A cross-sectional study of the associations between the built environment and physical activity-related cognitions in Canadian adults

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Background

- **Regular physical activity (PA) lowers the risk of chronic health conditions including cardiovascular disease, type II diabetes, some cancers, obesity, and depression.[1]**
- **The neighbourhood built environment ("walkability") is associated with physical activity, however, evidence about the built environment's (BE) influence on motivations to be physically active are less understood.[2]**
- **The Theory of Planned Behaviour (TPB), a social cognitive model for explaining behavioural motivation, can be used to understand the interrelationships between external barriers (walkability), motivations (attitudes, subjective norm (SN) and perceived behavioural control (PBC) and intentions) and behaviour (PA).[3]**

Study Aim

- **To investigate the extent to which objectively-measured neighbourhood walkability is associated with motivations (i.e., attitude, intention, SN and PBC) related to walking for transportation (WT), walking for recreation (WR) and vigorous-intensity PA (VIGPA).**

Method

Sample and Study Design

- **A simple random cross-sectional sample of n=4422 (response rate=35.2%) Calgarian adults completed telephone-interviews.[4]**
- **Telephone-interviews captured TPB constructs related to WT, WR, VIGPA, and socio-demographic characteristics.[4]**

Survey Variables

- **TPB variables including; attitudes, SN, PBC and intentions, specifically for WR WT and VIGPA.[4]**
- **Sociodemogaphic Characteristics (covariates): sex, age, education, home ownership, number of dependent children <18 years of age, time residing in neighbourhood.[4]**

Objectively-measured Walkability

- **Household postal codes were geocoded with Geographical Information Systems (GIS) to estimate BE characteristics within 1600m of participants homes which then underwent a two-staged cluster analysis that identified three neighbourhood types: low walkable (LW); medium walkable (MW); high walkable (HW).[4]**

Statistical Analysis

- **With our analytical sample (n=4323 with complete data) we used multi-variable linear regression unstandardized beta coefficients (β) and 95% confidence intervals (95CI) to estimate the differences in TPB constructs (dependent variables) between levels of neighbourhood walkability (independent variable), adjusting for sociodemographic characteristics (covariates).[4]**

Table 1. Sociodemographic characteristics of sample population

	Total Sample (n=4323)	LW (n=2472)	MW (n=1527)	HW (n=324)
Gender (% women)	59.9	60.2	60.6	54.3
Age in years (%)				
18-29 [a]	14.6	15.5	12.6	12.6
30-44 [a,c]	31.5	34.5	26.0	34.3
45-64 [a]	38.2	36.3	41.7	36.4
65≥ [a,c]	15.7	13.8	19.7	11.7
Highest education completed (%)				
Less then high school [a]	5.0	3.7	6.9	5.3
High school	27.6	27.6	28.4	24.4
College / technical school	26.1	26.8	25.3	24.4
University	41.3	41.9	39.4	46.0
Home owners (%) [a,b,c]	80.4	85.8	76.7	56.5
Dependent children (% ≥ 1 dependent) [a,b]	37.1	43.6	30.1	21.0
Years lived in neighbourhood (mean ± SD) [a,c]	11.34 ± 11.40	9.52 ± 9.38	15.00 ± 13.80	8.00 ± 8.37
Born in Canada (%) [a]	77.5	75.1	81.2	77.8

[a] = LW significantly differs from MW (P<0.5) based on Pearson's chi-square (categorical variables) or One-Way ANOVA (continuous variables) adjusted with Bonferroni pairwise comparison
[b] = LW significantly differs from HW (P<0.5) based on Pearson's chi-square (categorical variables) or One-Way ANOVA (continuous variables) adjusted with Bonferroni pairwise comparison
[c] = MW significantly differs from HW (P<0.5) based on Pearson's chi-square (categorical variables) or One-Way ANOVA (continuous variables) adjusted with Bonferroni pairwise comparison

Table 2. Linear regression estimating association between walkability and WT-related cognitions

