Factors Influencing Physical Activity Levels Among Canadian Youth

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ABSTRACT

Objectives: To describe the predisposing, enabling and reinforcing factors influencing the levels of physical activity among Canadian youth (ages 12-24).

Methods: Analyses of the 1996-97 National Population Health Survey (NPHS) were conducted using data collected from female (n=6195) and male (n=5925) Canadians aged 12-24 years. The data were analyzed using correlational, ANOVA and regression procedures with post hoc analyses (Bonferroni) employed where applicable.

Results: Compared to males, Canadian female youth were found to be less physically active, more concerned about being overweight, more depressed, and to consult mental health professionals more frequently. On the other hand, females were more likely to report greater social support than males and to be more socially involved. Those adolescents who smoke tend to be less physically active and, along with those who consume alcohol, have poorer health.

Discussion: The significant predisposing, enabling and reinforcing factors influencing youths' physical activity levels more profoundly affect females. The results are discussed in terms of strategies for enabling physical activity available in the literature. In addition to individual determinants influencing physical activity, a move toward understanding policy and environmental factors is recommended for further research.

La traduction du résumé se trouve à la fin de l'article.

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Physical inactivity has been identified as a health care burden.¹ It is a primary risk factor for psychological and physical ill health, including many disease states that often originate during pediatric years yet only manifest during adulthood.² Therefore, an understanding of patterns and predictors of physical activity behaviours for Canadian youth is needed.³ It has been estimated that three out of five Canadian youth are not active enough for optimal health benefits, and that males are more active than females at all ages.⁴ Gender differences in levels of physical activity have been reported, yet the contributing role of factors related to gender and age differences remains to be adequately addressed.^{5,6} The PRECEDE/PROCEED model⁷ provides a heuristic framework for understanding the nature of contributing factors. The first part of the model (PRE) refers to identifying predisposing, reinforcing and enabling influences on physical activity. Green and Kreuter⁷ suggest that any behaviour can be explained as a function of the aggregated influence of these three types of factors, thus any program or policy for promoting healthy living must consider all factors. Welk⁸ proposes that differences in activity levels between males and females may derive from the major differences among these factors.

Table 1 defines, and provides examples of, predisposing, enabling and reinforcing factors. Figure 1 depicts those factors from the NPHS 1996-97 survey selected by the authors for this investigation. This study was limited to investigating the variables included in the 1996-97 NPHS data set and therefore limits generalizability of the results. Other variables that have previously been shown to predict physical activity include predisposing factors of self-efficacy, attitudes, perceived behavioural control, subjective norm and intentions toward physical activity;^{6,9} enabling factors of the relative cost-benefit ratio of physical activity,¹⁰ physical skills and fitness,⁸ and environmental attributes, facilities and opportunities for physical activity;^{11,12} and, reinforcing influences of parental beliefs and encouragement of activity level.^{13,14}

The purpose of this article is to report on a research study that hypothesized:

1. Physical activity and health status will decline with age.
2. Increased physical activity levels will be associated with an enhanced gener-

TABLE I**Predisposing, Enabling and Reinforcing Factors – Definitions,⁷ Examples⁷ and NPHS Variables**

