IATSS Research 38 (2015) 125–129

Contents lists available at ScienceDirect

IATSS Research

Research article

Walking to school in Scotland: Do perceptions of neighbourhood quality matter?

E.O.D. Waygood [a,*], Y.O. Susilo [b]

[a] École supérieure d'aménagement du terroire et de développement régional (ÉSAD), Université Laval, Canada
[b] Department of Transport Science, Royal Institute of Technology (KTH), Stockholm, Sweden

ARTICLE INFO

Article history:
Received 29 May 2014
Received in revised form 9 December 2014
Accepted 26 December 2014
Available online 6 January 2015

Keywords:
Children
Reasonable distance
Neighbourhood perceptions
Walking
School

ABSTRACT

A decrease in active travel has been observed over the past years in many Western countries including Scotland. A large part of this is likely due to the greater travel distances. However, previous research has suggested that perceptions of one's neighbourhood may also affect walking levels. If parents fear crime or traffic levels, or feel that their neighbourhood is of low quality they may not let their child walk. These perceptions are subjective and may be interlinked to each other. It is important to understand which perceptions matter more than others, in order to design the most suitable policy to promote more active travel behaviour among children. Using the Scottish Household Survey, this study investigates how or whether 48 different perceptions of neighbourhood quality or 11 reasons for having chosen their house affect children walking to school. A variable attrition method was used to reduce the number of variables for modelling. When walking distance, household characteristics, and built environment are included in a binary regression model only two perceptions were found to be significant: *good local shops* and *slow/safe traffic*. Implications of the findings are discussed.

1. Introduction

Like other Western developed countries [1,2], Scotland experienced a significant reduction in the number of children walking to school in the past few decades, from 69% in 1986 to 54% in 2005 [3]. Active travel (such as walking or cycling) to school is important for various reasons, including reduced energy consumption, and it has been associated to greater overall physical activity [4,5]. Further justifying the focus of research on this specific aspect of children's travel, trips for education account for the largest segment of trips (30%) by children in Scotland [3]. Like other trips, distance is a major explanatory factor along with available transportation choices. In addition to those hard factors, soft factors such as parents' opinions and perceptions of different qualities of a neighbourhood will affect whether or not they allow their child(ren) to walk. In this paper, we examine how or if such opinions and perceptions affect children's travel to school in Scotland when a reasonable walking distance is taken into account.

One benefit of walking to school is the intrinsic exercise gained, thus contributing to physical health (for a review see [6]). Using active modes such as walking or cycling incorporates low-impact exercise into a child's daily life [7]. In addition to that, a number of separate studies found that children who use active travel to get to school are also associated with greater levels of physical activity overall for boys in the UK, Denmark, and the USA [4,5,8].

Recently, research on children's travel has begun to move beyond simply the physical health implications of travel mode. Westman et al. [9] found that children who were driven to school were more likely to be less alert (based on an activation scale between alert and sleepy) than other modes. Other authors have discussed the relationship between social interaction and subjective well-being (a global measure of well-being) and how children report that social interaction while they walk to school makes it fun and enjoyable [10]. Potentially increasing social interaction, children who walked to their destination were the most likely to see others that they knew while travelling between their origin and destination in contrast to those who rode in cars, where a strong negative correlation with seeing anyone was found [11]. Thus, walking may provide more than just physical health benefits or reductions in energy consumption and congestion.

A significant amount of research, in particular from the USA, has examined what contributes to or detracts from the likelihood of children walking to school (for a review see [12]). Those studies consistently found that distance was the strongest explanatory factor. In contrast to those findings, Waygood and Kitamura [7] showed that in Osaka, Japan children aged 10 and 11 years old walked to local schools regardless of distance, though maximum distances were likely under 3 km as the maximum walking time was 40 min. Therefore, though distance

* Corresponding author at: Pavillon Félix-Antoine-Savard 2325, rue des Bibliothèques Local 1622 Quebec, QC, G1V 0A6, Canada.
E-mail addresses: owen.waygood@esad.ulaval.ca (E.O.D. Waygood), yusak.susilo@abe.kth.se (Y.O. Susilo).
Peer review under responsibility of International Association of Traffic and Safety Sciences.

http://dx.doi.org/10.1016/j.iatssr.2014.12.002
0386-1112/

can be a strong explanatory factor, it is necessary to consider other influences.

