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The projected effect of increasing physical activity on reducing the prevalence of common mental disorders among Canadian men and women: A national population-based community study

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ABSTRACT

Objective. Little quantitative research has been conducted on the effect of physical activity (PA) modification on the prevalence of mental disorders in a nationally representative sample. We aimed to provide quantitative evidence regarding the potential effectiveness of PA in the management of mental disorders.

Methods. We used data from the national Canadian Community Health Survey of Mental Health and Well-being (CCHS 1.2) designed to represent the approximately the 25 million national community population aged 15 years and over in 2002.

Results. Around 1 in 10 Canadians reported a 12-month mental disorder. Women reported more mood and anxiety disorders, men more substance dependence. Almost half of Canadians were physically inactive. After adjusting for covariates, physical inactivity was a significant risk factor for common mental disorders, except manic episode. Approximately 780,000 cases nationally are attributable to physical inactivity. A 10% reduction in the rate of physical inactivity would reduce common mental disorders by 167,000 cases, a 25% reduction would result in 389,000 fewer cases. PA was more beneficial for men.

Conclusions. Clinicians and public health campaigns targeting individual patients and general populations can improve patients' symptoms and prevent a significant proportion of future mental disorders by increasing the amount of PA.

Introduction

Mental disorders are often chronic and recurrent and are associated with a tremendous burden. Although mental disorders have some effective treatments (Butler et al., 2006; Koenig and Thase, 2009; Leucht et al., 2011), the public health impact of these measures is limited (Fournier et al., 2010; Weisberg et al., 2007; Weissman et al., 2006). There is a need for additional cost effective treatment modalities to be identified.

To reduce the burden of mental disorders, greater attention should be given to prevention and promotion strategies which can be used by clinicians targeting individual patients and public health program planners targeting large population groups (WHO, 2002). These public health interventions should be low cost, accessible, and effective.

There has been considerable research interest in the effect of physical activity (PA) upon mental disorders (e.g. depression) (Daley and Jolly, 2012; Daley et al., 2007; Lawlor and Hopker, 2001; Legrand and Heuze, 2007; Trivedi et al., 2011). A recent review of reviews on exercise and depression concludes that exercise as treatment for depression is more effective than no treatment and is as effective as traditional interventions, at least in the short term, although it has minimal side effects, it can be limited by high remission rates, commitment, and motivational commitment from patients (Daley, 2008). Previous literature has qualitatively explored the association between PA and mental disorders, especially for depression (Cairney et al., 2009). Trivedi et al. (2011) quantitatively exploring the effectiveness of PA in a randomized controlled trial, found that exercise was a viable augmentation strategy for depressed patients who were not sensitive to selective serotonin reuptake inhibitors. Rimer et al. (2012) in their systematic review of randomized controlled trials found that: exercise may improve depressive symptoms for those with depression when compared with no treatment or control intervention; the effect of exercise decreased in the more robust trials; caution is needed when interpreting the positive role of exercise in treating depressive symptoms.

There has been a promising trend of using population attributable fractions (PAFs) as effective tools to quantify the potential effects of

Abbreviations: CCHS, Canadian Community Health Survey; DSM-IV, Diagnostic and Statistical Manual of Mental disorders, 4th Edition; MDE, major depressive episode; PA, physical activity; M&ADs, mood and anxiety disorders; OR, odds ratio; PAFs, population attributable fractions; WMH-CIDI, World Mental Health-Composite International Diagnostic Interview Instrument.

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risk factors on mental disorders at population level (Barnes and Yaffe, 2011; Bolton and Robinson, 2010; Sareen et al., 2008). PAFs are commonly defined as the proportional reduction in average disease risk that would be achieved by elimination of the exposure of interest (Rockhill et al., 1998). Strohle et al. (2007) using a community cohort of adolescents and young adults to explore relationships between PA and mental disorders found that: regular exercise was associated with a substantially reduced risk for some mental disorders and co-morbidity; the potentially preventive effects were greater for males than females. While the research linking PA to the prevention of mental disorders is promising, more research is needed at a national population level to provide quantitative measures of the potential effects of PA modification on the prevalence of mental disorders.

The aim of this study was to provide quantitative evidence regarding the potential effectiveness of PA in the control of mental disorders by calculating PAFs, which takes into account the prevalence of PA as well as the strength of its association with the outcome of interest. *Physical inactivity* is a largely modifiable risk factor, that can be modified and thus affect health outcomes.

Methods

Data source

Data analyzed was from a national mental health survey of the Canadian community population collected between May and December 2002 — Canadian Community Health Survey (CCHS 1.2) (Gravel and Beland, 2005). The survey employed a multistage sampling framework to ensure representation of Canadian community population. Sampling was based on the standard area probability frame employed by Statistics Canada for its Labor Force Survey (Statistics Canada, 2008). The sample consisted of 36,984 respondents. The response rate was 77.0%. Respondents were assigned weights therefore it was possible to calculate Canadian population parameters. The survey objectives and data collection methods were approved by the steering committee of Statistics Canada. Respondents were informed that their participation in the survey was voluntary. All personal information collected or held by Statistics Canada is kept confidential and secure. The present study is a secondary analysis of data from the CCHS 1.2. Details about this survey can be found from previous publications (Dewa et al., 2007; Gravel and Beland, 2005).

