

# Perceived Neighbourhood Walkability and Different Types of Physical Activity in Canadian Men and Women

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## ABSTRACT

**PURPOSE:** Few Canadian studies have examined whether associations between neighbourhood walkability and physical activity (PA) differ by gender. We estimated associations between perceived neighbourhood walkability and PA among urban Canadian men and women.

**METHODS:** This study included cross-sectional survey data from the 'Alberta's Tomorrow Project' (2008; n= 14,078), in which the International Physical Activity Questionnaire captured weekly PA and the Neighbourhood Environment Walkability Scale abbreviated version (NEWS-A) captured self-reported neighbourhood characteristics. NEWS-A subscale scores were standardized and overall walkability scores computed. Sociodemographic characteristics were also captured. Covariate-adjusted generalized linear models estimated the associations between physical activity participation and minutes (transportation walking: TW, recreational walking: RW, moderate: MPA, and vigorous: VPA) and walkability scores. Odds ratios (OR) were estimated for participation and beta coefficients ( $\beta$ ) were estimated for minutes of PA, with 95% confidence intervals (95CIs).

**RESULTS:** Overall walkability was positively associated with participation in TW (OR 1.05; 95CI 1.04, 1.06), RW (OR 1.03; 95CI 1.02, 1.04), MVPA (OR 1.02; 95CI 1.01, 1.03) and VPA (OR 1.02; 95CI 1.01, 1.03) and minutes of TW (B 1.41; 95CI 0.43, 2.40), RW (B 1.01; 95CI 0.08, 1.94), and VPA (B 1.37; 95CI 0.39, 2.35). In men, negative associations were found between street connectivity and VPA participation (OR 0.98; 95CI 0.97, 0.99) and crime safety and VPA minutes (B -10.58; 95CI -19.69, -1.46). In women, positive associations were found between pedestrian infrastructure and RW participation (OR 1.03; 95CI 1.02, 1.04) and overall walkability and VPA minutes (B 2.05; 95CI 0.94, 3.16). Notably, overall walkability was positively associated with RW participation in men and women (men: OR 1.005; 95CI 1.002, 1.008; women: OR 1.009; 95CI 1.007, 1.010).

**CONCLUSIONS:** Neighbourhood walkability is associated with participation and time spent in different PAs for men and women. Modifying perceptions, possibly via improving neighbourhood urban design, has the potential to increase PA in Canadian adults.

## HIGHLIGHTS

- Overall walkability is associated with minutes of different PAs.
- Overall walkability is associated with participation in different PAs.
- Pedestrian infrastructure was important for PA among women.
- Street connectivity and crime safety was important for PA among men.

## STUDY AIMS

- Estimate the associations between perceived neighbourhood walkability and different PAs including transportation walking (TW), recreation walking (RW), moderate physical activity (MPA), and vigorous physical activity (VPA).
- Estimate sex-related effect modification of the associations between walkability and PA.

## METHOD

- Alberta's Tomorrow Project (ATP), a cohort study of adults (35-69 years) which begun in 2000, investigating the etiologic factors of cancer, heart disease, and diabetes mellitus<sup>[5]</sup>.
- ATP inclusion criteria: English language; no cancer history; and not intending to leave Alberta in the next year<sup>[5]</sup>.
- Cross-sectional analysis of ATP 2008 follow-up survey data (n=15,342 in urban areas only)
- NEWS-A<sup>[6]</sup> captured perceived *residential density (RD)*, *land use mix diversity (LUMD)*, *land use mix access (LUMA)*, *street connectivity (SC)*, *pedestrian infrastructure (PI)*, *aesthetics (AESTH)*, *traffic safety (TS)*, *crime safety (CS)*, *hilliness (HILL)*, *physical barriers (PB)*, *lack of shopping area parking (PARK)*, and *overall walkability (OW)*.
- Internal consistency of the multi-item subscales ranged from  $\alpha=0.44$  (SC) to  $\alpha=0.94$  (LUMD) and  $\alpha=0.94$  for OW.
- IPAQ captured participation and duration of TW, RW, MPA, and VPA in the last 7-days<sup>[7]</sup>.
- Covariate-adjusted GLMs estimated odds ratios (OR; binomial/logit link) for associations between walkability and PA *participation* and slope coefficients ( $\beta$ ; gamma/identity link) for associations between walkability and PA *duration*.
- Sex tested as an effect modifier of the association between walkability and PA.
- Covariates: age, sex, health, marital status, number of children, education, employment status, income, and season.
- N = 14,078 participants provided complete data.
- Sample mean age was 55.0  $\pm$  9.1 years and 62% were female.