Considering that there is likely some limit to what a reasonable walking distance is, some papers have used increments of 0.5 miles [13,14], 0.5 km [15], or categories [16]. Other authors have used dummy variables based on the average distance deemed walkable by parents [17]. Some of that research [13,15,17] on why children are driven to school also found that even children who live less than the smallest increments used (0.5 miles or 0.5 km) were chauffeured by car. Thus, taking into consideration that this distance might vary between cultures and that 0.5 miles is not equivalent to 0.5 km (0.5 miles is roughly 0.8 km), there appears to be a gap in knowledge about country-specific "reasonable" walking distance. Such a threshold is likely an important explanatory factor in children walking to school.

Thus, though distance is one of the strongest known explanations of children walking to school, it is not the complete picture. To understand other influences on children's travel some authors have examined the reasons that parents give as to why their children do or do not walk to school. When parents are asked why they drive children to school, frequent answers that do not relate to distance are not only often tied to safety concerns such as fear of child abduction or "stranger danger" [13,2,18] and traffic danger [2,19,18], but also the parent's convenience [13,15,20]. Related to convenience, a parent's usual means of travel might also explain a child's mode as Susilo and Liu [21] found that a parent's habit of routinely travelling by non-motorised modes was positively correlated with children's active travel. In contrast to the study presented in this paper, those studies were based on transportation surveys examining the problem of children not walking to school, so parents would likely be giving responses to justify why their child is not doing the preferred behaviour.

The propensity of children to walk to school may also depend on the quality of the physical environment. Related to traffic safety, parents in Australia were concerned about safe crossings and large roads [22]. A UK study on attitudes towards walking and cycling [23] found that car culture dominates consideration of mode choice, which was built off fear and poor perceptions of the physical environment. For Scotland, the perceived quality of walking was found to be related to deprivation levels[1] of the neighbourhood [24]. That research found that the measures that influenced walking for adults in deprived areas made less difference in non-deprived areas. However, how neighbourhood deprivation impacts the propensity of children to travel to school is still largely unknown.

When a wider consideration of the physical environment is taken, two relevant studies have been conducted in the UK. The first was conducted in Bristol [25] and examined 23 different parental perceptions related to aesthetics, nuisance, safety, and access to local destinations. In that study, distance was again the strongest explanatory variable for active travel (AT) to school, but ease of access to local destinations was positively associated for boys' AT, while nuisance (based on three components: crime, noise, and bullying) was negatively associated for girls.

The second study was conducted in Norfolk, UK [16]. In this study, parental attitudes and safety concerns, as well as the presence of social support from parents and friends were associated with AT to school. However, that study's measures were mostly limited to those related to traffic or stranger danger, with the exception of the sense of community which was positively associated with walking for trips under 1 km. Thus, apart from Page et al. [25], the potential for parental perceptions of general neighbourhood quality has not been well studied.

Other studies have included parental perceptions such as neighbourhood safety or risk. Perceptions of neighbourhood safety were not significant in explaining children walking to school in the USA [26], while Wen et al. [15] found that the perceptions of neighbourhood and road safety were different between parents of children who themselves walked and those who did not. Also in Australia, Carver et al. [27] found that parents' perceptions of risks in their neighbourhood were linked to defensive behaviour, which was then linked to reduced active travel. However, these studies did not consider other aspects of the neighbourhood such as the overall rating of the neighbourhood or perceptions of anti-social behaviour that may affect the general sense of security.

As shown by the discussion above, while parents' perceptions might influence whether children would be allowed to walk to school, it is largely unknown which perceptions or preferences matter most. It is important to understand which matter the most in order to design the most suitable policy intervention.

