ASSOCIATIONS BETWEEN ACTIVE COMMUTING AND BODY ADIPOSITY AMONG ATLANTIC CANADIANS

Zhijie Michael Yu and Cynthia Forbes

INTRODUCTION

Though the beneficial effects of regular physical activity on both health and body weight control have been well documented,[1] only about one in ten people in the general population are aware of the public health guidelines for physical activity.[2,3] Both Canadian and American activity guidelines recommend that adults should engage in at least 150 minutes of moderate-to-vigorous intensity physical activity per week to help maintain good health and prevent disease.[1] Several research studies using Canadian Health Measures Survey data suggest that approximately 15% of Canadian adults meet the recommended guidelines according to objectively measured physical activity.[4] In addition, the prevalence of obesity in Canada has been constantly increasing over the past 25 years.[5] Currently, one in six Canadian adults are obese (body mass index [BMI] ≥ 30 kg/m^2). The situation is more pronounced in the Atlantic provinces in which one in four adults are classified as obese.[5]

Lifestyle changes, particularly the emergence of an obesogenic diet and a decreasing trend in total physical activity, have been ascertained as a key contributor to the obesity epidemic.[6] An increasingly sedentary lifestyle has been found to be one of the major contributors to the decreasing levels of total physical activity.[7] The reliance and use of motorized vehicles is one of the major sedentary lifestyle activities which has been shown to be associated with body adiposity.[8] In contrast, recent studies have reported that active commuting is associated with lower levels of body adiposity when compared with motor vehicle use.[9,10] We hypothesized that physical activities such as commuting via walking or cycling may be related to decreased body adiposity in our study population. Therefore, we carried out a cross-sectional analysis to assess whether active commuting is associated with body adiposity among participants of the Atlantic Partnership for Tomorrow's Health (Atlantic PATH) cohort study.

METHODS

Study Design and Sample

This population-based cross-sectional analysis utilized data from the Atlantic PATH cohort study, which is a part of the Canadian Partnership for Tomorrow Project.[11] In brief, 31173 participants aged 35-69 years were recruited for the baseline survey. In this study, we included 12575 participants who had data on body composition measures and physical activity assessed by using the International Physical Activity Questionnaire long-form (IPAQ-LF).[12]

Data Collection

Data collection procedures have been reported previously.[13] In brief, a set of standardized questionnaires on sociodemographic factors, health status, medication use, diet, and physical activity were completed by participants. Physical measurements (including anthropometric indexes and body composition) were measured by research nurses at an assessment center.

Assessment of physical activity, body composition, and covariables

Based on participants' responses to questions of the IPAQ-LF,[12] we defined active commuters as those who reported traveling by walking and/or cycling for at least 10 minutes during 7 days prior to completing the questionnaire and non-active commuters as those who reported exclusively traveling in a motor vehicle such as train, bus, car, or truck and did not report either walking or cycling for commuting during same time period. We also calculated metabolic equivalent minutes per week (MET-min/week) for physical activities at work and leisure-time, respectively, for each participant according to the IPAQ scoring protocol.[14]

Body weight, percentage fat mass, fat mass, and fat free mass were measured using the Tanita bioelectrical impedance device (Tanita BC-418, Tanita Corporation of America Inc., Arlington Heights, Illinois). Height was measured by a Seca stadiometer. BMI was calculated as weight in kilograms divided by height in meters squared. We also calculated fat mass index (FMI) and fat free mass index (FFMI) by dividing fat mass and fat free mass in kilograms by height in meters squared, respectively.

Ethnicity was categorized as white and non-white. Educational attainment was categorized as high school or lower, college level, and university level or higher. Marital status was grouped as married or living together and single, divorced, separated, or widowed. For smoking behavior, participants were grouped as non-smoker, former smoker, and current smoker. For alcohol drinking, respondents were classified as abstainer, occasional drinker, regular drinker, and habitual drinker. Healthy eating index scores for each participant were calculated according to previously developed protocol.[13] Chronic disease was defined as self-reported diabetes mellitus cardiovascular disease (coronary heart disease and stroke), and cancer. We utilized the Postal Code Conversion File Plus (PCCF+, version 6C, Statistics Canada), to classify study participants as living in urban or rural areas according to their reported residential postal code.[15]

Statistical Analyses

We utilized multiple linear regression models to examine whether active commuters in the study population had reduced body adiposity compared with those who reported exclusively traveling in motor vehicles as the reference group.

RESULTS

As shown in Table 1, 65% of study participants reported walking and/or cycling for commuting purposes for more than 10 minutes during the last 7 days. Compared with non-active commuters, active commuters were more likely to live in urban areas, have higher levels of education, energy expenditures at both work and leisure-time, and diet quality. They were also more likely to be non-smokers and alcohol users, and were less likely to have chronic diseases.

Table 2 shows that compared with non-active commuters, active commuters had significantly reduced levels of BMI and FMI. The associations between active commuting and decreased body adiposity were independent of sociodemographic and behavioral factors (e.g., smoking and alcohol use), geographic locations, chronic disease status, occupational physical activity, and exercise during leisure time.

