School Neighbourhood Environment and Active Transport to Secondary Schools in Dunedin, New Zealand

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Active Transport to School (ATS): Benefits

Travel to school by modes of transport reliant on physical activity, such as walking or cycling.

- **Adolescent active transport**
- **↑ daily PA**
- **Cycling to school associated with ↑ cardiovascular fitness**
- **↓ depressive symptoms**
- **Sustainable transport habits**
- **↓ traffic congestion**
- **↓ vehicle emissions**
- **Social interaction**
- **Community strengthening**
International Rates of ATS

Large variations in rates of walking or cycling to school

- Cycling tradition and culture
- Prioritising cycling-related infrastructure
- Traffic laws protecting rights of cyclists

Rates of walking and cycling to school have varied substantially over the past three decades.

Rates of ATS in Dunedin, New Zealand

Large across-school variability in rates of ATS

OGHS: 19.2%

Logan Park, Queens, Bayfield: >50%

Active Transport to School: Influences

Demographic factors
- Male gender
- Low SES
- Younger age
- Minority ethnic backgrounds
- Lack of parental supervision

Social Environment and Attitudes
- Parental concern: traffic and neighbourhood safety
- Cycling perceived as less safe
- Less parental and peer support for cycling

Built Environment Factors
- Distance to school
- Pedestrian and cycling infrastructure
- Attractiveness of environments
- Neighbourhood walkability
Built Environment and Active Transport

The built environment consists of the entirety of human designed and built places and facilities.

Micro-scale features
- Smaller environmental details that influence PA experiences
- Easier and cheaper to modify
- E.g. pedestrian/cycling infrastructure, road crossings, aesthetics

Macro-scale features
- Overall community design and structure
- Supportiveness of the environment for PA
- E.g. street connectivity, residential density
Measures of the Built Environment

Exist to identify and assess characteristics of the built environment for physical activity and active transport

Subjective measure
- To understand self-reported perceptions
- Survey format

Objective measure
- Quantify measureable environmental features
- Neighbourhood street audits or GIS analysis
Literature Gap

- The built environment and active transport has been well studied in adults and in primary school children.

- The influence of the school neighbourhood environment on adolescent ATS remains unknown.

- Future research could address this disparity and highlight the supportive or restrictive role of school neighbourhoods.
Purpose

To examine the association between the school neighbourhood built environment and the rates of ATS across all twelve secondary schools in Dunedin, New Zealand.
School-Specific Rates of ATS

ATS rates for adolescents living within 2.25 km of their school

n=471 (boarders excluded)
Do characteristics of the school neighbourhood built environment obtained from MAPS Global and GIS-based spatial analysis correlate with the rates of active transport across all twelve Dunedin secondary schools?
Microscale Audit of Pedestrian Streetscapes (MAPS) Global Tool

62 Questions; Subjective measures; Micro-scale features of Route, Segment, Crossing and Cul-de-sac

Route: Count both sides of the street

Section: Land use/destinations

1. How is audit information collected?
   - Foot (walked route)
   - Auto (drove route)
   - Both (walked & drove route)
   - Online (Streetview)

2. What types of residential uses?
   - Single family houses
   - Multi-unit homes (duplex, 4-plex, row house)
   - Apartments or condominiums
   - Apartments above street retail
   - None of the above

3. How many of the following types of non-residential destinations are present?
   a. Fast food restaurant (national or local chain, primarily sells burgers, chicken, pizza, etc.)
   - 0
   - 1
   - 2
   - 3
   - 4
   - 5+
   b. Sit-down restaurant or bar (all-ages)
   - 0
   - 1
   - 2
   - 3
   - 4
   - 5+
   c. Grocery/supermarket

4. What other street characteristics are present? (specify # of each type)
   - Traffic calming (signs, circles, speed tables, speed humps, curb extension)
   - Roll-over curbs (if whole segment = 1)
   - None of the above

5. Presence of street amenities
   - Check all that apply
   - Trash bins (public)
   - Benches or other places to sit
   - Bicycle racks
   - Secure bicycle access lockers or compounds
   - Kiosks or information booths
   - Hawkers/shops/carts
   - None of the above

Section: Aesthetics and Social

1. Do you observe pleasant hardscape features, such as fountains, sculptures, or art (public or private)?
   - Yes
   - No

2. Do you observe any natural bodies of water?
   - Yes
   - No

3. Do you observe softscape features such as gardens or landscaping (e.g., designated viewpoints, retaining walls, bark, ponds)?
   - Yes
   - No

4. Are the buildings well maintained?
   - 0%
   - 1-49%
   - 50-99%
   - 100%

5. Is landscaping well maintained?
   - 0%
   - 1-49%
   - 50-99%
   - 100%

http://sallis.ucsd.edu/measure_maps.html
Individual School Buffer-Zones

Micro-scale environment

Environmental audit of all street segments within a 500-m buffer of each school

St Hilda's Collegiate School
500 metre street network buffer

n=67 segments
**Objective Measures of Built Environment**

- Macro-scale environment
- Geographic unit of analysis: individual school neighbourhood environments
- Four separate street-network buffer-zones: 500 m, 1 km, 1.5 km and 2.25 km

- Land use mix
- Residential density
- Intersection density

GIS-based spatial analysis

Walkability index score
Buffer-Zones of Twelve Dunedin Secondary Schools

Four street-network buffer-zones: 500 m, 1 km, 1.5 km, 2.25 km
Research Question 2

Among adolescents who live within walking distance to school (≤2.25 km), do perceptions of the route to school correlate with school neighbourhood environment features (from MAPS Global and GIS-based spatial analysis)?
Perceptions of the Route to School

Six questions in the BEATS Student Survey:

- Hills along the route to school
- Lighting along the way
- Presence of traffic
- Dangerous crossings
- Stray dogs
- If the route to school was boring
Data Analysis

Micro-scale features
MAPS Global Tool

Macro-scale features
GIS spatial analysis

Adolescents’ perception of route to school

• Analysed between groups with above average, average and below average rates of ATS using ANOVA
• Categorical variables: Chi square-test
• Continuous data: mean±standard deviation or frequency
Significance and Implications

- Micro- and macro-scale neighbourhood features can have substantial influences on ATS
- Understanding the environmental characteristics which are associated with higher rates of ATS in Dunedin adolescents
- May contribute to the design or modification of school neighbourhood environments and interventions to enhance rates of ATS
Thank you!

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