Using data from the 2006 Scottish Household Survey, this paper explores whether perceptions of the neighbourhood are related to a child walking to school. Unlike the previous studies cited above that examined parent justifications for not driving children to school, which primarily focused on traffic safety and personal security, this research uses data from a general household survey that, while it includes questions related to traffic, children's security, and general safety, it also includes many other questions such as the quality of local shops and facilities and community measures such as friendly people, good neighbours, and community spirit. Thus, it not only examines the safety component, but also removes the "justification" element in responses, and expands the research consideration to other qualities of a neighbourhood and reasons for their household location choice.

The next section will discuss the dataset and methods used in this paper. The first section of the analysis lays down basic findings on modal share and establishes what the "reasonable" walking distance to school is for children in Scotland. Fifty-nine subjective values by the parents are considered, and those that are significantly correlated with children walking to school are then considered in a binary logit model that includes parents' commitments, their perceive quality of the built environment and the traditional characteristics of the built environment. The paper closes with Section 4 Discussion and Section 5 Conclusions.

2. Material and methods

Data for this research comes from the geographically representative 2005/2006 Scottish Household Survey[2] (SHS). It is a continuous cross-sectional survey with roughly 31,000 households participating over a two-year period. The survey considers three main policy areas: Housing, Social Justice and Transport. The survey was designed to provide information about the characteristics, attitudes and behaviour of Scottish households and individuals on a range of issues including transport. Within the survey, a few questions pertain to one child's mode to school.

For this study, responses from household surveys where the random child was between the ages of 10 and 11 years were used. Children aged 10 and 11 years old were used for two reasons. The first is that this corresponds with the age where parents in the UK expect their children to be able to travel to school independently [28]. Secondly, a considerable amount of the research on children's travel focuses on children aged 10 and 11, thus this age allows for comparison. The relevant descriptive variables for the children, their households, and their neighbourhoods can be seen in Table 1. Unfortunately, variables such as the number of cars within the household, population density and shop density were unavailable. Because of the protection of personal identity, geographical identification is not possible, so proxy measures for those are also not possible. However, information on car availability, the parent's mode to work, and variables related to perceptions of local shops and facilities were included, and thus related relevant measures are included.

[1] Scottish deprivation levels relate to an index score based on a range of social, economic, and housing issues (Scottish Government, 2009).

[2] http://discover.ukdataservice.ac.uk/catalogue?sn=5608.

Table 1
Descriptive variables used in the analysis process.

Variables	Percent or average	Std. Dev'n
Individual and household		
Boy	52.5%	0.50
Average age of children (years)	10.6	0.50
Parent drives to work	46.3%	0.50
Married or living together	65.6%	0.48
Degree/professional/higher qualification	22.5%	0.42
Full time employed	48.8%	0.50
Part time employed	25.9%	0.44
Low household income (0–£20 k)	35.0%	0.48
Medium household income (£20 k–40 k)	50.0%	0.50
High household income (more than £40 k)	15.0%	0.36
Built environment (population)		
Large urban areas (≥125,000)	33.1%	0.47
Other urban areas (10–125,000)	27.8%	0.45
Small accessible town (3–10,000)	10.0%	0.30
Small remote town (3–10,000)	7.5%	0.26
Accessible rural (<3000)	14.1%	0.35
Remote rural (<3000)	6.9%	0.25
Deprivation index		
Most 20% deprived areas	20.0%	0.40
More deprived areas (20–40%) quintile	17.2%	0.38
Average deprivation	21.9%	
Less deprived areas (60–80%) quintile	21.9%	0.41
Least 20% deprived areas	19.1%	0.39

The urban/rural classification that is used in this study is the Scottish 6-fold urban/rural classifications that are: large urban (> 125,000 people), other urban, accessible small town, remote small town, accessible rural, and remote rural. In this classification, "accessible" distinguishes rural areas or towns that are within a 30-minute drive of a town or an urban area respectively. It therefore differentiates between potential commuter towns or rural areas and those that are more autonomous (here, "remote").

