Implications from Project Safer. *Psychology, Health and Medicine, 6*, 223-238.

Gagne, C., & Godin, G. (2000). The theory of planned behavior: Some measurement issues concerning belief-based variables. *Journal of Applied Social Psychology, 30*, 2173-2193.

Godin, G., Jobin, J., & Bouillon, J. (1986). Assessment of leisure time exercise behavior by self-report: A concurrent validity study. *Canadian Journal of Public Health, 77*, 359-361.

Hardeman, W., Johnston, M., Johnston, D. W., Bonnet, D., Wareham, N. J., & Kinmonth, A. L. (2002). Application of the theory of planned behaviour change interventions: A systematic review. *Psychology and Health, 17*, 123-158.

Health Canada. (2002). *Health Canada's Physical Activity Guide*. Retrieved August, 2004, from http://www.hc-sc.gc.ca/english/lifestyles/physical_activity.html

Health-Canada. (2002). *Health Canada's Physical Activity Guide*. Retrieved August, 2004, from http://www.hc-sc.gc.ca/english/lifestyles/physical_activity.html

Manson, J. E., Greenland, P., LaCroix, A. Z., Stefanick, M. L., Mouton, C. P., Oberman, A., et al. (2002). Walking compared with vigorous exercise for the prevention of cardiovascular events in women. *The New England Journal of Medicine, 347*, 716-724.

Reger, B., Cooper, L., Booth-Butterfield, S., Smith, H., & Bauman, A. (2002). Wheeling walks: a community campaign using paid media to encourage walking among sedentary older adults. *Preventive Medicine, 35*, 285-292.

Rhodes, R. E., Blanchard, C. M., & Matheson, D. H. (2006). A multi-component model of the theory of planned behavior. *British Journal of Health Psychology, 11*, 119-137.

Rhodes, R. E., Blanchard, C. M., Matheson, D. H., & Coble, J. (2006). Disentangling motivation, intention, and planning in the physical activity domain. *Psychology of Sport and Exercise, 7*, 15-27.

Rhodes, R. E., Brown, S. G., & McIntyre, C. A. (2006). Integrating the perceived neighbourhood environment and the theory of planned behaviour when predicting walking in Canadian adult sample. *American Journal of Health Promotion, 21*, 110-118.

Rhodes, R. E., & Courneya, K. S. (2003). Investigating multiple components of attitude, subjective norm, and perceived behavioral control: An examination of the theory of planned behavior in the exercise domain. *British Journal of Social Psychology, 42*, 129-146.

Rhodes, R. E., & Courneya, K. S. (2004). Differentiating motivation and control in the theory of planned behavior. *Psychology, Health and Medicine, 9*, 205-215.

Rhodes, R. E., & Courneya, K. S. (2005). Threshold assessment of attitude, subjective norm, and perceived behavioral control for predicting exercise intention and behavior. *Psychology of Sport and Exercise, 6*, 349-361.

Rhodes, R. E., Plotnikoff, R. C., & Spence, J. C. (2004). Creating parsimony at the expense of precision? Conceptual and applied issues of aggregating belief-based constructs in physical activity research. *Health Education Research, 19*, 392-405.

Statistics Canada. (2002). *2002 Census*. Retrieved November 7, 2006, from http://ww2.statcan.ca/english/profil/

Sutton, S. (2002). Using social cognition models to develop health behaviour interventions: Problems and assumptions. In D. Rutter & L. Quine (Eds.), *Intervention research with social cognition models* (pp. 193-208). Buckingham, England: Open University Press.

Symons Downs, D., & Hausenblas, H. A. (2005). Exercise behavior and the theories of reasoned action and planned behavior: A meta-analytic update. *Journal of Physical Activity and Health, 2*, 76-97.

U.S. Department of Health and Human Services. (2003). Prevalence of physical activity, including lifestyle activities among adults - United States, 2000-2001. *Morbidity & Mortality Weekly Report, 15*, 764-769.

Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the evidence. *Canadian Medical Association Journal, 174*, 801-809.

Weinstein, N. D. (in press). Misleading tests of health behavior theories. *Annals of Behavioral Medicine*.

Table 1
Demographic, Health, and Physical Activity Profile

Characteristic	Study 1 (N = 55)	Study 2 (N = 358)
Demographic Profile		
Age Mean (SD)	50.6 (14.14)	53.9 (16.03)
% Female	56.4	49.0
% Caucasian	92.7	80.9
% Married/Common-Law	65.4	65.3
% Completed University	40.0	49.2
% > $40,000	51.0	60.7
% Currently Employed	58.2	54.3
Health Profile		
% Smokers	NA	10.0
% High Blood Cholesterol	NA	23.0
% High Blood Pressure	NA	24.5
% Past Heart Attack	NA	5.1
% Stroke	NA	2.9
% Cancer Survivors	NA	8.6
% Diabetes	NA	9.4 (64.5% Type 2)
BMI Mean (SD)	25.86 (4.53)	25.71 (4.59)
Past Physical Activity		
% Meeting Health Canada's Guidelines	54.7	48.8
% Aware of these Guidelines	NA	17.0

NA = Not available from the data-set.