## RATIONALE

- Walkable neighbourhoods are needed to increase PA at the population level.
- A meta-analysis found perceived *facilities, sidewalks, shops and services, and traffic safety* were positively associated with PA<sup>[1]</sup>.
- A multi-country study (excluding Canada) found perceived *residential density, land use mix access, land use mix diversity, street connectivity, traffic safety, crime safety, and aesthetics* to be associated with PA<sup>[2]</sup>.
- Perceived neighbourhood characteristics supporting PA may differ for men and women<sup>[3,4]</sup>.
- Only a few studies estimate sex-specific associations between neighbourhood walkability and different PAS.
- Evidence on perceived walkability and PA could inform urban planning and public health interventions.

## SELF-REPORTED PA IN LAST 7-DAYS

|     | Participation (%) | Mean duration (minutes/week) |
|-----|-------------------|------------------------------|
| TW  | 60.8              | 191 $\pm$ 221                |
| RW  | 60.8              | 194 $\pm$ 207                |
| MPA | 28.6              | 167 $\pm$ 177                |
| VPA | 32.9              | 181 $\pm$ 157                |

## ASSOCIATIONS: WALKABILITY AND PA

|       | TW OR | RW OR | MPA OR | VPA OR | TW $\beta$ | RW $\beta$ | MPA $\beta$ | VPA $\beta$ |
|-------|-------|-------|--------|--------|------------|------------|-------------|-------------|
| OW    | 1.05* | 1.03* | 1.02*  | 1.02*  | 1.41*      | 1.01*      |             | 1.37*       |
| RD    | 1.25* | 1.04* |        |        | 4.72*      |            |             | 6.92*       |
| LUMD  | 1.22* | 1.09* | 1.08*  | 1.12*  |            |            |             | 5.73*       |
| LUMA  | 1.30* | 1.14* |        | 1.12*  | 5.75*      |            | 1.06*       | 9.40*       |
| SC    | 1.07* |       |        |        |            |            |             |             |
| PI    | 1.11* | 1.10* |        | 1.08*  |            |            |             | 4.99*       |
| AESTH | 1.15* | 1.20* | 1.10*  | 1.11*  | 8.43*      | 4.87*      |             |             |
| TS    | 0.97* |       |        |        |            |            |             |             |
| CS    | 0.92* | 1.06* |        |        |            |            |             |             |
| HILL  |       |       |        |        |            | 4.60*      |             |             |
| PB    |       |       |        |        |            | 4.13*      |             |             |
| PARK  | 1.09* |       |        |        | 6.91*      |            | 6.17*       | 5.62*       |

\* p < .05; covariate-adjusted associations between walkability and PAs for men and women combined

<sup>1</sup> Duncan, M.I. et al. (2005). Perceived environment and physical activity: a meta-analysis of selected environmental characteristics. *IJNPA* 2:11  
<sup>2</sup> Sallis, J.F. et al. (2016). Physical activity in relation to urban environments in 14 cities worldwide: a cross-sectional study. *Lancet* 387:2207-17.  
<sup>3</sup> Spence, J.C. et al. (2006). Perceived neighbourhood correlates of walking among participants visiting the "Canada on the Move" website. *Can J Pub Health* 97:536-540.  
<sup>4</sup> Van Dyck, D. et al. (2015). Moderating effects of age, gender and education on the associations of perceived neighbourhood environment attributes with accelerometer-based physical activity: The IPEN adult study. *Health and Place* 36:65-73  
<sup>5</sup> Robson, P.J. et al. (2016). Design, methods and demographics from phase 1 of Alberta's Tomorrow Project cohort: a prospective cohort profile. *CMAJ Open* 4:E515-E27  
<sup>6</sup> Cerin, E. et al. (2006). Neighbourhood Environment Walkability Scale: validity and development of a short form. *Med Sci Sports Exerc* 38:1682-91.  
<sup>7</sup> Craig, C.L. et al. (2003). International Physical Activity Questionnaire: 12-Country reliability and validity. *Med Sci Sports Exerc* 35:1381-95.