ABSTRACT

In this article, the effects of physically active leisure on the relationships between stress and health are examined using structural equation modeling (SEM). The analyses are based on data from Canada's 1994 National Population Health Survey ($n = 17,626$). Overall, physically active leisure was found to directly contribute to higher levels of physical health and wellbeing, and lower levels of mental ill-health among Canadians. When the respondents experienced higher levels of chronic stress, life event stress, and/or work stress, involvement in physically active leisure appeared to help them maintain good health and wellbeing. Also, higher levels of participation in physically active leisure helped paid workers suppress levels of work stress. Agencies involved in health promotion and lifestyle intervention should give greater consideration to physically active leisure. As a significant component of an active lifestyle, physically active leisure can contribute to better health, and provide a valuable resource for coping with stress.

ABRÉGÉ

Nous avons analysé les effets de l'activité physique sur la relation entre le stress et la santé en nous servant d'un modèle d'équations structurelles. L'analyse repose sur des données recueillies dans le cadre de l'Enquête nationale sur la santé de la population de 1994 ($n = 17\ 626$). Sommairement, nous avons constaté que, chez les Canadiens, les loisirs actifs avaient une influence positive sur le bien-être et la santé physique et favorisaient une meilleure santé mentale. L'activité physique contribuait à maintenir la santé et le bien-être des répondants en période de hauts niveaux de stress chronique, de stress lié aux événements traumatisants de la vie, et/ou de stress professionnel. De plus, un niveau élevé d'activité physique aidait les hommes et femmes actifs à réduire les effets du stress professionnel. Les organismes de promotion de la santé et de modification des habitudes de vie devraient se pencher sur les bienfaits des loisirs actifs qui, s'ils font partie intégrante d'une vie active, peuvent améliorer la santé et deviennent un outil précieux pour combattre le stress.

The Effects of Physically Active Leisure on Stress-Health Relationships

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The rise in stress levels experienced by people today is a significant social problem.^{1,2} According to a recently released study by the Conference Board of Canada, stress levels among Canadians have increased dramatically over the last ten years. Specifically, the Board reported that the percentage of Canadians surveyed who experience a moderate to high level of stress has increased from only 27% in 1988 to almost half of the respondents in 1999.³ Also, the detrimental effects of stress on population health have been widely documented.⁴⁻⁷ However, research has shown that some types of coping strategies may be effective in dealing with stressful encounters and maintaining good health.⁸⁻¹¹

Recently, researchers have proposed and some evidence has been found that leisure can be an important means of helping people cope with stress and maintaining good health.¹²⁻²³ As one form of leisure, physically active leisure may have the potential to provide stress-coping and health benefits.²⁴ The health benefits of physical activity have been studied extensively. A major synthesis of the research reported in 1999 by the Federal, Provincial and Territorial Advisory Committee on Population Health in Canada led to the conclusion

that "Lack of physical activity is recognized as a significant risk factor for coronary heart disease and other serious health problems. Conversely, active living provides many health benefits including a reduced risk of cancer, diabetes, heart disease and osteoporosis, and an enhanced feeling of well-being" (p. 115).²⁵ The report identified that personal health practices (e.g., physical activity) are one of the key determinants of health, along with genetics, gender, age, income, environment, and health services.²⁵ However, there has been little empirical evidence presented to help explain the mechanisms by which physically active leisure contributes to stress-coping and/or good health, particularly mental health.²⁶

The purpose of the analyses reported here was to examine the role of physically active leisure in: a) directly promoting health, b) maintaining good health for highly stressed individuals, c) reducing stress levels, and d) mediating the effects of stress on the health of Canadians. Also, mental as well as physical health was examined.