Table 2.
Belief elicitation of regular walking (N = 55).

	% Listed
Behavioural Beliefs	
Feel good	49%
Takes too much time	47%
Improve fitness	80%
Physical appearance	44%
Reduce chances of disease	13%
Stress relief	40%
Normative Beliefs	
Family	47%
Friends	25%
Physician	31%
Partner/spouse	20%
Control Beliefs	
Lack of time	67%
Cost	13%
Injury	18%
Recreation access	22%
Social support	16%
Bad weather	27%
Poor health	20%

Table 3.
Hierarchical R^2 Evaluation of Expectancy, Value, and their Interaction when predicting Walking Intention and Behaviour.

	Intention		Behaviour[1]		Behaviour[2]	
Step	1	2	1	2	1	2
Belief	E & V	E X V	E & V	E X V	E & V	E X V
Behavioural Beliefs						
1. Feel good	.23*	.00	.03*	.00	.05*	.00
2. Increase fitness	.18*	.01	.03*	.01	.04*	.01
3. Appearance	.12*	.01	.05*	.00	.06*	.01
4. Reduce disease	.14*	.00	.02	.00	.02	.01
5. Stress relief	.20*	.00	.06*	.00	.06*	.00
6. Take too much time	.25*	.01	.09*	.01	.10*	.00
Normative Beliefs						
1. Friends	.11*	.00	.01	.01	.01	.00
2. Family	.15*	.00	.02	.01	.01	.01
3. Physician	.15*	.00	.03*	.01	.04*	.01
4. Partner/spouse	.16*	.00	.02	.01	.02	.00
5. Friends (DN)	.08*	.01	.06*	.00	.05*	.00
6. Family (DN)	.07*	.00	.03*	.00	.02	.00
7. Physician (DN)	.08*	.01	.05*	.01	.04*	.01
8. Partner/spouse (DN)	.12*	.01	.04*	.00	.03	.00
Perceived Control						
1. Time	.09*	.00	.04*	.01	.03*	.00
2. Financial cost	.01	.00	.00	.01	.00	.01
3. Injury	.01	.01	.00	.04*	.01	.03*
4. Recreation access	.03*	.00	.00	.00	.01	.00

5. Social support	.03*	.00	.00	.00	.00	.00
6. Bad weather	.03*	.01	.00	.00	.00	.00
7. Health	.02	.01	.01	.01	.00	.01

Note: Results include age and education as covariates of intention, and income as a covariate of behaviour. * = $\underline{p} < .01$. E = expectancy, V = Value. DN = descriptive norm. Behaviour[1] = walking with imputed missing values, Behaviour[2] = walking with listwise deletion of missing values.

Table 4.
Number and percentage meeting Health Canada physical activity criteria by scale response category for regular walking.

	Frequency (%)					χ^2	% Target
Belief	1-3	4	5	6	7		
Feel good	5 (38%)	1 (20%)	19 (49%)	100 (67%)	97 (70%).	14.34*	9%
Increase fitness	6 (50%)	10 (48%)	23 (55%)	83 (65%)	100 (69%)	6.91	
Appearance/ weight control	16 (46%)	28 (51%)	58 (65%)	74 (76%)	45 (66%)	15.00*	22%
Stress relief	8 (33%)	15 (47%)	27 (55%)	93 (72%)	79 (71%)	21.34*	16%
Too much time (reverse scored)	40 (46%)	26 (57%)	25 (74%)	75 (74%)	54 (73%)	21.36*	20%
Friends descriptive norm	32 (52%)	46 (64%)	65 (66%)	57 (72%)	22 (61%)	6.67	
Family descriptive norm	33 (60%)	31 (55%)	47 (57%)	74 (75%)	36 (70%)	9.11	
Physician norm value	18 (53%)	28 (58%)	54 (64%)	76 (66%)	46 (71%)	3.99	
Spouse/partner norm	5 (71%)	17 (50%)	8 (42%)	35 (65%)	136 (71%)	11.13	
Spouse/partner descriptive norm	31 (54%)	28 (57%)	33 (69%)	33 (65%)	72 (76%)	9.34	
Time	33 (44%)	8 (73%)	40 (57%)	99 (73%)	42 (71%)	21.05*	21%

Note: * = P<.01. % target = % of sample below the highest threshold of 10% difference not meeting Health Canada recommendations.