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) modi cation 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 signi cant 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%

Introduction

Mental disorders are often chronic and recurrent and are associ-

risk factors on mental disorders at population level (Barnes and Yaffe, 2011; Bolton and Robinson, 2010; Sareen et al., 2008). PAFs are commonly de ned 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 modi cation 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 modi able risk factor, that can be modi ed and thus affect health outcomes.

Methods

Data source

Data analyzed was from a national mental health survey of the Canadian

literature (

Table 5
The projected potential reduction of past-12 month mental disorders cases given selected reductions in physical inactivity, Canada 2002.

Past 12-month mental disorders	10% deduction of physical inactivity prevalence	25% deduction of physical inactivity prevalence
Total		
Numbers of potential mental disorders cases	167,709	389,326
Social phobia	23,124	59,609
Any selected anxiety disorder	22,249	58,734
Any selected mood and anxiety disorders	37,090	95,764
Any selected disorders/ substance dependence	53,306	92,220
Suicidal thoughts	31,939	82,999
Males		
Numbers of potential mental disorders cases	128,359	341,451
Major depressive episode	17,229	46,322
Social phobia	10,797	28,781
Any selected mood disorder	15,635	41,333
Any selected anxiety disorder	11,825	31,047
Any selected mood and anxiety disorder	24,297	64,163
Any selected disorders/ substance dependence	27,611	71,642
Suicidal thoughts	20,965	58,162

significant risk factor for the most of the selected mental disorders, except manic episode. About 780,000 cases of mental disorders were potentially attributable to physical inactivity in 2002. Increasing PA was more beneficial for men, than for women, in decreasing potential prevalence of mental disorders. A 10% reduction in the prevalence of physical inactivity could potentially prevent more than 167,000 mental disorders cases, whereas 389,000 cases could be prevented if there was a 25% reduction in physical inactivity.

Our results are consistent with previous literature on PA and physical and mental disorders. We found that physical inactivity was the major risk factor for all mentioned mental disorders, except manic episode. Persons with mania are more likely to have excessive behaviors such as excessive PA (Goodrich and Kilbourne, 2010).

Several meta-analytic studies have evaluated the effects of exercise as a treatment for mental disorders, and their findings support exercise protecting against mental disorders, and the behavioral and neurobiological consequences of exercise may explain the mechanism(s) of action (Barbour et al., 2007; Blumenthal et al., 2007; Dunn et al., 2005; Smith and Lynch, 2012).

In addition to confirming previous findings, our study quantitatively measured the potential magnitude of PA effect on the prevalence of mental disorders. Notably, being physically active can alleviate depressive and anxious symptoms but not manic behaviors. Theoretically physical inactivity influences approximately 780,000 cases of mental disorders. Increasing PA was more beneficial for men, than for women, in decreasing prevalence of mental disorders. Some findings in the literature support gender differences in the

Table 6
Population attributable fractions for associations between mental disorders and physical activity status among Canadians in 2002, by gender.

Past 12-month mental disorders	Physical activity status			
	Moderate [a]		Inactive [a]	
	AOR[b] (95%CI)	PAF (95%CI)	AOR[b] (95%CI)	PAF (95%CI)
Males				
Major depressive episode	1.17 (0.83 ..1.63)	NS	1.57 (1.16..2.13)	20.38 (6.70 ..33.66)
Manic episode	0.71 (0.43 ..1.16)	NS	0.81 (0.49..1.34)	NS
Panic disorder	1.76 (0.98 ..3.13)	NS	1.53 (0.93..2.52)	NS
Social phobia	1.06 (0.76..1.48)	NS	1.48 (1.05..2.09)	17.73 (2.20 ..32.86)
Agoraphobia	0.97 (0.36 ..2.59)	NS	0.91 (0.46..1.80)	NS
Any selected mood disorder	1.08 (0.80 ..1.45)	NS	1.41 (1.07..1.85)	15.55 (3.05 ..27.62)
Any selected anxiety disorder	1.21 (0.90 ..1.63)	NS	1.36 (1.01..1.83)	13.91 (0.45 ..27.15)
Any selected mood and anxiety disorder	1.20 (0.95 ..1.51)	NS	1.42 (1.14..1.77)	15.87 (5.91 ..25.69)
Alcohol dependence	1.26 (0.94 ..1.70)	NS	0.98 (0.75..1.28)	NS
Drug dependence	1.32 (0.69 ..2.55)	NS	1.08 (0.64..1.83)	NS
Any substance dependence	1.25 (0.93 ..1.68)	NS	1.00 (0.77..1.29)	NS
Any selected disorders/substance dependence	1.22 (1.00 ..1.50)	NS	1.28 (1.07..1.53)	11.17 (3.05 ..19.22)
Suicidal thoughts	1.27 (0.93 ..1.75)	NS	1.85 (1.38..2.48)	27.62 (14.58 ..39.92)
Suicidal attempts	1.80 (0.73 ..4.49)	NS	2.04 (0.94..4.45)	NS
Females				
Major depressive episode	0.97 (0.75 ..1.26)	NS	0.90 (0.73..1.12)	NS
Manic episode	0.85 (0.46 ..1.56)	NS	0.59 (0.37..0.93)	..[c]
Panic disorder	0.97 (0.66 ..1.43)	NS	0.85 (0.59..1.21)	NS
Social phobia	1.13 (0.83 ..1.54)	NS	1.29 (0.97..1.70)	NS
Agoraphobia	0.69 (0.38 ..1.24)	NS	0.68 (0.40..1.17)	NS
Any selected mood disorder	0.96 (0.75 ..1.23)	NS	0.88 (0.71..1.08)	NS
Any selected anxiety disorder	1.06 (0.83 ..1.35)	NS	1.08 (0.86..1.36)	NS
Any selected mood and anxiety disorder	1.06 (0.88 ..1.28)	NS	1.03 (0.87..1.22)	NS
Alcohol dependence	1.03 (0.66 ..1.61)	NS	1.29 (0.86..1.92)	NS
Drug dependence	1.23 (0.55 ..2.72)	NS	1.76 (0.87..3.57)	NS
Any substance dependence	1.03 (0.69 ..1.55)	NS	1.25 (0.87..1.70)	NS
Any selected disorders/substance dependence	1.05 (0.87 ..1.26)	NS	1.03 (0.87..1.22)	NS
Suicidal thoughts	1.13 (0.84 ..1.52)	NS	1.19 (0.87..1.61)	NS
Suicidal attempts	0.80 (0.38 ..1.70)	NS	0.95 (0.51..1.77)	NS