Factor	Definition	Example	NPHS Variables
Predisposing	Attributes that facilitate or hinder motivation for change	Knowledge, attitudes, income, gender, race	<p><u>Age</u>: Age was collapsed into 2-year group cohorts beginning at age 12 until 24</p> <p><u>Derived total household income</u>: Respondents were asked to estimate income from all sources, before taxes and deductions, in 1 of 12 categories, from no income to \$80,000 or more</p> <p><u>Currently attending school</u>: A dichotomous variable indicating whether respondents were currently attending a school, college or university</p> <p><u>Opinion of own weight</u>: A single 3-point item asking respondents to consider themselves as overweight (1), underweight (2) or just about right (3).</p> <p><u>Derived depression scale</u>: Nine questions on mental health that involve thoughts and feelings (e.g., hopelessness, sadness, restlessness).</p> <p><u>Consulted with health professional about mental health</u>: A dichotomous variable indicating whether respondent has seen/talked to a health professional about mental health in the last 12 months.</p>
Enabling	Personal skills, abilities, resources or barriers that facilitate or hinder behavioural and/or environmental changes	Availability of personal and community resources, skills, abilities (e.g., health behaviours such as substance use).	<p><u>Derived type of smoker</u>: Daily smoker, occasional smoker (former daily smoker), always an occasional smoker, former daily smoker, former occasional smoker, never smoked.</p> <p><u>Frequency of drinking</u>: A single, 8-point item asking respondents to indicate how often they consumed alcoholic beverages during the past 12 months, from every day to less than once a month or not applicable.</p>
Reinforcing	Feedback, support/rewards that encourage or discourage continuation of the behaviour	Attitudes, behaviour of peers, parents, social support	<p><u>Derived social support index</u>: the sum of 4 yes-or-no questions measuring perceived social support (whether respondents had someone to confide in, count on, give them advice and make them feel loved).</p> <p><u>Social involvement</u>: A dichotomous variable assessing if respondents were members of voluntary organizations or associations such as school groups or community centres.</p>

al health status for both females and males at all ages.

3. Males will have higher levels of physical activity than females at all ages.
4. Physical activity levels will be inversely related to smoking and alcohol consumption.
5. Females will exhibit greater social support than males, and this difference will increase with age.
6. Increased social support will enhance physical activity levels.

METHODS

Analyses of the 1996-97 National Population Health Survey (NPHS) were conducted using data collected from female (n=6195) and male (n=5925) Canadians aged 12-24 years. This sample represents 5.1 million Canadians. The data consisted of cross-sectional information regarding socio-demographic data, health determinants, health status, and health behaviours including those related to physical activity. A full description of NPHS survey design and other methodological issues is described elsewhere.¹⁵ The main dependent variables were physical activity and general health with predisposing,

TABLE II**Standardized Effects of Gender, the Linear and Quadratic Effects of Age, and Their Interactions**

	Gender	Age (Lin)	Age (Quad)	Gender by Age (Lin)	Gender by Age (Quad)
Physical Activity	0.165*	-0.178*	-0.002	-0.083*	-0.038
Predisposing Factors					
Household income	0.025	-0.166*	-0.045*	0.038*	0.015
Attending school	-0.037*	-0.548*	-0.053*	-0.018	0.019
Opinion of weight	-0.194*	0.078*	0.053*	0.001	0.058*
Consulted professional	-0.066*	0.041*	-0.036*	-0.034*	0.029
Depression	-0.098*	-0.057*	-0.056*	0.002	0.041*
Enabling Factors					
Smoking	0.011	0.226*	-0.131*	0.068*	0.022
Alcohol	0.108*	0.519*	-0.163*	0.121*	0.015
Reinforcing Factors					
Social support	-0.094*	-0.006	-0.028*	-0.015	-0.001
Social involvement	-0.035*	-0.227*	0.105*	-0.020	0.001
Health Status	0.118*	0.025	0.052*	-0.040	-0.045*

* Denotes significance

enabling, and reinforcing factors of physical activity as independent variables (See Figure 1).

The data were analyzed using correlational, ANOVA and regression procedures with post hoc analyses (Bonferroni) employed where applicable. Gender by age (G x A) analyses of physical activity were conducted, followed by an examination of age and gender differences in predisposing, enabling, and reinforcing factors. Subsequently, multiple regression analyses relating physical activity to gender, age,

predisposing, enabling, and reinforcing factors were completed. All data analyses were performed using estimation procedures for complex survey designs. These procedures used NPHS population weights, stratification, and clustering information in order to produce accurate point and variance estimates. Formal procedures for evaluating mediational/ reciprocal models (such as Figure 1) were not used, as programs for structural equation modeling (e.g., LISREL) do not accommodate complex survey designs. However, the media-

* Physical Activity Index: A measure of energy expenditure values based on caloric output, categorized as active, moderately active or inactive.