The deprivation index that is provided in the dataset is the Scottish Index of Multiple Deprivation (SIMD). It is the Scottish Government's official measure of area based multiple deprivations. The 2009 indices encapsulate 37 different indicators in seven domains including income, employment, health, education, skills and training, accessibility, and crime. In combination or individually, these indices provide a relative measure of deprivation for each data zone [29].

3. Analysis and results

3.1. Mode share and reasonable walking distance

To begin, the mode shares of children aged 10 and 11 years with respect to gender are presented in Fig. 1. Very little difference can be seen with respect to gender, with a larger percentage of girls taking school buses and a smaller percentage travelling by cars than for boys.

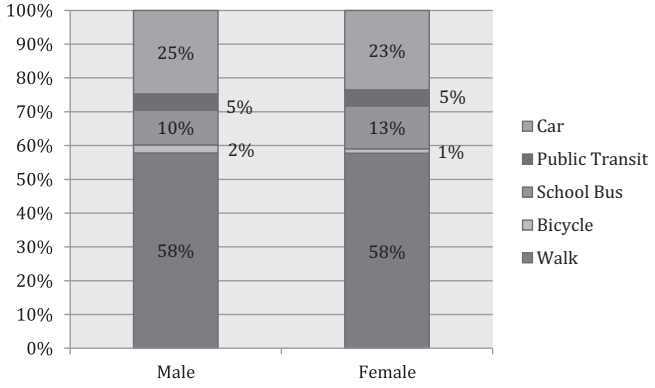

Fig. 1. The modal shares for male (n = 166) and female (n = 149) children aged 10 and 11 years in Scotland.

If distance is considered as a defining measure, then clear differences in mode use are evident. Taking the 80th percentile of the distance walked by those children in the dataset (see [30] for further discussion of this threshold concept), it was found that for Scotland the "reasonable" walking distance for children aged 10 to 11 years was 0.78 km. The 80th percentile represents an "elbow" in the distribution of distances, after which a few students travelled considerably longer distances (whom may be considered outliers or anomalies). Using this criterion, 83.5% of children living within 0.78 km walked to school, while only 26.7% of those living beyond that threshold did.

3.2. Analysis of the factors related to a child walking to school

Several steps were taken prior to the final models that are presented below. The initial steps related to the variable attrition method are summarized before the final models are given.

In the first step of the variable attrition method used, correlation analyses (chi-square tests for independence for non-parametric and bivariate correlation for parametric) were completed between the dummy variable *child walks to school* and measures for: neighbourhood perceptions (23 positively framed and 25 negatively); reasons for choosing the current residence (11 questions); household characteristics (e.g., family structure, income, education, car availability and use, etc.); child's characteristics (e.g., sex, age) and built environment characteristics (e.g., deprivation categories, built environment categories).[3] Of those, 21 variables were found to be significantly correlated at $\alpha < 0.1$. In the second step, those 21 variables were used in an initial expanded binary logit model that did not include the threshold distance. Variables that were significant in that step (the 2nd) at $\alpha < 0.1$ were retained for the final analyses.

Two binary (or direct) logistic regression models were tested: one with the significant variables from the preliminary (expanded) binary analysis; a second that also included the threshold distance dummy variable (Table 2). The coefficients indicate a propensity to walk to school (dependent variables: 1 = walk to school; 0 = otherwise). Binary logistic regression models were used as the research question relates to a binary variable (e.g., either the child walks to school or they do not). With consideration to the number of potential variables, a reduction technique such as factor analysis could have been used. However, such a method results in indices that cannot be easily interpreted. The variable attrition technique used in this study allowed for many variables to be considered without limiting the research to only that which the researchers might have considered important. The results shown in Table 2 are discussed in the next section.

4. Discussion

A number of important findings can be found in Table 2. First, from the potential 70 plus different variables, only five variables (not including distance) were retained in the final models following the attrition process. Unlike most previous studies, this research did not pre-select the variables to be included, thus any variable (within the limits of the survey) that might influence walking could have been retained. Further, this is possibly the first time where parents' general perceptions of their neighbourhood and reasons for choosing a house have been used with respect to explaining walking to school. Previous studies that have considered parents' attitudes or perceptions have mostly focussed on specific transportation considerations.

