Challenges for Active Transport to School in Urban and Rural New Zealand: Insights from the BEATS Research Programme

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www.otago.ac.nz/active-living

BEATS Team 2018: Multidisciplinary Expertise

BEATS Research Programme Report 2013-2018

New Zealand Physical Activity Report Card for Children and Adolescents 2018

Weight Status and Physical Activity in New Zealand Adolescents
Physical Activity (PA) in Dunedin Adolescents

Self-reported physical activity (n=1,300)

Guidelines: ≥60 min per day
Average: 4.2 ± 2.1 days/week
17.9% met PA guidelines

Mandic S et al. BMJ Open. 2016; 6:e011196

Accelerometer assessment of physical activity (n=314)

Average daily activity profile:
- Moderate-to-vigorous physical activity: ~1.0 hrs/day (<10%)
- Light physical activity: ~3.2 hrs/day (25%)
- Sedentary activities: ~9.6 hrs/day (79%)

39.2% met PA guidelines (45.6% boys, 36.0% girls; p=0.101)


Guidelines: ≥60 min per day
Average: 4.2 ± 2.1 days/week
17.9% met PA guidelines


Average daily activity profile:
- Travel to school: 21% driven, 20% walking, 19% cycling
- Travel to school: 32% driven, 27% walking, 27% cycling


Built Environment and Transport-Related Physical Activity

Activities: What people spend the majority of their time doing
- Leisure
- Home
- Transportation
- Occupation

Built Environment Settings: That support physical activity in these areas
1. Open space/nature
2. Urban design/services
3. Transportation
4. School
5. Neighbourhoods

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BEATS Research Programme at Otago

Built Environment and Active Transport to School (BEATS) Study
- Investigates:
  - transport to school habits,
  - the neighbourhood environment and
  - physical activity habits
in Otago adolescents.

www.otago.ac.nz/beats

Adapted from Sallis JF et al. Circulation. 2012;125:729-737

Mandic S et al. BMJ Open. 2016; 6:e011196
Significance

If effective, population level initiatives aimed to increase physical activity across all groups such as pedestrian and/or cycling infrastructure construction/improvements will contribute to improving health and wellbeing of communities.

Involvement of the key stakeholders facilitates the generation of usable data, relevant to the local context and generalisable to other areas, and the incorporation of new knowledge into policy and future initiatives.

Research Methodology

Adolescents & Parents
- Survey
- Maps; GIS Analysis
- Anthropometry
- Physical Activity
- School bag weight
- Focus groups
- Adolescents, Parents, Teachers
- Interviews
- School Principals

BEATS Research Programme (2013-2022)

URBAN

BEATS Cultural Study (2018-2019; in progress)

BEATS Study (2014-2017) (Dunedin)

BEATS Natural Experiment (2020-2022) (Dunedin)

RURAL

BEATS Rural Study (2018-2019) (Rural Otago)

BEATS Urban versus rural

Dunedin City

12 Secondary schools (100% school recruitment rate)

Otago Region

11 Secondary schools (73% school recruitment rate)

Disciplines & impact areas:
- Exercise Science
- Public Health
- Transport
- Built Environment
- Education

Partnerships:
- Academy
- City Council
- Schools
- Community

Spinn-off projects:

- Evaluation of cycle skills training programme (2016-2017)
- BEATS Rural Study: Rural Otago (2018-2019)
- BEATS Natural Experiment: Dunedin (2020-2021)

BEATS Cultural Study: Dunedin & Bay of Plenty: (2018-2019)

Research outputs:
- 103 Conference abstracts
- 15 Journal articles
- 1 Book chapter
- 21 Seminar presentations

BEATS Natural Experiment: Dunedin (2020-2021)

Projects:

BEATS Study (Dunedin 2014-2017)

12 Secondary schools 1780 Adolescents 355 Parents 14 Teachers 12 Principals

BEATS Rural Study (Rural Otago 2018-2019)

11 Secondary schools 1014 Adolescents 78 Parents 2 Principals

BEATS Cultural Study (Dunedin & Bay of Plenty 2018-2019)

12 Secondary schools 1014 Adolescents 78 Parents 2 Principals

Total sample of adolescents (n=2,656)

BEATS Study

BEATS Rural Study

BEATS Cultural Study

BEATS Natural Experiment

BEATS Urban versus rural

BEATS Natural Experiment: Dunedin (2020-2021)


