

Objectively Measured Commute Distance: Associations with Actual Travel Modes and Perceptions to Place of Work or Study in Auckland, New Zealand

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Background: Little is known about the relationships between objectively measured commute distance with actual and perceived transport-related physical activity (TPA) engagement. *Methods:* A telephone survey assessed travel behaviors to place of work/study within an adult sample ($n = 772$) residing in New Zealand. *Result:* Overall, 50% of respondents perceived they could, and 10% of the sample actually did, use TPA modes to commute to their occupation for distances less than 5 km. Differences between TPA perceptions and engagement existed for all distance classifications, and prevalence declined as distances increased. *Conclusions:* Differences between TPA engagement and perceptions were evident. Actual and perceived TPA engagement levels declined as commute distance increased.

Key Words: Geographical information systems; physical activity; transport; occupation; adults

Motorized transport is now the dominant form of travel for the majority of developed countries, contributing in part to increased traffic congestion, air pollution, and diminishing community cohesion.¹ Simultaneously, physical inactivity is a major public health concern for these countries.² One potential solution to minimize problems associated with automobile reliance and physical inactivity is to promote transport-related physical activity (TPA) modes for traveling short distances. Research has shown individuals who engage in TPA modes have shorter self-reported network distances to their occupation than those who commute by automobile.³ Although commute distance plays a pivotal role in transport modal choice, perceptions should also be considered. An Australian study reported that time travel perception was the most common barrier to TPA/transit engagement to university for employees and students, followed by perceived commute distance.⁴

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This study builds the commute distance evidence by using geographical information systems (GIS) route measures, actual travel mode, and TPA perceptions in relation to accessing place of work/study for the first time using an adult regional representative sample.

Methods

Study Sample

The Active Friendly Environments Survey (AFES) was implemented in a representative adult sample (≥ 16 y of age) of North Shore City, (Auckland, New Zealand) residents in 2005. Participants were drawn randomly from the electronic telephone white pages and contacted through computer assisted telephone interview procedures. Overall, 2000 respondents were recruited (31% response rate). Consent was provided prior to participation and the Auckland University of Technology Ethics Committee approved the study.

AFE Travel Mode Measures

The TPA component reported typical travel modes for commuting from residence to occupation. Respondents were asked “How do you usually get to and from your place of work/study?” Answers were collapsed into three travel mode categories: motorized, TPA, and transit/combined.

AFE TPA Perceptions

Participants reported whether they recognized they could engage in TPA modes to access their occupation from their residence by responding yes or no to the question: “Do you think that you could access your place of work/study by traveling on foot or cycling?”

Commute Distance

Commute distances between residence and place of work/study were calculated using ArcView version 9.1 OD Cost Matrix function GIS software. Residential and place of work/study addresses were obtained directly from respondents and geocoded. The shortest street network distance between the points was calculated in kilometers (km) for every resident. Distances were collapsed into four categories.

Statistical Analysis

Proportions and exact associated confidence intervals were made based on the binomial assumption. Crude and adjusted relative risk estimates were made using binary logistic regression analyses. Statistical comparisons were made using SPSS version 11.5 and Stata version 8.0.

Results

Overall, 772 respondents from the sample were eligible for analysis as they resided and engaged in an occupation within North Shore City. Motorized travel was the dominant mode of transport to access place of work/study (87%; $n = 673$), followed by TPA (10%; $n = 75$) and transit/combined (3%; $n = 24$) travel modalities. Table 1 outlines the overall respondent profile, which was similar to North Shore City census data.⁵

A total of 75 people engaged in TPA to access their place of work/study, and 50% ($n = 385$) of all respondents perceived they could access their occupation by TPA modes. Those age 30 y and under were more likely to engage in TPA modes to commute to place of work/study when compared to other age categories, and respondents with trade qualifications were more likely to engage in motorized transport relative to other education classifications. Women were more likely to recognize they could employ TPA modes for commuting to their occupation in comparison to men.

Figure 1 outlines the relationship between commute distance with actual and perceived TPA modes for accessing place of work/study. Participants' perception and actual use of TPA both showed declines as commute distances increased. Table 2 further reveals the likelihood of an individual traveling to work by TPA modes decreasing as commute distance increases.

The group of importance for public health is those who do not use TPA, but perceive they can, therefore we excluded those who engaged in TPA modes for the final analysis. Perusal of Table 3 reveals a strong association between non-TPA mode respondents perceiving they could employ TPA modes to access their occupation and commute distance (P -value < 0.001). The likelihood of these individuals perceiving they could use TPA modes to access their place of work/study decreased as commute distance increased.

Discussion

This study confirms that individuals who lived closer to their occupation were more likely to actually, and perceive they could, engage in TPA modes to access their place of work/study. Perception prevalence levels were substantially higher than current TPA engagement. Almost all respondents (97%) identified they could use TPA modes to access their occupation for distances 1 km or less, however, less than half (46%) of this population currently employed TPA modes for this distance. Steady declines in TPA engagement and perceptions were also shown as commute distance increased. Despite the reduction in actual and perceived TPA engagement with longer distances, when the 5 km WHO TPA advocacy threshold¹ is applied to our findings, 47% of the adult working/studying population commuted within this distance parameter, 68% of this group perceived they could use, and 18% actually used, TPA modes for commuting purposes. As such, TPA promotion for up to 5 km appears to be a reasonable public health recommendation. These findings concur with previous research using an online survey with university staff and students ($n = 2210$). Shannon et al.,⁴ reported 30% of staff and students perceived they could replace their current motorized travel mode to university with TPA means,