Conceptual models that we tested include: the direct effect model (Figure 1A) and the indirect and mediating model (Figure 1B). The direct effect model assumes that involvements in physically active leisure directly and positively impact health indicators regardless of stress levels. The inclusion of stress into the direct effect model led to the construction of the indirect and mediating model. Physically active leisure may indirectly influence health through its effects on stress. Alternatively, physically active leisure may mediate the effect of stress on health. These hypothesized relationships are consistent with a variety of models of life stress and coping processes that have been proposed by Ensel and Lin and others.²⁷⁻³⁰

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METHODS

We analyzed data from the 1994 National Population Health Survey (NPHS; $n = 17,626$) conducted by Statistics Canada. The target population of the NPHS included household residents aged 12 years and over in all provinces in Canada, with the exclusion of populations on Indian Reserves, Canadian Forces Bases and some remote areas in Quebec and Ontario. To correct for possible sampling deficiencies, weight factors were assigned to each case.³¹ The measures used for our analyses are summarized below (see Table I for the descriptive statistics of the variables examined):

1) **Health** was comprised of three constructs: physical health, mental ill-health, and wellbeing. Physical health consisted of the subjective assessment of physical health ("How would you describe your health?," ranging from 1 = poor to 5 = excellent), and overall functional health (the Health Utility Index) based on eight attributes such as vision, hearing, mobility, and dexterity.³¹ Mental ill-health was measured by the Mental Distress Scale and Depression Scale.³² Wellbeing was assessed as feelings of happiness using a 5-point Likert-type scale (1 = "so unhappy that life is not worthwhile" to 5 = "very happy and interested in life") and as cognitive ability using the derived cognition variable (1 = "very forgetful" to 5 = "no cognitive problems").

2) **Stress** was measured with three indicators: chronic stress, life events stress, and work stress. Chronic stress was assessed by the Adjusted Specific Chronic Stress Index which took into consideration the respondents' life circumstances.³¹ Chronic stressors consisted of personal problems, relationship problems, financial problems, environmental problems, etc. The Adjusted Recent Life Event Index was used to measure recent negative life events relevant to the respondents' personal situations.³¹ Work stress was measured by the Work Stress Index representing various dimensions such as limited skill requirements, job insecurity, and psychological demands.³¹

Figure 1. Conceptual models of physically active leisure, stress, and health

Figure 2. Effects of physically active leisure on health and wellbeing
Note: Regular numbers represent beta coefficients or factor loadings, whereas italicized numbers indicate squared multiple correlations. All values are statistically significant at the 0.05 level unless marked with n.s.

3) The level of *physically active leisure* was measured with three indicators: a) the physically active leisure index, b) frequency of overall physical activity (the participants' overall assessment of the level of frequency in carrying out physical activities; 1 = "infrequent," 2 = "occasional," 3 = "regular"), and c) daily participation in physical activity (the extent to which the participants felt that they were physically active in their daily lives; 1 = "inactive," 2 = "moderate," 3 = "active").³¹ The physically active leisure index was computed on the basis of the frequency of participation in 20 activities such as walking, running, gardening, and swimming dur-

ing the past three months. Frequency scores were weighted based on the frequency distribution of each activity to adjust these scores to a 5-point Likert-type scale (1 = "very infrequent" to 5 = "very frequent"). Then, the sum of these weighted frequency scores were converted to overall index scores (range = 0 to 100).

RESULTS

We performed structural equation modeling (SEM) using AMOS 4.0.^{33,34} Our analysis of the direct effect model for the total sample (Figure 2) suggested that higher levels of participation in physically active leisure directly enhanced physical

TABLE I
Description of Variables

Measures	Description	Range	M	SD
Subjective Assessment of Physical Health	1 item	1-5	3.69	1.02
Overall Functional Health (Health Utility Index)	Based on 8 attributes	0-1	0.89	0.14
Mental Distress Scale	6 items	0-24	3.43	3.49
Depression Scale	27 items	0-8	0.48	1.59
Emotional Wellbeing	1 item	1-5	4.68	0.59
Cognitive Wellbeing	2 items	1-5	4.28	1.13
Adjusted Chronic Stress Index	17 items	0-16	3.00	2.69
Adjusted Recent Life Event Index	10 items	0-8	0.62	1.03
Work Stress Index	11 items	0-45	19.82	5.22
Leisure Index	Based on 20 activities	0-100	16.08	13.23
Frequency of Overall Physical Activity	1 item	1-3	2.31	0.84
Daily Participation in Physical Activity	Derived summary index	1-3	1.60	0.79

health (beta = 0.36; $p < 0.05$) and well-being (beta = 0.18; $p < 0.05$), and directly reduced mental ill-health (beta = -0.06; $p < 0.05$).