† Derived Health Description Index: A single 5-point item asking respondents to describe their health from excellent (1) to poor (5).

Figure 1. Predisposing, Reinforcing and Enabling Factors from the NPHS 1996-97 Survey
 The proposed relationships for the three sets of factors influencing physical activity as proposed by Green and Kreuter.⁷ Solid lines imply primary effects. Dashed lines imply secondary effects. Numerals indicate order in which actions or influences usually occur.

tional influence of predisposing, enabling, and reinforcing factors on the effects gender and age have on physical activity are supported to the extent that those factors substantially reduce the influence of gender and age.¹⁶ Similar analyses of general health status were also conducted. In all analyses, the linear and quadratic effects of age (and their interaction with gender) were estimated. Significance was set at $p < 0.05$.

RESULTS

Figure 2 illustrates the relationship between gender, age, and physical activity. The standardized ANOVA effects of gender, the linear and quadratic effects of age, and their interactions appear in Table II. Only linear and quadratic effects are reported, as no other trend components were significant. Compared to males, females were less phys-

ically active, more concerned about being overweight, more depressed, and more likely to consult mental health professionals. On the other hand, females were more likely to report greater social support than males and to be more socially involved, although the potential reinforcing effects of social involvement decreased with age for both genders.

The results in Table III, column 1 indicate that, along with the gender and age effects discussed previously, physical activity increases with household income, school attendance, and social involvement, and decreases with concern about weight and with increased smoking. The second column contains the standardized partial effects of all variables resulting from regressing physical activity on all variables simultaneously and indicates that gender and age effects, although diminished, remained significant. Males were more

physically active than females, physical activity decreased with age, and the gender difference was still greatest from ages 12 through 20. The relationships between physical activity and the enabling and reinforcing factors were also maintained, although the unique contribution of alcohol consumption frequency became positively related to physical activity. In contrast, the relationship between physical activity and the predisposing factors of household income, school attendance and concern with weight, all of which had significant zero-order relationships, became non-significant when other variables were controlled.

Columns 3 and 4 of Table III provides the zero-order and partial effects, relating to gender, age, and the predisposing, enabling, and reinforcing factors to general health. Figure 3 depicts the relationship of general health status to gender and age.

Although there were significant gender and age (quadratic) main effects, the most compelling result is the G x A (quadratic) interaction. While there were no gender differences in general health status at age 12 ($p=0.9144$), female health status was significantly poorer than that of males from ages 13 through 20. This is due to a decline in female general health from 12 through 16 years followed by an increasing trend thereafter. Males show a stable health profile throughout this same age range.

Of the remaining predisposing factors, income, opinion of weight, depression, and consulting a mental health professional all had significant zero-order effects on general health status. Smoking, physical activity, social support and social involvement were all significantly related to general health status.

When general health status was regressed simultaneously on all variables (see Table III, column 4), the unique effects of the predisposing, enabling, and reinforcing factors essentially replicated the zero-order effects (column 3). When these factors and physical activity were combined in a single simultaneous regression, a different picture of gender and age effects emerged. In particular, although the gender effect remained significant, the partial coefficient is substantially (40%) smaller than the zero-order coefficient. This pattern of results, where an independent variable and mediators are related to each other and separately to a dependent variable, but in combination the mediators remain related to the dependent variable while the effect of the independent variable is substantially reduced, suggests a partial mediating effect.¹⁶ In this case, predisposing, enabling, and reinforcing factors, and physical activity might be viewed as partial mediators of the relationship between gender and general health status.

DISCUSSION

Figure 1 is a heuristic tool for thinking about patterns and predictors of physical activity, but in its entirety does not represent a testable model from a statistical perspective. Unlike previous investigations which have used the model to theoretically guide the research design and analysis,^{17,18} this study used the model solely in a post hoc analysis on the NPHS data set.

