

Perceived environmental correlates of walking and cycling in urban and rural areas in the Netherlands

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Abstract

Physical activity, such as walking, is important for health. It reduces the risk of coronary heart diseases, diabetes, hypertension, obesity and some forms of cancer. Whereas traditionally research focused on individual factors, such as attitudes and socio-demographic factors, the importance of the physical environment in facilitating or constraining walking is more and more acknowledged. A better understanding of the relations between perceived environmental characteristics and walking and cycling would enable more successful interventions aimed at increasing physical activity. In this short paper we describe the preliminary results of an internet survey carried out in the Netherlands. The internet survey contains questions on walking and cycling frequencies as well as the perception of the natural and built infrastructural environment (road connections, quality of sidewalks and bike lanes, lighting, aesthetics etc.). Besides, socio-demographic variables (age, neighborhood, income etc.) are surveyed, which made it possible to control for these possibly confounding variables. Data showed that inhabitants of a strongly urbanized environment have higher frequencies of cycling than inhabitants of a non-urbanized environment. Furthermore, weight and education appear to be related to the living environment. Further Analyses are currently being conducted.

Brief biography of the authors

Maartje de Goede received her PhD in Experimental Psychology on her thesis 'Gender differences in Spatial Cognition' at Utrecht University (The Netherlands) in 2008 and is currently working the Traffic Behaviour Department of TNO, BU Human Factors, at Soesterberg. She is working on several traffic behavioural research projects on drivers' decision-making in traffic and individual differences with respect to traffic safety. She provides advice, designs and executes research projects on Human Factors issues in traffic, especially related to vulnerable road users.

Tineke Hof has a major in Social Psychology and is currently working as a research scientist at TNO Human Factors. She develops and applies knowledge about understanding, influencing and changing human behaviour in traffic, especially of elderly people and vulnerable road users such as pedestrians and bicyclists.

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Introduction

The physical activity levels of populations of industrialized countries have steadily declined in the last three decades (World Health Organization, 2002). Our current environment tends to discourage physical activity: increased car ownership and improvements in roadway infrastructure for the purposes of automobile use have resulted in significant reductions in the frequency and length of active forms of transport (Cerin, Leslie & Owen, 2009). Physical inactivity is yet a major contributor to many of the leading causes of death, including obesity and chronic disease (Lorenc, Brunton, Oliver, Oliver & Oakley, 2008). Besides the different significant health benefits of physical activity, encouraging active modes of transports will also give a considerable amount of advantages for the environment (Titze, Stronegger, Janschitz & Oja, 2008; Booth, Owen, Bauman, Clavisi & Leslie, 2000). Switching from driving to walking or cycling is important for reducing CO₂ emissions (Jacobsen et al., 2009)

Social ecological models have increasingly been applied to understand the determinants of physical activity and inactivity. Ecological models specify that physical environments, social environments and personal-level attributes may influence health behaviour and physical activity. There is a growing body of evidence showing that characteristics of the build environment has a significant influence on the active lifestyle choices of adults, particularly walking for transport (Cerin et al., 2007; Giles-Corti et al., 2009)

Walking is the most common form of physical activity among adults (Cerin, Leslie, du Toit, Owen, Frank, 2006). Therefore, to date, the majority of studies focused on determinants of walking. But in the Netherlands, there is a strong cycling culture: of the 16 million inhabitants more than 13 million people own a bicycle and The Netherlands has the highest cycle-density and the most cycle-tracks in the world (Stichting Landelijk Fietsplatform Nederland, 2009). Whereas in most countries the bike has a recreational function, the bicycle is pre-eminently a means of transport in the Netherlands.

A better understanding of the relations between perceived environmental characteristics and walking and cycling would enable more successful interventions aimed at increasing physical activity. Therefore, our primary interest is to determine the independent associations between physical environmental variables and walking and cycling to go to and from places, while considering personal (self efficacy) and social environmental factors as possibly modulating factors. Self efficacy is concerned with people's belief in their capabilities to perform a specific action required to attain a desired outcome. Regarding social environmental influences subjective norms and social support were assessed. Subjective norms can be divided in what significant others think the person should do and what significant others are perceived to do with respect to the behaviour in question. Significant

others are individuals or groups whose preferences about a person's behaviour in this domain are important to him or her (Ajzen, 2006).

Studies into the influence of the built environment have largely occurred in urban settings, despite the fact that urban and rural physical environments are extremely different. These differences often make findings obtained in urban settings invalid in rural settings (Moore, 2010). Therefore, this study distinguishes people who are living in non urban (rural), moderately urbanized and strongly urbanized areas in investigating which factors influence transport related physical activity. A question of primary interest is whether dependencies between perceived environmental characteristics and physical activity differ between people from rural and urban areas. Besides, it is hypothesized that different (perceived) environmental characteristics are important for walking and cycling (see Figure 1).