DISCUSSION

Our analyses showed that compared with exclusive motor vehicle use, displacing sedentary time with walking or cycling was associated with decreased body adiposity. Compared with non-active commuters, active commuters had decreased BMI score by 0.54 unit and FMI score by 0.27 unit, respectively. These data may be translated into decreased body weight of 1.5 kg and fat mass of 0.8 kg, respectively. These findings imply that while meeting the recommended physical activity guidelines has positive effects on overall health,[1] displacing some sedentary time spent in a vehicle with moderate-to-vigorous intensity activities, such as walking or cycling, may also have some impacts on weight control.

Interestingly, 65% of study participants were classified as active commuters and their levels of BMI and FMI were remarkably lower than their counterparts who were exclusive vehicle users. This characteristic shows that people who were physically active in commuting had less fat mass than those who were inactive in commuting. This finding is in line with previous studies which have reported that active commuting is associated with decreased body adiposity,[9,10] and motor vehicle driving is associated with obesity.[8] Recently, some studies have shown that though it is an important factor that may influence obesity development, physical activity levels have been declining over time.[7] To counteract the adverse effect of motor vehicle use on body weight changes, it may be helpful to redesign the built environment in order to facilitate more active methods of travel. However, to effectively control and prevent obesity development, comprehensive interventional strategies that include the improvement in both diet and physical activity may be more effective than focusing on one factor alone.[6]

CONCLUSIONS/IMPLICATIONS

Active commuting is associated with decreased body adiposity among populations in Atlantic Canada. Being physically active in any way is a healthy lifestyle choice that may help maintain an optimal body weight.

Table 1. Characteristics of study participants[a]

	Non-active commuter (n=4436)		Active commuter (n=8139)	
Age, yr	53.3	(8.8)	53.9	(8.8)
Female, n, (%)	3174	(71.6)	5669	(69.7)
Province, n (%)				
Nova Scotia	2885	(65.0)	6044	(74.3)
New Brunswick	933	(21.0)	1403	(17.2)
Newfoundland and Labrador	555	(12.5)	631	(7.8)
Prince Edward Island	63	(1.4)	61	(0.7)
Rural area, n (%)	1777	(40.1)	2609	(32.1)
Ethnicity, n (%)				
White	3974	(89.6)	7441	(91.4)
Non-white	231	(5.2)	416	(5.1)
DNK/PNA	231	(5.2)	282	(3.5)
Education, n (%)				
Less than high school	881	(19.9)	1274	(15.7)
College level	1822	(41.1)	3142	(38.6)
University level or higher	1721	(38.8)	3701	(45.5)
DNK/PNA	12	(0.3)	22	(0.3)
Marital status, n (%)				
Married or living together	3613	(81.4)	6485	(79.7)
Single, divorced, separated, or widowed	819	(18.5)	1638	(20.1)
DNK/PNA	4	(0.1)	16	(0.2)
Smoking status, n (%)				
Never	2187	(49.3)	4287	(52.7)
Former	1790	(40.4)	3193	(39.2)
Current	420	(9.5)	609	(7.5)
DNK/PNA	39	(0.9)	50	(0.6)
Alcohol drinking, n (%)				
Abstainer	499	(11.2)	735	(9.0)
Occasional drinker	1894	(42.7)	3211	(39.5)
Regular drinker	1258	(28.4)	2577	(31.7)
Habitual drinker	695	(15.7)	1452	(17.8)
DNK/PNA	90	(2.0)	164	(2.0)
Chronic disease[b], yes, n (%)	548	(12.4)	878	(10.8)
Body weight, kg	76.8	(15.4)	74.6	(15.3)
Body height, cm	166.4	(7.4)	166.6	(7.7)
Body mass index, kg/m^2	27.7	(5.0)	26.8	(4.8)
Percentage fat mass, %	32.9	(8.7)	32.2	(8.4)
Fat mass index, kg/m^2	9.3	(3.8)	8.8	(3.5)
Fat free mass index, kg/m^2	18.3	(2.9)	18.0	(2.8)
Occupational activity, MET-hr/week	1219	(3149)	1602	(3551)
Leisure time activity, MET-hr/week	3189	(3278)	4260	(4008)
Healthy eating index score	38.1	(9.0)	39.6	(8.9)

DNK=do not know; PNA=prefer not to answer.

[a]Data are means (standard deviation) and number of participants (percentage).

[b]Self-reported diabetes mellitus, cardiovascular disease (coronary heart disease and stroke), and cancer.

Table 2. Differences in body adiposity measures between non-active commuters and active commuters

	β coefficients (95% CIs)		
Body adiposity measures	**Non-active commuter** (n=4436)	**Active commuter** (n=8139)	
BMI, kg/m²			
Model 1	Reference	-0.62	(-0.80, -0.45)
Model 2	Reference	-0.56	(-0.74, -0.39)
Model 3	Reference	-0.54	(-0.72, -0.36)
Percentage body fat, %			
Model 1	Reference	-0.39	(-0.68, -0.10)
Model 2	Reference	-0.31	(-0.60, -0.01)
Model 3	Reference	-0.21	(-0.51, 0.08)
Fat mass index, kg/m²			
Model 1	Reference	-0.34	(-0.47, -0.21)
Model 2	Reference	-0.30	(-0.43, -0.17)
Model 3	Reference	-0.27	(-0.40, -0.14)

Model 1, adjusted for age, sex, province, and urban/rural.
Model 2, further adjusted for ethnicity, education, education, marital status, smoking, alcohol use, chronic disease, and healthy eating index based on model 1.
Model 3, further adjusted for occupational activity and exercise at leisure time based on model 2.

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