AOR = adjusted odds ratio; CI = confidence interval; PAF = population attributable fraction; and NS = non-significant.
[a] The reference group was individuals being physical active.
[b] Simultaneously adjusted for age, marital status, education, income, immigrant status, place of residence, and a measure of chronic medical condition (including asthma, arthritis, osteoporosis, back problems, high blood pressure, migraine headaches, chronic bronchitis, emphysema, chronic obstructive pulmonary disease, diabetes, heart diseases, cancer, intestinal or stomach ulcers, stroke, urinary incontinence, bowel disorder, Alzheimer's disease or other dementia, Parkinson's disease, cataracts, glaucoma, and thyroid condition).
[c] AOR less than 1; PAF not calculated.

association between PA and mental disorders: 1) Valentine et al. (2009) found that PA was independently associated with fatigue in women, but not in men; 2) a recent US study reports that gender has different roles in behavioral domains. Females are more likely to have depression, and gender has a significant direct effect on depression severity (Ryba and Hopko, 2012); and 3) depression may be an additional risk factor for exercise noncompliance, as females are more likely to stop exercising (Craft and Perna, 2004).

We also found that there was no added benefit for being "Active" vs. being "moderately active", which is consistent with prior data (Dunn et al., 2005; Hamer et al., 2009). It is evidenced that exercise alleviates symptoms of depression and may be useful to treat depression with a requirement of a minimum amount of exercise. A lower amount of exercise is not effective.

Our study strongly suggests that greater attention should be given to increasing the amount of physical activity in mental health prevention and promotion strategies. Exercise can be used by public health campaigns targeting the general population to prevent a significant proportion of future mental disorders. Increasing PA is more likely beneficial for men than women from a population preventive perspective. Physical inactivity is a modifiable risk factor. General practitioners and specialists (i.e. psychiatrists) should be encouraged to make exercise a routine supplemental treatment and provide adequate psychological support to their patients based on the individual patient's condition.

Limitations of the study are noted. Because of the cross-sectional nature of the study, we cannot make any causal inference. Exercising cannot be guaranteed to prevent the occurrence of any mental disorder. However, evidences from systematic reviews are supported by randomized clinical trials that increasing PA in patients with mental disorders and healthy populations experience significant improvements of their psychiatric symptoms and psychological well-being, respectively (Daley, 2008; Trivedi et al., 2011). Again, because of the cross-sectional nature of our study, it is possible that participants who experienced a mental disorder may have subsequently become less physically active. Second, the prevalence of any mental disorder was assessed by the WMH-CIDI according to the DSM-IV criteria for the past-12 months mental health status, whereas the physical activity was evaluated over the past three months. Third, it should be noted that the PAFs and projected reduction in the prevalence is likely to underestimate the association between PA and mental disorders, because individuals with severe mental disorders were more likely to report less physical activity (Ussher et al., 2007). Those with severe mental disorders are likely to be no longer physically active at the time of the survey.

The current study represents the first evidence of the potential quantitative effect of PA modification on the prevalence of mental disorders in a national population and the projected reduction of mental disorders that results from decreasing physical inactivity in a population.

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