	Instrumental Attitude	Affective Attitude	Perceived Behavioural Control	Subjective Norm	Intention
	Adjusted[1] β (95CI)	Adjusted[1] β (95CI)	Adjusted[1] β (95CI)	Adjusted[1] β (95CI)	Adjusted[1] β (95CI)
Walkability					
Low	Ref.	Ref.	Ref.	Ref.	Ref.
Medium	-0.03 (-0.08, 0.02)	-0.02 (-0.07, 0.04)	0.06 (0.01, 0.11)*	-0.02 (-0.08, 0.04)	-0.01 (-0.08, 0.06)
High	-0.03 (-0.12, 0.06)	-0.01 (-0.11, 0.10)	0.08 (-0.01, 0.18)	0.03 (-0.07, 0.13)	0.05 (-0.08, 0.17)
Intercept	4.13 (3.99, 4.27)*	4.01 (3.85, 4.18)*	3.96 (3.81, 4.12)*	3.68 (3.52, 3.84)*	3.75 (3.55, 3.95)*
Explainable Variance (R^2)	0.136	0.062	0.045	0.097	0.073

*p<.05; 1 Estimates adjusted for sociodemographic characteristics included sex, age, education, number of dependent <18 years at home, home ownership, total years residing in neighbourhood, Canadian birth status and season of data collection.

Table 3. Linear regression estimating associations between walkability and VIGPA-related cognitions

	Instrumental Attitude	Affective Attitude	Perceived Behavioural Control	Subjective Norm	Intention
	Adjusted[1] β (95CI)	Adjusted[1] β (95CI)	Adjusted[1] β (95CI)	Adjusted[1] β (95CI)	Adjusted[1] β (95CI)
Walkability					
Low	Ref.	Ref.	Ref.	Ref.	Ref.
Medium	-0.01 (-0.05, 0.03)	0.00 (-0.05, 0.04)	0.16 (0.11, 0.22)*	-0.02 (-0.07, 0.04)	0.10 (0.02, 0.18)*
High	0.05 (-0.02, 0.12)	0.06 (-0.02, 0.14)	0.26 (0.17, 0.36)*	0.01 (-0.09, 0.11)	0.11 (-0.03, 0.25)
Intercept	4.10 (3.98, 4.20)*	3.80 (3.68, 3.93)*	3.81 (3.65, 3.96)*	3.50 (3.35, 3.66)*	3.50 (3.27, 3.72)*
Explainable Variance (R^2)	0.052	0.051	0.037	0.023	0.048

*p<.05; 1 Estimates adjusted for sociodemographic characteristics included sex, age, education, number of dependent <18 years at home, home ownership, total years residing in neighbourhood, Canadian birth status and season of data collection.

Findings

- **Our sample consisted mainly of women, a higher proportion of residents between the ages of 45-64, from lower walkable neighbourhoods, with a university education and were home owners. Compared with MW and HW neighbourhoods, LW neighbourhoods had a significantly (p<.05) higher proportion of participants aged 18-29 years, home owners and those with children <18 years of age at home (table 1).**
- **Compared with LW neighbourhoods, respondents from MW neighbourhood had a significantly (p<.05) higher *PBC for VIGPA* (β = 0.06, 95CI 0.01-0.11) (table 2).**
- **Compared with LW neighbourhoods, respondents from MW and HW neighbourhoods had a signifcantly (p<.05) higher *PBC for WT* (MW: β = 0.16, 95CI 0.11-0.22 vs. HW: β = 0.26, 95CI 0.17-0.36), and MW had higher *intentions for WT* (β 0.10, 95CI 0.02-0.18) (table 3).**
- **No significant differences for any TPB constructs related to WR were found between levels of neighbourhood walkability (results not shown).**

Conclusions

- **Our findings suggest that neighbourhood walkability could encourage physical activity by influencing an individual's motivation to be physical active.**
- **Notably, PBC for VIGPA and WT, reflecting perceived internal and external barriers and constraints was higher among those in higher walkable neighbourhoods – a finding supported elsewhere.[5,6]**
- **Our findings and those elsewhere, suggest that social cognitions may mediate the causal pathway between the built environment and physical activity behaviour.[2,4-6]**
- **The built environment however, may influence physical activity via other pathways, for instance when individual's attempt to translate their intentions into behaviour (i.e., the intention-behaviour gap). More research is needed to investigate the different pathways.**

References

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