BEATS Rural Study: Rural Otago (2018-2019)

BEATS Cultural Study: Dunedin & Bay of Plenty: (2018-2019)

Research outputs: (as of Feb 2019)

- 103 Conference abstracts
- 15 Journal articles
- 1 Book chapter
- 21 Seminar presentations

The Catalyst Project (planned 2020)

Academia

- Exercise Science
- Public Health
- Transport
- Built Environment
- Education

Team’s expertise:
- Exercise science
- Public Health
- Transport
- Built Environment
- Education

Advisory Board members:
- 10 Investigators

Members:
- Academia
- City Council
- Schools
- Community
- Transport sector

Projects:


12 Secondary schools 1780 Adolescents 355 Parents 14 Teachers 12 Principals

BEATS Rural Study: Rural Otago (2018-2019)

11 Secondary schools 1014 Adolescents 78 Parents 2 Principals

BEATS Cultural Study: Dunedin & Bay of Plenty (2018-2019)

12 Secondary schools 1014 Adolescents 78 Parents 2 Principals
Spin Off Projects

Cycle Skills Training Content and Delivery (2018-2019)

BEATS Study Symposia 2014 | 2016 | 2018 2nd 2019 1st 2017
(B20)

Comprehensive Dissemination of Research Findings
BEATS Research Programme Outputs to Date

Journal articles
Conference abstracts
Technical Reports
Presentations
Symposia

15 Published 2 in review 6 in preparation 1 Book chapter
28 International 25 Academic 38 Published (including 4 progress reports)
21 National 1 Non-academic

Last updated: Feb 2019

BEATS Research Programme Outputs to Date
38 Published (including 4 progress reports)
2 Keynotes
3 Invited Presentations
25 Academic
21 Non-academic
3 Local (2014; 2016; 2018)
2 International (2017; 2019)


Active Transport
Motorised + Active Transport
Motorised Transport
No significant difference across urbanisation settings
79.9% had a bicycle at home
75.8% had 2+ vehicles at home

Transport to School Habits across Otago

89.9% liked how they travel to school
38.8% 47.9% 58.5%
30% 40% 50% 60% 70% 80% 90% 100%
Main urban Semi urban Rural settlements

Mendic S et al. (abstract). ISBNPA 2019 (Accepted)

Threshold Distance for Walking and Cycling to School in Adolescents

Threshold distance for walking to school: ≤2.25 km
Sensitivity: 85% Specificity: 86% AUC: 93%

Walkable and Cycleable Distance to Secondary School in Dunedin

Average distance to secondary school in Dunedin: 6.2 ± 7.4 km

Walkable and Cycling Distances to Dunedin Secondary Schools

Within walkable distance: 32% (range: 6% to 64%)
Walking to school rates: 26% (range: 12% to 47%)

Within cycling distance: 53% (range: 37% to 79%)
Cycling to school rates: 1.5% (range: 0% to 7%)

Rates of Active Transport to School
(Living ≤4.8 from school; boarders excluded)

Rates of Cycling to School
(living ≤4.8 from school; boarders and mixed modes excluded)

Transport to School and Physical Activity in Dunedin Adolescents

Met physical activity guidelines
Active Transport (n=73) 47.9%
Active and Motorized Transport (n=185) 46.4%
Motorized Transport (n=56) 33.5%

Physical activity differences by transport mode were observed:
- In girls but not boys
- On school days but not weekend days
- Only during school commute time

Both active transport and combined active and motorized transport to/from school are potential avenues to increase daily physical activity in adolescents, particularly in adolescent girls.

Perceptions of Distance to School
(among adolescents living ≤4.8 km from school)

It is too far to walk to school.