Figure 2. Gender and Age Effects on Physical Activity

TABLE III

Combined and Unique Effects of Gender, Age, Predisposing Factors, Enabling Factors, and Reinforcing Factors on Physical Activity and Health Status†

	Physical Activity		Health Status	
	Zero-order Effects	Partial Effects	Zero-order Effects	Partial Effects
Predisposing Factors				
Gender	0.165*	0.138*	0.118*	0.073*
Age(lin)	-0.178*	-0.159*	0.025	0.073*
Age(quad)	-0.002	-0.003	0.052*	0.040
Gender x age(lin)	-0.083*	-0.071*	-0.040	-0.027
Gender x age(quad)	-0.038	-0.033	-0.045*	-0.029
Household income	0.086*	0.039	0.084*	0.066*
Attending school	0.101*	-0.005	-0.008	-0.015
Opinion of weight	-0.067*	-0.024	-0.127*	-0.110*
Depression	-0.004	0.021	-0.134*	-0.082*
Consulted professional	-0.004	0.007	0.092*	-0.044*
Enabling Factors				
Smoking	-0.067*	-0.039*	-0.152*	-0.125*
Alcohol	0.007	0.116*	-0.015	-0.002
Reinforcing Factors				
Social support	0.023	0.029	0.036*	0.031
Social involvement	0.109*	0.084*	0.061*	0.038*
Physical activity			0.078*	0.054*
Multiple R		0.287*		0.295*

† Estimates of the linear effects of age and all main effects were obtained without interaction effects and quadratic effects included in the regression model. Refer to Cohen and Cohen⁷² for an explanation of this rationale.

* Denotes significance

An absence of depression was the significant predisposing factor influencing physical activity among females. Physical activity may offer protective, buffering effects on mental health for youth prior to the onset of emotional problems,¹⁹⁻²¹ independent of many other risk factors,²² by raising levels of self-esteem, body image and self-concept. The goal-setting orientation to physical activity can offer a feeling of self-

accomplishment,²³ and together with the development of new physical, social and mental skills, may reduce the sense of loss of control frequently linked to depression.²⁴ Indeed, regular exercise participation has been found to be associated with decreases in state and trait anxiety,^{25,26} depression,²⁷⁻²⁹ and stress.^{30,31} An investigation of what body change strategies predicted positive or negative affect among

Figure 3. Gender by Age Effect on General Health Status

adolescents found that strategies to increase muscle mass (i.e., exercise) produced high levels of positive affect.³² This relationship was less pronounced for strategies to decrease body weight, which may not have included some form of physical activity.

Supporting evidence in the literature, the results from this study suggest that youths' other health behaviours enable a physically active lifestyle.³³⁻³⁵ Cross-sectional data argue that physical activity may offer protective effects for substance abuse among youth.^{36,37} It has been suggested that physical activity relieves the boredom and stress often associated with the uptake of at-risk and unhealthy behaviours.^{38,39} Specifically, physical activity among youth correlates with less cigarette smoking,³⁹⁻⁴² particularly in discouraging the initiation of smoking among female adolescents,⁴² and in deterring smoking among males later in adulthood.⁴³ For some, smoking can attenuate depression²⁸ or stress,⁴⁴ while physically active adolescents may have reduced levels of depression and consequently rely less on substances for this purpose.^{39,45-47} The literature is equivocal about the relationship between physical activity and alcohol consumption, although there is a consistent positive correlation among highly physically active male adolescents.^{39,48,49} This study found

alcohol consumption to be positively related to physical activity among males and females. It may be that a 'subculture' of athletic and sport celebration is tolerated, and tailored alcohol abuse prevention programs for athletes and coaches are required.⁵⁰