Before interpreting the results of the regression analysis, the finding for the threshold distance (a "reasonable" walking distance) is discussed. For Scottish children aged 10 and 11 years this was determined to be 0.78 km based on the 80% threshold used in previous

[3] Due to considerations on the paper's length, further details on the measures are not included here but can be found here: http://discover.ukdataservice.ac.uk/catalogue?sn=5608.

Table 2
Results of binary logistic regression on a child walking to school for children aged 10 and 11 years old (n = 320).

Explanatory variables	No distance threshold coefficient	Distance threshold included coefficient
A car is available (in general)	−1.429***	−1.347**
Married or living with partner	0.358	0.312
Good local shops[a]	1.234**	1.446**
Friendly people in neighbourhood[a]	0.523*	0.411
Traffic is slow or safe[a]	−1.893**	−1.748*
Threshold distance (<0.78 km)	Not included	2.641***
Constant	1.010**	−0.318
Variance explained (Cox & Snell R^2 to Nagelkerke R^2)	9.9% to 13.3%	34.3% to 46.0%

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.
[a] Perception.

studies [31,30]. This distance is comparable, if slightly shorter, to those found by Morency et al. [30] who examined children in Montreal, Canada and reported distances of roughly 0.88 km for 9–10 years old and 1.09 km for 11–12 years old. Thus, for children in Scotland of this age, 0.5 miles (e.g., [13]) might be an appropriate threshold, but it appears that for children in Montreal at least, it is too short and for both 0.5 km is below the threshold (e.g., [15]).

The inclusion of the distance threshold variable to the binary logistic regression model reduced the number of significant variables, while at the same time considerably increasing (at least doubling) the variation explained by the model. This confirms that distance is probably the strongest explanatory factor when it comes to walking to school, which is in-line with McDonald and Aalborg's [13] findings, for example. Their study showed that, in the United States, the number of children walking to school nationally is only about 13%, but when it is broken down by 0.5 mile increments, nearly 80% of children who live within 0.5 miles walk or cycle [13]. For this sample, roughly 83% of students within the 0.78 km (roughly 0.5 miles) threshold walked to school, thus supporting McDonald and Aalborg's [13] findings. Lastly, in this sample from Scotland about half of all children lived within the "reasonable" walking distance, and national averages for walking to school are around 50% [3]. This result points towards school location policy and housing development policies as being key tools in improving walking to school.

However, while distance is a strong determinant for children walking to school, it does not explain everything. With respect to perceptions of their neighbourhood, three measures were retained in the models and two measures were found to be statistically significant. Past research that considered parents' perceptions of their neighbourhood had mixed results [15,26,27,32,21]. Here, the measure *good local shops* was positively correlated, while *traffic is slow or safe* was negatively correlated. The latter result is non-intuitive and both variables are discussed next. The third perception variable contained in the model, *friendly people in the neighbourhood*, was not significant once the distance threshold was included. So, although intuitively and corroborated by studies in sociology [33] we might expect that a neighbourhood with friendly people would support children walking to school by reducing parental anxiety, it was not found to be statistically influential here.

The perception of *good local shops* may indicate an area where there is local walking, as people who would consider their local shops to be good, would likely do some of their shopping locally. Unfortunately, it is not evident how the individuals would interpret this question, as it is subjective. We offer that the respondents would likely think of not only whether the shops were useful to accomplish daily tasks such as buying groceries, but also whether the upkeep of the shops was reasonable (e.g., the shops are visually well-maintained). In Scotland and in the United Kingdom in general, high streets with small-scale shops are still a regular part of the urban environment. Interaction between shoppers and shopkeepers is common, which was found to be an important factor in sense of place [34] and may result in the parent feeling that there are familiar "eyes on the street" [35]. Such a feeling was mentioned as being a factor in letting children walk alone to places [33,36]. If sufficient people were walking in the neighbourhood, it would also suggest a social norm of walking. Unfortunately, what constitutes 'good' shops is not clear, but should act as a proxy of the likelihood of the parents using them.