Table 1 Demographic Profile of Adults Who Currently Access, and Perceive They Can Access, Place of Work/ Study by TPA Engagement

	Sample profile		Actual TPA engagement		Perceived TPA engagement		P-value
	n	(%)	n	(%)	n	(%)	
Gender							
Male	306	(40)	37	(49)	173	(45)	<0.01
Female	466	(60)	38	(51)	212	(55)	
Age (y)							
≤ 30	210	(30)	36	(51)	118	(34)	0.26
31-50	155	(22)	14	(18)	74	(21)	
51-70	194	(28)	9	(13)	95	(27)	
> 70	134	(19)	12	(17)	63	(18)	
Ethnicity							
NZ European	500	(66)	53	(71)	262	(69)	0.19
Maori	36	(5)	5	(7)	18	(5)	
Pacific Island	12	(2)	3	(4)	8	(2)	
Asian	72	(10)	5	(7)	28	(7)	
Other	135	(18)	9	(12)	65	(17)	
Education							
No high school	84	(11)	21	(28)	47	(12)	0.35
High school only	169	(22)	20	(27)	82	(21)	
Trade, diploma, or certificate	204	(26)	8	(11)	93	(24)	
University degree or higher	315	(41)	26	(35)	163	(42)	
Household income (NZ\$)							
< 20,000	59	(9)	11	(18)	30	(9)	0.39
20,000-40,000	106	(16)	11	(18)	45	(14)	
40,001-80,000	259	(39)	23	(38)	126	(38)	
80,001-120,000	161	(24)	13	(22)	85	(26)	
> 120,000	77	(12)	2	(3)	43	(13)	

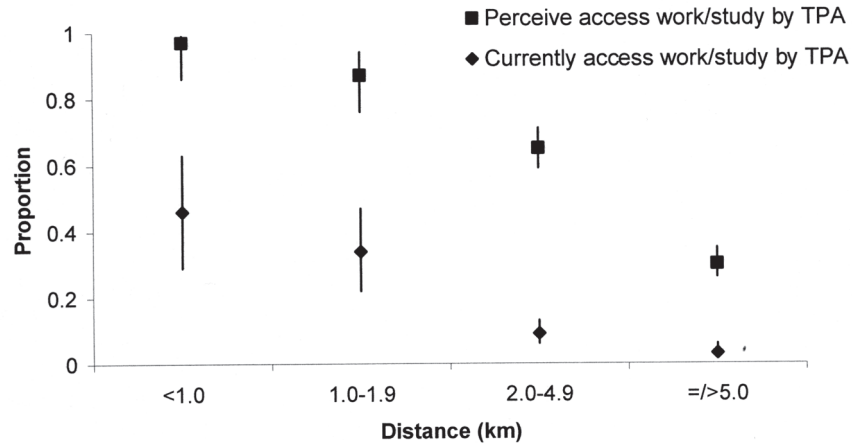


Figure 1—Population proportions of actual and perceived access to place of work/study by TPA modes compared by commute distance.

with a strong relationship between commute distance, time travel, and travel mode evident. Our findings are consistent with other self-reported commute distance and travel modality findings.³

Although this study clearly showed the relationships between actual travel modes, perceptions of accessing place of work/study by TPA means, and commute distance, limitations were evident. These include the cross-sectional design, the small sample size, and basing perceptions and travel modalities on self-report. Measuring perceptions of TPA modes is problematic; recognition of TPA participation may not associate strongly with engagement. Nevertheless, perceptions serve to provide a rudimentary indication of TPA acceptance.

Conclusions

There is considerable recognition of acceptability for TPA modes for distances 5 km or less. Substantial divergences, however, between travel behaviors and perceptions exist. Prospective work in this field should focus on shifting perceptions to behavior change and developing infrastructure that supports reduced commute distances.

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Table 2 Travel Mode Prevalence and Logistic Regression Models of TPA Engagement Defined by Commute Distance

Distance (km)	TPA travel		Motorized travel		Crude RR	95% CI	Adjusted RR ^a	95% CI
	n	(%)	n	(%)				
< 1.0	17	(23)	18	(3)	1.0	referent	1.0	referent
1.0 - 1.9	21	(28)	37	(5)	0.6	0.3 - 1.4	0.4	0.1 - 1.3
2.0 - 4.9	23	(31)	230	(34)	0.1	0.05 - 0.2	0.1	0.03 - 0.3
≥ 5.0	14	(19)	388	(58)	0.04	0.02 - 0.1	0.04	0.01 - 0.1

CI = confidence interval; km = kilometer; RR = relative risk

^aRR adjusted by gender, age, ethnicity, education, and household income

Table 3 Travel Mode Prevalence and Logistic Regression Models of Perceiving Can Engage In TPA to Access Place of Work/Study Defined by Commute Distance

Distance (km)	Perceived TPA engagement				Crude RR	95% CI	Adjusted RR ^a	95% CI
	Yes		No					
	n	(%)	n	(%)				
< 1.0	17	(6)	1	(0)	1.0	referent	1.0	referent
1.0 - 1.9	29	(10)	8	(2)	0.2	0.02 - 1.9	0.4	0.05 - 4.3
2.0 - 4.9	137	(48)	93	(24)	0.1	0.01 - 0.7	0.1	0.02 - 1.1
≥ 5.0	103	(36)	285	(74)	0.02	0.003 - 0.2	0.04	0.02 - 0.3

CI = confidence interval; km = kilometer; RR = relative risk

^aRR adjusted by gender, age, ethnicity, education, and household income

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