It is too far to cycle to school.
### Adolescents’ Perspective

**Cycling versus Walking to School**

- **Health**
- **Enjoyment**
- **Discomfort**
- **Cost**
- **Preferences**
- **Less satisfied**
- **More satisfied**
- **Personal factors**
- **Family factors**
- **Environmental factors**
- **Destination characteristics**
- **Travel behaviour**
- **Less safe**
- **Safe routes**
- **Less support**
- **More support**
- **Factors related to transportation**
- **Factors specific to active transport**

**BEATS Student Survey (n=764)**
(adolescents living ≤4 km from school)


### The Tale of Two New Zealand Cities

**Dunedin**
(n=430)

- **38.4%**
- **47.2%**
- **1.9%**

**Christchurch**
(n=373)

- **16.9%**
- **50.9%**
- **17.7%**

**Future interventions should consider interpersonal factors, the social needs of adolescents and adolescents’ cycle skills**


### Adolescents’ Perceptions of Route to School for Walking or Cycling

- **35.6%**
  - Too much traffic
- **32.9%**
  - Too many hills
- **33.3%**
  - Boring route
- **32.4%**
  - Dangerous crossing(s)

**n=753**
(753 adolescents living ≤4 km from school)


### Parental Barriers to Active Transport to School

- **57.3%**
  - Convenience of trip chaining
- **37.2%**
  - Fewer barriers for walking compared to cycling
- **41.6%**

**Future interventions should address parental barriers for active transport to school (especially for cycling).**

**Mandic S et al. (Abstract); OERC Symposium 2016 and ISBNPA 2017**

### Perceptions of Safety

- **It is unsafe to walk to school.**
  - **Adolescents’ concerns**
  - **Parental concerns** (reported by adolescents)
  - **Urban**
  - **Semi-urban**
  - **Rural**

  - **12%**
  - **9%**
  - **0%**

  - **13%**
  - **8%**
  - **3%**

- **It is unsafe to cycle to school.**
  - **Urban**
  - **Semi-urban**
  - **Rural**

  - **45%**
  - **23%**
  - **9%**

  - **31%**
  - **15%**
  - **4%**

**Mandic S et al. (abstract); ISBNPA 2019 (Accepted)**

### Perceptions of Cycling to School

- **From Student and Parental Focus Groups**

  - **Perceived safety:**
    - A complex range of factors including:
      - Features and perceptions of the built environment
      - Traffic safety (including behaviours of other road users)
      - Previous cycling experiences (including accidents)
      - Adolescents’ cycling skills and on-road experiences
  - **Implicit messages**
  - **Social norms**


**Dr Debbie Hopkins (Oxford)**
Cycle Skills Training: Perceptions and Evaluation

Cycle skills training could make adolescents safer in traffic

39% of adolescents
73% of parents

Interventions should capitalize on this interest

(BEATS Spin-off project)

Effects of Cycle Skills Training (CST) in Children

Pre-training Post-training
Traffic-Free CST
(n=166)
Traffic-Free + On-Road CST
(n=265)
No change
Improved
Improved
Improved
Improved
Improved
Improved
Improved
No change
No change
No change
No change
No change
No change
No change
No change

Cycling-related knowledge
Self-perceived confidence to cycle ...
... in parks/reserves ...
... on the road ...
... to school
Cycling behaviours and preferences
Rates of cycling to school
Cycling as a preferred mode of transport to school

To achieve behavioural change, additional interventions may be necessary.


Cycle Skills Training (CST) in Adolescent Girls

Pre-training Post-training
Traffic-Free CST
(n=43)
Traffic-Free + On-Road CST
(n=74)
No change
Improved
Improved
Improved
No change
Improved
Improved
No change
Improved
Improved
No change
Improved
Improved

Cycling-related knowledge
Self-perceived confidence to cycle ...
... in parks/reserves ...
... on the road ...
... to school
Cycling behaviours and preferences
Rates of cycling to school
Cycling as a preferred mode of transport to school

Future CST programs should be tailored to adolescents’ needs and preferences.


Enablers of Cycling to School: Adolescents’ Perspective

41.4%
40.1%
36.4%
26.2%
32.7%
22.1%

Cycle-friendly uniform
Safer bike storage at school
Slower traffic
Bus bike racks free of charge
Bike ownership
Cycling without a helmet


Cycle Helmet Legislation as a Barrier to Cycling to School

22%

Adolescents would cycle to school more if helmet use was not mandatory

Significant factors:
• Distance to school
• Māori and other ethnicities (vs. NZ European)
• Cycling to school is ‘not cool’
• Cycling often with friends
• Boring route to school
• Cycling as a great way to exercise (+)

Recommendations:
Design educational interventions to influence adolescents’ attitudes towards the use of helmets.
Could be offered as part of cycle skills training.

Molina-García et al. (2018) J Transp Health. 11, 64-72
Active transport users were less likely to report heavy school bags.