Continuing with parental perceptions, the negative correlation of *traffic is slow and safe* is at first counter-intuitive as one would expect that such a perception would be related to a decreased sense of traffic danger, but given second thought there is a possible explanation. Such a perception may be associated with neighbourhoods that have low congestion, thus making it easier for the parent to drive their child. That would relate to the parent's convenience factor [15,20]. Further, Babey et al. [26] did not find perceived traffic danger to be a significant explanatory variable in children walking to school either. Thus, higher levels of traffic may actually act as a deterrent to the parent's convenience to drive the child. To be clear though, we do not suggest that the promotion of traffic (as opposed to congestion) would be an appropriate means to improve walking rates.

Moving onto the impact of household cars. As mentioned previously, household car ownership was not available, but the variable *car availability* was negatively associated to children walking to school. Over 80% of the households reported having access to a car and about 60% of those households reported driving to work. However, only 30% of the parents of elementary aged children reported that they drove their children to school. When those results are considered with the distance threshold, less than 12% of children within the "reasonable" walking distance were driven to school compared to over 37% above that threshold. Thus, as the analysis demonstrated, distance is a stronger explanatory variable than car availability.

Lastly, none of the built environment measures were retained in the final regression models. This does not imply that the built environment is not important, as measures such as distance, good local shops, and traffic speed were retained in the model and are linked to built environment. Distance relates to the population or dwelling density and where the school is located with respect to the population. The probability of local shops (as opposed to large shops that attract people from outside the local area) existing relates to the number of people living locally (again, population density). The traffic speed would relate to regulation (what speed is legally allowed), street design (e.g., narrow or wide, single lane or multiple lane), and congestion (which would relate to traffic generation and street design). Further, the built environment measures were non-precise, distinguishing only between urban, town, or rural with the latter two distinguishing between those that are within commuting distance of an urban centre or not, and "urban" using a threshold of 125,000 people.

4.1. Potential solutions

Distance was the strongest explanatory variable in this study. Short-term solutions to distance are likely difficult. As demonstrated by the difference between the distance threshold for Scottish and Canadian children, the "reasonable" distance can vary. One means to potentially increase that threshold would be to address parental concerns. Community organized walking school buses led by children, as found in Japan [7,36], could reduce parental concerns about stranger danger (not directly included in this study, but significant for children in London [14]) and traffic. In one study [7], all children walked to school, regardless of distance and the walking school bus was given as the reason for this success. In a walking school bus, the children walk as a group, thus they are more visible to vehicles, thus reducing traffic danger and as a group they are not isolated (e.g., walking alone), which should also reduce parental anxiety about stranger danger.

Another short-term solution to overcome the problem of distance without resorting to motorised modes, would be to improve cycling conditions. Godefroy and Morency [31] demonstrated that for children aged 5 to 12 years in Montreal, the threshold distance was 1.99 km for boys and 1.27 km for girls. For boys, this is nearly double the threshold distance for walking (1.09 km) for children aged 11 and 12 years old. Improving children's cycling rates is another challenge, and a detailed discussion of how that might be achieved is not possible here.

Longer-term solutions include addressing built environment aspects such as land-use, density, school location, and smaller blocks allowing for greater connectivity (e.g., [37]). Developers play the game within the rules set by the policy decision makers. It is the responsibility of planners (land-use, housing, and transportation) to work together to create rules that result in more travel options for parents and environments that support children's active travel. Improvements here could reduce distances, better support local shops, and reduce traffic speed through street design and regulation.

5. Conclusions

This paper looked at walking trips to school for children in Scotland aged ten and eleven years. It identified a cultural-specific "reasonable" walking distance, and then used binary logit analysis to consider the "reasonable" walking distance, nearly 50 parental perceptions of the neighbourhood, 11 different possible reasons for choosing a home, household demographics, and built environment variables. Unique aspects of this paper include: a general household survey that did not focus on children's travel was used, thus avoiding the potential bias of parents "justifying" why their children do not walk to school; the breadth of parental perceptions of the neighbourhood; and reasons for choosing a home.