Also, we tested the direct effect model separately for men and women and for different age groups and the results are summarized in Figure 2. We found that: a) the relationship between physically active leisure and the health indicators is stronger for women than for men, and b) the same relationship is stronger for older age groups than for younger age groups.

Then, the same direct effect model depicted in Figure 2 was tested only for those respondents who reported higher stress levels (i.e., stress scores of higher than one standard deviation above the means). For respondents whose chronic and/or life event stress scores were higher

than one standard deviation above the means (i.e., high chronic stress group, $n = 2,626$; and high life event stress group, $n = 2,205$), participation in physically active leisure was associated with greater physical health (betas = 0.35 & 0.31, respectively; $p < 0.05$) and wellbeing (betas = 0.19 & 0.14, respectively; $p < 0.05$) and reduced mental ill-health (betas = -0.12 & -0.07, respectively; $p < 0.05$). Similarly, for respondents whose work stress scores were higher than one standard deviation above the mean (i.e., high work stress group, $n = 1,171$), the higher the level of participation in physically active leisure, the better their physical health and wellbeing (betas = 0.27 & 0.06, respectively; $p < 0.05$).

Next, the mediating role of physically active leisure in the stress-health relationship was examined. We found that higher

levels of chronic stress and life event stress appeared to “trigger” greater participation in physically active leisure (betas = 0.04 & 0.08, respectively; $p < 0.05$) and, consequently, higher levels of participation were positively associated with better health and wellbeing (Figures 3 & 4). For paid workers (Figure 5; $n = 9,465$), physically active leisure appeared to suppress levels of work stress (beta = -0.06; $p < 0.05$), and had a positive impact on physical health and wellbeing (betas = 0.23 & 0.08, respectively; $p < 0.05$).

Table II summarizes the overall fit indices estimated for the models tested using SEM. Overall, NFI, IFI, and CFI suggested a good fit of the models to the data, and RFI and TLI showed a moderate fit of the models to the data. However, chi-square and RMSEA indicated that the models could be improved. Chi-square is not a useful fit measure with large sample sizes.

DISCUSSION

The present analyses provide evidence for the physical and mental health benefits of physically active leisure among Canadians. Specifically, evidence was found for: 1) the direct effects of physically active leisure on health for the total surveyed population; 2) the positive effects of physically active leisure on health for the respondents who experienced higher levels of stress; 3) the mediating role of physically active leisure in the relationships between chronic stress or life event stress and health; and 4) the indirect effects of physically active leisure on work stress-health relationships.

The findings have several important implications. First, regardless of whether

health is conceptualized in a positive or negative way, physically active leisure directly contributed to better health. Specifically, the higher the level of participation in physically active leisure, the better one's overall functional health and subjective assessment of physical health. Also, better emotional and cognitive wellbeing is associated with greater involvement in physically active leisure. Furthermore, people tend to experience lower levels of distress and depression when they are highly involved in physically active leisure.

Second, the health benefits of physically active leisure go beyond its direct effects on health. When the respondents experienced higher levels of chronic stress, life event stress, and/or work stress, the involvement in physically active leisure appeared to help them maintain better health. The findings suggest that physically active leisure has the potential to serve as an important means of coping with stress. One should, however, acknowledge that, *on balance*, the negative effects of stress cannot be fully compensated for by physically active leisure alone.