School Bag Weight as a Barrier
- 68% of parents
- Adolescents: 58% for walking
- 66% for cycling

Full bag weight: 5.6 kg (± 2.1 kg)
37.9% of adolescents’ body weight
9.3% (± 3.9%) of adolescents’ body weight

Active transport users did not differ by mode of transport to school.

Actual school bag weights did not differ by mode of transport to school.

Higher rates of active transport to school:
- When distance to school is <1.3 km compared to greater distances
- In boys versus girls
- In medium decile compared to high decile schools
- In home neighbourhoods with higher versus lower street connectivity

New Zealand’s Systematic Meta Analysis
- Maps with route to school
- 1,462 digitized segments
- 347 (24.3%) marked as ‘unsafe’

Adolescents perceptions of ‘unsafe’ segments:
- 50.2% Built environment characteristics (roads, intersections, lack of footpaths)
- 39.6% Traffic safety (vehicles, traffic)
- 25.5% Personal safety (people, dogs, street lighting)
- 6.3% Other (weather-dependent, winds, glare)
School Choice and Transport to School

When you enrolled, was this the secondary school closest to your home?

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<th>School Code</th>
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n=1,465

Boards excluded


Implications of School Choice Decisions on Active Transport to School

Without school zoning, 51.3% of adolescents enrolled in the closest school.

- Distance
- Importance of school proximity to home
- Co-educational school status

School choice has implications for education, health, transport and environment


Adolescents' perspective

Programmes and facilities

- 52.3% Facilities
- 46.3% Sports programmes
- 33.0% Cultural programmes

Reasons for school choice

- Positive feedback from students and parents
- Comments from students and parents

Social connections

- 55.7% Students enrolled
- 25.1% Sibling(s) went or enrolled
- 35.1% Parents attended
- 27.0% Parents attended
- 63.6% Preferred co-ed

Co-ed status

- 25.3% Preferred single-sex school
- 7.3% Other reasons

Proximity

- 36.5% Closest school to home

Other

- 5.9% Other


Next Challenge: BEATS Natural Experiment (2020-2022)

Exposure areas:
- Cycling infrastructure constructed since 2014
- 'Exposure' schools: Cycling infrastructure
- 'Exposure' schools: Pedestrian infrastructure
- Control schools

Follow-up data (2020/2021) (≥10 schools)

Baseline data (BEATS2014/2015) (12 schools)

Adolescents (n=797)
(Special character (integrated) schools and schools with zoning excluded)
(Students from 6 out of 12 Dunedin secondary schools (50%) included in the analysis)

Without school zoning, 51.3% of adolescents enrolled in the closest school.

Distance

Importance of school proximity to home

Co-educational school status

Social feedback

Closest school

Distant school

46.5% 8.6%

School choice has implications for education, health, transport and environment


BEATS Natural Experiment: Assessments

- Data collection at schools (120-150 students per school; 1 school period)
- Online survey
- Height & weight
- School bag weights

- GIS Analysis
- Environmental scan of school neighbourhoods

- Physical activity (40-50 students per school)
- Mapping route & school neighbourhood (50 students per school)

- Focus group (6-8 students per school)

Summary: Factors Influencing Active Transport to School in Otago Adolescents

Policy Environment

Built Environment

Social/Cultural Environment

Individual

- School choice policy
- School uniforms
- Cycling helmet legislation
- Distance to school
- Built environment features
- Perceptions of safety
- Built environment features
- Perceptions of safety
- Built environment features
- Perceptions of safety

Future research:
- Urban versus rural settings
- Walking versus cycling
- Understanding local context

Adapted from Sallis JF et al. Circulation. 2012;125:729-737

Mandic S et al. BMJ Open. 2016; 6:e011196

Online survey
GIS Analysis
Physical activity
Mapping route & school neighbourhood
Focus group

Online survey
GIS Analysis
Physical activity
Mapping route & school neighbourhood
Focus group
Policy Implications

- Different interventions and approaches are required for increasing rates of walking versus cycling to school.
- Different interventions are required in urban versus rural settings.
- Minimise adolescents’ and their parents’ safety concerns related to walking and cycling to school.
- Promote mixed modes of transport to school when relying solely on active transport is not feasible.
- Encourage and support evaluations of the effectiveness of active transport-related infrastructure changes in short-, medium- and long-term.
- Consider implications of other relevant policies such as education policies related to school choice, school uniforms and school bag requirements.