In the binary logit analysis, few parental perceptions were significant. However, the perception of good local shops was associated with more walking, while traffic is slow or safe was negatively correlated. Reasons for such findings are discussed above. Car availability was the largest negatively associated variable.

Living within the "reasonable" walking distance was by far the greatest explanatory factor considered. Solutions that increase the "reasonable" walking distance that children will walk such as walking in groups and infrastructure that support cycling may help increase overall active travel rates, but some attention must be paid to home location choice and development of urban areas.

References

[1] N.C. McDonald, Active transportation to school: trends among U.S. schoolchildren, 1969–2001, Am. J. Prev. Med. 32 (2007) 509–516.
[2] M. Hillman, J. Adams, J. Whitelegg, Book One False Move… A Study of Children's Independent Mobility, Policy Studies Institute, London, 1990.
[3] Scottish Executive, Travel by Scottish Residents: Some National Travel Survey Results for 2002/2003 and Earlier Years, Scottish Executive, 2005.
[4] D.E. Rosenberg, J.F. Sallis, T.L. Conway, K.L. Cain, T.L. McKenzie, Active transportation to school over 2 years in relation to weight status and physical activity, Obesity 14 (2006) 1771–1776.
[5] A.R. Cooper, A.S. Page, L.J. Foster, D. Qahwaji, Commuting to school: are children who walk more physically active? Am. J. Prev. Med. 25 (2003) 273–276.
[6] J. Panter, A. Jones, E. van Sluijs, Environmental determinants of active travel in youth: a review and framework for future research, Int. J. Behav. Nutr. Phys. Act. 5 (2008) 34.
[7] E.O.D. Waygood, R. Kitamura, Children in a rail-based developed area of Japan, Transp. Res. Rec. J. Transp. Res. Board 2125 (2009) 36–43.
[8] A.R. Cooper, N. Wedderkopp, H.A.N. Wang, L.B. Andersen, K. Froberg, A.S. Page, Active travel to school and cardiovascular fitness in Danish children and adolescents, Med. Sci. Sports Exerc. 38 (2006).
[9] J. Westman, M. Johansson, L.E. Olsson, F. Mårtensson, M. Friman, Children's affective experience of every-day travel, J. Transp. Geogr. 29 (2013) 95–102.
[10] C. O'Brien, P.J. Tranter, Planning for and with children and youth: insights from children about happiness, well-being and walking, walk21-VII, "the next steps", The 7th International Conference on Walking and Liveable Communities, Melbourne, Australia, 2006.
[11] E.O.D. Waygood, Connecting with neighbours: investigating how transportation and the built environment affect children's community connections, 18th International Conference of Hong Kong Society for Transportation Studies, Hong Kong, 2013.
[12] J.R. Sirard, M.E. Slater, Walking and bicycling to school: a review, Am. J. Lifestyle Med. 2 (2008) 372–396.
[13] N.C. McDonald, A.E. Aalborg, Why parents drive children to school: implications for safe routes to school programs, J. Am. Plan. Assoc. 75 (2009) 331–342.
[14] C. DiGuiseppi, I. Roberts, L. Li, D. Allen, Determinants of car travel on daily journeys to school: cross sectional survey of primary school children, Br. Med. J. 316 (1998) 1426–1428.
[15] L.M. Wen, D. Fry, C. Rissel, H. Dirkis, A. Balafas, D. Merom, Factors associated with children being driven to school: implications for walk to school programs, Health Educ. Res. 23 (2008) 325–334.
[16] J.R. Panter, A.P. Jones, E.M.F. van Sluijs, S.J. Griffin, Attitudes, social support and environmental perceptions as predictors of active commuting behaviour in school children, J. Epidemiol. Community Health 64 (2010) 41–48.