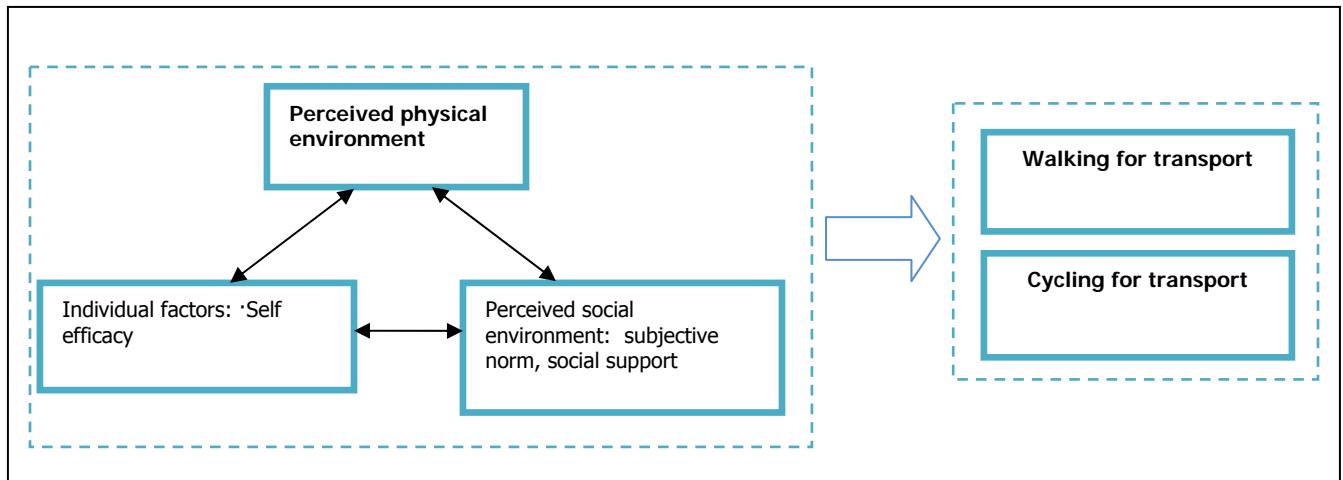


Figure 1 Conceptual model of associations between individual factors, perceived physical environment & social physical environment, and walking and cycling for transport

Methods

Participants

An e-mail, included with an URL to a web based questionnaire, was sent to different panels. At the same time we ask the participants to forward the e-mail to other possible participants. A lottery-based incentive was provided. In total 1137 people opened the internet survey of whom 803 (70.6%) completed the whole questionnaire. Participants were all Dutch inhabitants aged 17-80 years.

Questionnaire

A web based survey was conducted in August en September 2010. Questions were on: demographic characteristics, the amount of physical activity for transport (walking and cycling), perceived environmental attributes, self efficacy and the social environment. The time it took to fill out all the questions was approximately 20 minutes.

Perceived urbanization

Participants were asked for the perceived urbanization of their living environment. Three levels could be dissociated; non urban (rural), moderately urbanized and strongly urbanized.

Demographic characteristics. This part of the survey included questions on age, gender, education, health status, height, weight, availability of bicycle and/or car, zip code.

Independent variables

Based on a review of published studies on walking and cycling, behaviour change models and the 'Neighborhood Environment Walkability Scale' (Saelens, Sallis, Black & Chen, 2003) a list of built-environment, social environment and personal items for transportation-related physical activity was generated.

Perceived environmental attributes. Sixteen items were used to assess the perceived environment. Based on Pikora et al. (2003), questions concerning 'functionality', 'safety', 'aesthetics' and 'destination' concerning the built environment were included. The items were rated on a seven point Likert Scale, ranging from 'strongly disagree' until 'strongly agree'.

Self efficacy. Self-efficacy for performing transport related walking and cycling was assessed with four items using a seven point Likert scale from 'very difficult' to 'very easy'. Respondents were required to rate how easy or difficult it is to cycle for transport to their most visited destination: 'even when the weather is bad', 'when it is very hot outside', 'when you are tired' and 'when you feel you don't have time'.

Social influences. Respondents were asked to rate on a seven point Likert scale ranging from 'strongly disagree' to 'strongly agree' expressions related to opinions on physical activity of friends and family.

Dependent variables

Physical activity. The amount of transport related physical activity was measured through the following two questions: Which destination(s) did you visit? And how much time did you spend on walking, cycling or traveling by train, bus, car, tram or another kind of vehicle to get to and from these places. Each question needed to be answered per day of an average week. We computed the total amount of minutes that people walk, cycle or use any other means of transport to get somewhere.