Social support is considered the most well-established determinant in the literature reinforcing physical activity,⁵¹ particularly among women.⁵²⁻⁵⁴ Both parents and peers play a pivotal role in supporting youths' physical activity experiences.⁵⁵⁻⁵⁹ Our results indicate that although females experience greater social support and involvement than do males, they are less physically active. Still, females' support systems may afford a promising environment for reinforcing physical activity should we be able to convince friends and family to be advocates of active living. Because involvement in school and community recreation sport and activity programs serves to broaden youths' social networks, and nurture their familiarity to and connection with their community,^{38,60,61} opportunities to participate must be numerous and diverse to accommodate varied interests, skills and abilities for males and females.⁴ In turn, individuals with a sense of belonging, involvement and perceived connection to their community are less likely to make health-compromising

choices, and are more likely to be physically active,^{62,63} than those less well connected.^{64,65}

As called for in the literature,⁸ this study provides insights into some of the predisposing, enabling and reinforcing influences on youths' physical activity behaviours. Our analyses support the premise that encouraging Canadian youth to increase their physical activity cannot be accomplished by simply exhorting or educating them to exercise more.⁶⁵ The established course of action to promote changes in lifestyle, such as physical activity, has been individually focused and behaviourally oriented.⁶⁶ Since such programs are appropriate for, at most, 25% of the population, the notion of lifestyle is more useful once the factors and conditions influencing behaviour are understood.⁶⁷ While this study adds to the growing literature detailing personal, social and psychological determinants of physical activity, evidence also exists that policy and environmental factors influence individuals' efforts to be active.^{68,69} The importance of intersectoral and environmental and policy approaches to promoting physical activity has been recently acknowledged,^{70,71} and will be an important focus of future research which will broaden our understanding of what motivates, enables and reinforces physical activity.

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RÉSUMÉ

Objectifs : Décrire les facteurs de prédisposition, d'incitation et de renforcement qui influencent les niveaux d'activité physique des jeunes Canadiens (12 à 24 ans).

Méthode : Par corrélation, analyse de la variance et régression, on a analysé les données sur les filles (n=6 195) et les garçons (n=5 925) canadiens de 12 à 24 ans publiées dans l'Enquête nationale sur la santé de la population (1996-1997), en effectuant des analyses ultérieures (Bonferroni) le cas échéant.

Résultats : Par rapport aux garçons, les filles canadiennes font moins d'activité physique, sont plus préoccupées par l'embonpoint et plus déprimées, et consultent plus souvent des professionnels de la santé mentale. Par contre, elles sont plus susceptibles que les garçons d'avoir un bon réseau de soutien social et une vie sociale remplie. Les fumeurs adolescents font proportionnellement moins d'activité physique et, comme ceux qui consomment de l'alcool, ont tendance à être en moins bonne santé.

Débat : Les importants facteurs de prédisposition, d'incitation et de renforcement qui influencent les niveaux d'activité physique des jeunes touchent plus particulièrement les filles. Ces résultats sont expliqués à la lumière des stratégies d'encouragement de l'activité physique décrites dans la documentation disponible. En plus de s'attacher aux différents déterminants de l'activité physique, on recommande de pousser la recherche sur les facteurs politiques et environnementaux qui pourraient être en cause.

Coming Events / Activités à venir

To be assured of publication in the next issue, announcements should be received by **December 1, 2002** and valid as of **February 28, 2003**. Announcements received after **December 1, 2002** will be inserted as time and space permit.

Pour être publiés dans le prochain numéro, les avis doivent parvenir à la rédaction avant le 1^{er} décembre 2002 et être valables à compter du 28 février 2003. Les avis reçus après le 1^{er} décembre 2002 seront insérés si le temps et l'espace le permettent.