Physical activities

The PA measures in CCHS 1.2 are based on sources used by Canadian Fitness and Lifestyle Research Institute (www.cflri.ca), and in other surveys such as Ontario Health Survey (www.chass.utoronto.ca/datalib/codebooks/utm/ohs/ohs90.htm) and the Campbell's Survey on Well-Being in Canada (www.cflri.ca/cflri/pa/surveys/88survey.html). Exposure to leisure time PA in the past three months was assessed through a series of questions, e.g. "Have you done any of the following (physical activities) in the past three months…?"; "In the past three months, how many times did you participate in that activity?"; "How much time did you spend on each occasion?". Energy expenditure values previously developed were used to categorize an individuals' PA level as active, moderate, and inactive (www.cflri.ca/cflri/pa/surveys/88survey.html).

Mental disorders

The CCHS 1.2 used selected modules from World Mental Health-Composite International Diagnostic Interview Instrument (WMH-CIDI) to assess the prevalence of common mental disorders (Kessler et al., 2004). This diagnostic instrument has been widely used internationally (Kessler et al., 2007). The WMH-CIDI is a lay-administered psychiatric interview that generates a profile of those with a disorder according to the definitions of the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV). Past-year prevalence of the following *DSM-IV* mental disorders were assessed: major depressive episode (MDE), manic episode, panic disorder, social phobia, agoraphobia, any mood disorder, any anxiety disorder, any substance dependence, alcohol dependence, illicit drug dependence, and any selected disorder or substance dependence. Individuals with any of mood or anxiety disorder were also grouped together as mood and anxiety disorders (M&ADs) positive. Comorbidity was defined as suffering more than one mental disorder.

Table 1
Demographic characteristics of the study sample of Canadians, 2002.

	Men, n (%)[a]	Women, n (%)[a]
Total	16,773 (49.2)	20,211 (50.8)
Age, years		
15–25	2926 (18.6)	3220 (17.6)
26–45	6131 (39.3)	6080 (37.5)
46+	7716 (42.1)	10,191(44.9)
Marital status		
Married/common law	9234 (63.5)	9950 (59.9)
Never married	5138 (28.1)	4660 (22.8)
Separated/widowed/divorced	2388 (8.4)	5582 (17.1)
Household income		
Highest	4722 (33.5)	3955 (26.5)
Upper middle	5721 (33.4)	6061 (31.4)
Middle	3309 (17.4)	4772 (20.4)
Lower middle	989 (4.8)	2366 (7.9)
Lowest	651 (2.6)	948 (3.1)
Education		
Post secondary graduation	7659 (47.7)	8955 (45.8)
Some post secondary	1363 (8.5)	1687 (8.1)
Secondary school graduation	2887 (17.8)	3610 (19.7)
Less than secondary school graduation	4739 (25.0)	5853 (25.5)
Immigrant status		
No	14,128 (77.4)	17,024 (77.2)
Yes	2540 (21.9)	3059 (22.1)
Place of residence		
Rural	3870 (19.3)	4368 (18.4)
Urban	12,903 (80.7)	15,843 (81.6)

Totals for each variable vary due to missing data.
[a] Numbers are unweighted, and percentages are weighted.

Suicidality

Past-year suicidal thought was measured by using the following question: "Did you seriously thought about committing suicide or taking your own life?" Past-year suicidal attempt was measured by using the question: "Have you ever attempted suicide during the past 12-month?"

Statistical analyses

The bootstrap procedure recommended by Statistics Canada utilizing a set of 500 replicate sampling weights that are representative of the national community population was used. The CCHS 1.2 survey sample was weighted to represent the Canadian community population of 24,996,593 individuals aged 15 and over in 2002 (12,286,109 males and 12,710,483 females). All analyses were conducted using the CCHS 1.2's confidential Master data files at the Saskatchewan Research Data Centre on the University of Saskatchewan campus. All analyses were based on SAS software, version 9.1 (SAS Institute Inc., Cary, NC). We examined the prevalence of PA, mental disorders, and suicidality stratified by gender. We used the χ^2 test to determine the differences between men and women with respect to exposure to the PA variables and dependent variables. PAFs of dependent variables represent the percentage of all cases of each outcome among national community population exposed to different levels of PA that would not have occurred if the exposure had not occurred.

The definition of PAF is the proportional reduction in average diseases risk that would be achieved by elimination of exposure of interest (Rockhill et al., 1998). The PAF was calculated by the following formula based on previous

Table 2
Physical activity status among Canadians in 2002.

Physical activity status	Total, n (%)[a]	Men, n (%)[a]	Women, n (%)[a]	*P*-value[b]
Active	9526 (26.1)	4950 (29.0)	4576 (23.4)	<0.001
Moderate	9818 (26.7)	4342 (26.1)	5476 (27.2)	
Inactive	17,634 (47.2)	7478 (44.9)	10,156 (49.4)	

[a] Numbers are unweighted, and percentages are weighted.
[b] The chi-square test was used for two gender groups.