These findings are consistent with the results from recent small-scale studies on leisure-stress-health relationships. It has been suggested also that certain characteristics of leisure, over and above its physically active nature, may serve to facilitate coping. For example, Coleman found that the belief that leisure behaviour is freely chosen and under personal control acted as a buffer against stress in maintaining good health.¹³ Iso-Ahola and Park found that those participants who believed that they had developed friendships and social support through leisure pursuits seemed to be less susceptible to physical illness due to stress.¹⁷ More recently, Iwasaki and Mannell found evidence that the choices people make for the use of their leisure may help them develop feelings of empowerment, contribute to palliative coping and enhance their moods, and that these factors help them cope with stress.¹⁸

Another type of health benefit of physically active leisure is its stress-reducing potential. We found that physically active leisure helped paid workers suppress levels of work stress. However, the strengths of the relationships between stress and physically active leisure are generally small; thus,

Figure 4. Physically active leisure-life event stress-health relationships
Note: Regular numbers represent beta coefficients or factor loadings, whereas italicized numbers indicate squared multiple correlations. All values are statistically significant at the 0.05 level.

Figure 5. Physically active leisure-work stress-health relationships
Note: Regular numbers represent beta coefficients or factor loadings, whereas italicized numbers indicate squared multiple correlations. All values are statistically significant at the 0.05 level.

support for mediating and stress-reducing mechanisms is "tentative" at this time and deserves more research attention in the future. On the other hand, it could be argued that stress-leisure links might be made stronger if planners found ways to facilitate and support people's involvement in meaningful leisure pursuits. Those involved in formulating public health policy and practice need to pay more attention

to the role of physically active leisure in promoting positive health, reducing negative health, and coping with stress.

Other findings relevant to program and policy planning concern sex and age differences. Specifically, we found that: a) the positive impact of physically active leisure on health and wellbeing is stronger for women than for men, and b) generally older age groups tend to gain greater health

TABLE II
Summary of Overall Fit Indices

Models	NFI	RFI	IFI	TLI	CFI	χ^2 (df)	RMSEA
Effects of physically active leisure on health and wellbeing (Fig. 2)	0.96	0.93	0.96	0.93	0.96	13,254.12 (24)	0.18
Physically active leisure-chronic stress-health relationships (Fig. 3)	0.97	0.95	0.97	0.95	0.97	10,442.55 (29)	0.14
Physically active leisure-life event stress-health relationships (Fig. 4)	0.97	0.94	0.97	0.94	0.97	12,321.46 (29)	0.15
Physically active leisure-work stress-health relationships (Fig. 5)	0.97	0.95	0.97	0.95	0.97	6,551.85 (29)	0.15

Note: NFI = Normed Fit Index, RFI = Relative Fit Index, IFI = Increment Fit Index, TLI = Tucker-Lewis Index, CFI = Comparative Fit Index, χ^2 = Chi-square, df = degrees of freedom, RMSEA = Root Mean Square of Approximation.

benefits from physically active leisure than younger age groups. These findings seem to provide some important directions for program and policy planners. Women and older people appear to be important target groups for program and policy development to educate people about and promote the importance of physically active leisure to enhance good health in their lives.

In interpreting the findings, certain limitations of our analyses should be kept in mind. Although the data used in the analyses are part of a longitudinal panel study, the stress measures are not available in each wave of the NPHS. Thus, we could not perform longitudinal analyses to examine the research questions. With the use of the cross-sectional data, we cannot provide definitive support for the existence of the causal links suggested by the models even if the patterns of relationships among the variables in the models are consistent with the hypotheses. However, the *a priori* specification of the models based on a sound theoretical rationale plus the use of SEM that allows a statistical test of the fit of the models to the data, provide more clues about causal relationships than more exploratory approaches.³⁴ Finally, because measures for assessing non-physical types of leisure (e.g., social leisure, relaxing leisure, and cultural leisure) are not included in the NPHS, we were not able to examine the impact of different types of leisure.

The issue of how much activity to recommend is important but difficult to assess on the basis of the measures of participation we had available. We suspect that the formula of "the more active people are, the healthier they are" may hold for everyone. People may differ in what is an optimal activity level for them. These optimal activity levels may change over time for a given individual due to aging and

other changes in her/his life circumstances. This assumption could not be directly tested in our analyses, although the sex and age differences found may provide some "support" for the assumption.

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