Nursing Leadership: Building the Future

2003 Nursing Leadership Conference

Canadian Nurses Association in partnership with Academy of

Canadian Executive Nurses, Canadian Association of University Schools

of Nursing, Canadian College of Health Service Executives, Canadian Healthcare Association, and CPHA

10-11 February 2003

Ottawa, ON

Contact:

Canadian Nurses Association Secretariat

Tel: 613-237-2133 (x219)

Toll-free: 1-800-361-8404 (x219)

E-mail: nfreeman@cna-nurses.ca

www.cna-nurses.ca

Tel: 604-822-4965

Fax: 604-822-4835

E-mail: elaine@cehs.ubc.ca

www.interprofessional.ubc.ca

Aboriginal Voices and Visions in HIV/AIDS: Our Ancestors Speak

7th Annual Aboriginal HIV/AIDS Conference
Sponsored by Healing Our Spirit B.C. Aboriginal HIV/AIDS Society and the Stolo Nation

March 16 - 19, 2003

Chilliwack, BC

Contact:

Michelle George, Conference Coordinator

Healing Our Spirit

Tel: 604-879-8884 ext. 34

Fax: 604-879-9926

E-mail: michelle@healingourspirit.org

Violence and Health 2003

Sponsored by Interprofessional Continuing Education (ICE), The University of British Columbia in cooperation with BC Women's Hospital and Health Centre

3-5 April 2003

Vancouver, BC

Contact:

ICE

Tel: 604-822-4965

Fax: 604-822-4835

E-mail: interprof@cehs.ubc.ca

www.interprofessional.ubc.ca

Impact of Global Issues on Women and Children

16-21 February 2003

Bangkok, Thailand

Contact:

International Conference

McMaster University

Tel: 905-525-9140 Ext.22847/27533

Fax: 905-521-8834

E-mail: ic2003@mcmaster.ca

or Burapha University Bangsae

Chonburi, Thailand, 20131

Fax 011-66-38-745-790, E-mail: iwc@buu.ac.th

www.fhs.mcmaster.ca/slru

FAS and Other Drug-related Effects 2003: Doing What Works

Sponsored by Interprofessional Continuing Education, UBC; the FAS Support Network of BC; and Sunny Hill Health Centre for Children

20-22 February 2003

Vancouver, BC

Contact:

ICE, UBC

A View to the Future/Regard sur l'avenir

94th Annual Conference of the Canadian Public Health Association/ 94^e conférence annuelle de l'Association canadienne de santé publique
Co-sponsored by the Alberta Public Health Association/Co-parrainée par l'Association de la santé publique de l'Alberta

10-13 May/mai 2003

Calgary, AB

Contact/ Contacter :

CPHA Conference Department

Département des conférences de l'ACSP

Tel/ Tél : 613-725-3769, ext. 126

Fax/ Téléc : 613-725-9826

E-mail/ Courriel : conferences@cpha.ca

www.cpha.ca

Child and Youth Health 2003

3rd World Congress & Exposition

Sponsored by: B.C.'s Children's Hospital

Foundation; University of British Columbia; and Canadian Institute of Health Research, Institute of Human Development, Child and Youth Health

11-14 May 2003

Vancouver, BC

Contact:

Child & Youth Health 2003

c/o Venue West Conference Services, Ltd.

Tel: 604-681-5226

Fax: 604-681-2503

E-mail: congress@venuewest.com

www.venuewest.com/childhealth2003

International Forum on Ecosystems Approaches to Human Health: Turning Knowledge into Action / Forum international sur les approches écosystèmes et santé humaine, de la connaissance à l'action

18-23 May/mai 2003

Montréal, Québec

Themes: Definition and Conceptualization of Ecosystems Approaches to Human Health; Successes and Challenges through the Presentation of Case Studies; Links between Research Results and Policy Development; Institutionalization of Ecosystem Approaches to Human Health Research and Practices

Contact / contacter :

Anne-Marie Legault, Forum Coordinator

Ecosystem Approaches to Human Health

International Development Research Centre

Tel: 613-236-6163 ext. 2273 Fax: 613-567-7748

E-mail: forum2003@idrc.ca

Looking Back, Moving Forward

25th Anniversary Guelph Sexuality Conference

9-18 June 2003

Guelph, ON

Contact:

Office of Open Learning

University of Guelph

Tel: 519-767-5000

Fax: 519-767-1114

E-mail: info@open.uoguelph.ca

www.open.uoguelph.ca/sexconf