Results (preliminary)

Level of urbanization

When respondents were classified based on how they perceived their environment, 264 people (28.9 percent) lived in a rural environment, 242 people (28.9 percent) lived in a moderate urban environment and 331 (39.6%) lived in a strong urban environment (see Table 1) .

Demographic characteristics

Table 1 shows the demographic characteristics of the participants. The amount of participants with a high education living in a highly urbanized environment (46,5%) was significantly larger than the amount of participants with a low education living in a highly urbanized environment (16.7%; $\chi^2 = 30,59$, $p < 0.05$). There was also found an association between surroundings and BMI. The proportion of respondents with a BMI > 25 lives more often in rural environments than in urbanized environments

($\chi^2 = 9,567, p < 0.05$). There were no significant gender differences: as much men as women lived in the different environments concerning urbanization level.

	Non urban (rural)		Moderately urbanized		Highly urbanized	
	N	(%)	N	(%)	N	(%)
Gender						
Female	115	(54)	104	(52)	154	(55)
Male	98	(46)	97	(48)	127	(45)
Age (yr)						
17 – 20	4	(2)	6	(3)	4	(1)
21 – 30	40	(19)	48	(24)	125	(45)
31 – 40	23	(11)	33	(16)	53	(19)
41 – 50	40	(19)	43	(21)	43	(15)
51 – 60	61	(29)	45	(22)	45	(16)
61 – 70	41	(19)	24	(12)	11	(4)
71 – 80	4	(2)	2	(1)	0	
Education						
Low	27	(12)	18	(9)	9	(3)
Moderate	54	(23)	52	(25)	43	(14)
High	132	(56)	131	(64)	229	(75)
Availability of a car						
Never	8	(3)	13	(6)	62	(20)
Sometimes	20	(9)	24	(12)	71	(23)
Regularly	24	(10)	26	(13)	28	(9)
Always	182	(78)	143	(70)	146	(48)
Availability of a bicycle						
Yes, normal	221	(94)	200	(97)	301	(98)
Yes, electric	5	(2)	3	(2)	1	(0)
Yes, both: normal & electric	7	(3)	2	(1)	3	(1)
No	1	(0)	1	(0)	2	(1)
Health Status						
Bad	0	(0)	0	(0)	0	(0)
Moderate	4	(2)	2	(1)	4	(1)
Average	24	(11)	18	(9)	12	(4)
Good	139	(65)	127	(63)	156	(56)
Very good	46	(22)	54	(27)	109	(39)

Table 1 Demographic characteristics

Physical activity

Table 2 gives an overview of the mean time that is spent on transport activity for each level of urbanization. Participants living in strongly urbanized locations cycled significantly more minutes for transport than did participants in non urban locations ($F = 5.93, p < .05$).

	Non urban (rural)		Moderately urbanized		Highly urbanized	
	N	Mean (minutes)	N	Mean (minutes)	N	Mean (minutes)
Cycling to get to and from places	229	145	202	163	303	192
Walking to get to and from places	229	89	202	97	303	92
Other kind of vehicles	229	260	202	231	303	215
Active transport	229	235,	202	260	303	283

Table 2 Mean time (in minutes) spent in cycling, walking and using other means of transport for different levels of urbanization of the living environment

Conclusion (preliminary)

These preliminary results show that cycling is dependent on the urbanization level of the living environment, i.e. people who perceived their environment as strongly urbanized cycled more in an average week than people living in a area perceived as rural. This might be explained by the fact that since rural areas have a low population density, there is a higher likelihood that rural residents live further away from facilities. Living close by facilities, like for example shops and facilities, will encourage people to walk or cycle. At the same time the high density of cars, high parking rates and a scarcity of parking places in Dutch city centres will promote bike use in more urbanized locations. Nevertheless, in rural areas there is more green space which is assumed to promote physical activity (Maas, Verheij, Spreeuwenberg, Groenewegen, 2008). Apparently this is not the case for physical activity for transport. Further analyses have to provide insight on whether other physical attributes of the environment, besides green space, relate to peoples' physical activity for transport, and whether these attributes differ for walking and cycling. Moreover these dependencies might be modulated by the level of urbanization of the living environment. To exclude the influence of self efficacy and the social environment, these factors will be included as control variables.

Another interesting finding is that the level of urbanisation of one's environment appears to relate to education level and body mass index. Inhabitants of rural areas have in general a lower education level and a higher body mass index than inhabitants of urbanized areas. Further analyses might provide insight in the possible interaction of these factors with physical activity.

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