[17] A. Timperio, K. Ball, J. Salmon, R. Roberts, B. Giles-Corti, D. Simmons, L.A. Baur, D. Crawford, Personal, family, social, and environmental correlates of active commuting to school, Am. J. Prev. Med. 30 (2006) 45–51.
[18] C. Lee, X. Zhu, J. Yoon, J. Varni, Beyond distance: children's school travel mode choice, Ann. Behav. Med. 45 (2013) 55–67.
[19] J. Salmon, L. Salmon, D.A. Crawford, C. Hume, A. Timperio, Associations among individual, social, and environmental barriers and children's walking or cycling to school, Am. J. Health Promot. 22 (2007) 107–113.
[20] A. Fyhri, R. Hjorthol, Children's independent mobility to school, friends and leisure activities, J. Transp. Geogr. 17 (2009) 377–384.
[21] Y.O. Susilo, C. Liu, The impacts of parents' perceptions, residential self-selectivity and travel patterns to the children's physically active modes, Transportation (2015) (submitted for publication).
[22] A. Timperio, D. Crawford, A. Telford, J. Salmon, Perceptions about the local neighborhood and walking and cycling among children, Prev. Med. 38 (2004) 39–47.
[23] T. Lorenc, G. Brunton, S. Oliver, K. Oliver, A. Oakley, Attitudes to walking and cycling among children, young people and parents: a systematic review, JECH 62 (2008) 852–857.
[24] J. Anable, G. Schuitema, Y.O. Susilo, P. Aditjandra, M. Beecroft and J. Nelson, Walking and cycling and socio-economic status in Scotland, in: Editor (Ed.)^(Eds.), Book Walking and cycling and socio-economic status in Scotland, NHS Health Scotland, 2010.
[25] A.S. Page, A.R. Cooper, P. Griew, L. Davis, M. Hillsdon, Independent mobility in relation to weekday and weekend physical activity in children aged 10–11 years: the PEACH project, Int. J. Behav. Nutr. Phys. Act. 6 (2009).
[26] S.H. Babey, T.A. Hastert, W. Huang, E.R. Brown, Sociodemographic, family, and environmental factors associated with active commuting to school among US adolescents, J. Public Health Policy 30 (2009) 203–220.
[27] A. Carver, A. Timperio, K. Hesketh, D. Crawford, Are children and adolescents less active if parents restrict their physical activity and active transport due to perceived risk? Soc. Sci. Med. 70 (2010) 1799–1805.
[28] M.S. Joshi, M. Maclean, Maternal expectations of child development in India, Japan and England, J. Cross-Cult. Psychol. 28 (1997) 219–234.
[29] Scottish Government, Scottish Index of Multiple Deprivation: 2009 General Report, Scottish Government, 2009.
[30] C. Morency, M. Demers, É. Poliquin, Shifting short motorized trips to walking: the potential of active transportation for physical activity in Montreal, J. Transp. Health 1 (2) (2014) 100–107.
[31] F. Godefroy, C. Morency, Estimating latent cycling trips in Montreal, Canada, Transp. Res. Rec. J. Transp. Res. Board 2314 (2012) 120–128.
[32] J. Kerr, D. Rosenberg, J.F. Sallis, B.E. Saelens, L.D. Frank, T.L. Conway, Active commuting to school: associations with environment and parental concerns, Med. Sci. Sports Exerc. 38 (2006).
[33] K. Bonner, Book a Great Place to Raise Kids: Interpretation, Science, and the Urban–Rural Debate, McGill-Queen's University Press, Quebec, 1997.
[34] H. Suzuki, S. Fujii, A study of the effects of shopping behavior on place attachment, in: K. Kobayashi, T. Tamura, H. Westlund, H. Jeong (Eds.),Social Capital and Development Trends in Rural Areas, 2009, pp. 99–110.
[35] J. Jacobs, Book the Death and Life of Great American Cities, Random House, New York, 1993.
[36] Y.O. Susilo, E.O.D. Waygood, A long term analysis of the mechanisms underlying children's activity-travel engagements in the Osaka metropolitan area, J. Transp. Geogr. 20 (2012) 41–50.
[37] B. Giles-Corti, S. Kelty, S. Zubrick, K. Villanueva, Encouraging walking for transport and physical activity in children and adolescents, Sports Med. 39 (2009) 995–1009.