

## How children view their travel behaviour: a case study from Flanders (Belgium)

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### ABSTRACT

Understanding the thoughts of contemporary children about travel and their opinions on different transport modes of transport may provide important answers for policy-makers on how to respond to current and future transport needs of children. Obviously, children do not act autonomously and their travel behaviours also strongly influence their parents' travel behaviours. Therefore, a better understanding of children's travel behaviours seems necessary.

This paper reports the results of a large-scale, self-reporting survey ( $N = 2546$ ) that was conducted to examine the concept and meaning of travel and travel behaviour of children aged between 10 and 13 years in Flanders. It was found that children are able to complete a travel diary on their own, that their travel patterns differ and that the most important part of travelling for them is the social aspect.

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### 1. Introduction

Children are not usually considered the main actors in the domain of transportation. Even when they do 'act', their travel behaviour is often evaluated in terms of their traffic safety (Meire and Vleugels, 2004), their health (Mackett, 2001), their inability to develop travel skills and their desire to travel independently (Hillman, 1999; McDonald, 2005). The studies by Hillman et al. (1990), Hillman (1997, 1999) are important for analyzing the (in)dependent travel behaviour of children. O'Brien (2001) and Mackett (2001) and Mackett et al. (2005) have also investigated different topics regarding children's travel. More recently, modelling efforts regarding children's travel have been carried out by Copperman and Bhat (2007), Sener and Bhat (2007), Müller et al. (2008) and Jensen (2009).

It is broadly accepted that very young children are totally dependent on their parents when it comes to organizing their daily life activities, their nourishment and their travel. Children fully rely on their parents to drive them or to escort them to where they want to go, which in turn strongly influences parents' travel behaviour and intra-household decision-making (Copperman and Bhat, 2007). At a certain age, children are considered able and old enough to travel independently by bicycle or on foot. The child's

age at this turning point has been increasing in recent years, which in turn has led to a dramatic decrease in children's independent travel (Hillman et al., 1990; Hillman, 1997; Tillberg Mattson, 2002; Pooley et al., 2005).

The literature demonstrates different influences on the (independent) mobility of children. Traffic danger was found to be parents' most important reason for escorted travel, mostly by car (van der Spek and Noyon, 1993; Karsten et al., 2001; van der Houwen, 2003). Social safety<sup>1</sup> was another parent-related factor preventing independent travel (O'Brien et al., 2000; Karsten et al., 2001; Johansson, 2005). Furthermore, the growing availability of cars in families encourages the use of the car (van der Houwen et al., 2002), which is reinforced by the time-pressured lifestyle of a growing number of double-income households (Pol and Need, 2003). The time-space path of organized leisure activities leaves less time for children's independent travel (van der Spek and Noyon, 1993; Christensen and O'Brien, 2003; Neutens et al., 2007). Decreasing family size also offers children fewer opportunities to learn to cope with independent travel (van der Spek and Noyon, 1993). Finally, a number of demographic and socio-economic variables, such as age and gender, home location and the family's socio-economic situation, influence children's (independent) travel behaviour (van der Spek and Noyon, 1993; O'Brien et al., 2000; van der Houwen et al., 2002).

The results of all these changes are an increase in overall car travel and less independent travel (Hillman et al., 1990; Tillberg

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<sup>1</sup> 'Social safety' is a term used here to describe protection or the feeling of being protected against the dangers caused by human actions in public spaces. Examples of these incidents are aggressive behaviour, public drunkenness, vandalism, drug trading and use, assaults and murder.

Mattson, 2002). This process is also likely to continue to increase because the current travel behaviour of children will affect their future travel behaviour as adults (Karsten, 1995; Tillberg Mattson, 2002; Clifton, 2003; McDonald, 2005; Verhetsel and Witlox, 2006).

To understand how children currently travel, their opinions on different transport modes and their attitudes towards travel will no doubt be relevant for policy-makers. For instance, children's views on travel may be taken into account in local mobility projects. It also offers policy-makers a means to potentially change preferences and travel behaviour in order to promote the use of more sustainable (and independent) transport modes (e.g., a policy of promoting bicycle use).

In order to grasp these problems, the travel behaviour and attitudes towards different transport modes among children aged between 10 and 13 years in Flanders, Belgium is examined in this paper by using a descriptive statistical analysis. Based on this study, a framework for children's participation in local mobility plans and environmental-planning processes was created. The Flemish public bus company has used our results for a new marketing campaign for a youth season concession ticket.

This study focuses on children aged 10–13 years. There are several good reasons for choosing this particular age category as the target group. First, children at this age are in the middle of the turning-point process. They are pushing very hard to act more autonomously, while their parents tend to be more protective because of their perception of the risks and dangers in public spaces (social and traffic safety risks). Second, due to the educational system in Flanders,<sup>2</sup> 12-year-old children are often confronted for the first time with an important change in their school-going travel when they graduate from a nearby primary school to a secondary school located further away. Finally, public authorities at different policy levels are specifically targeting children at this age to use public transport (through the introduction of special discounted public transport fares) or to go to school by bicycle (governments create cycle-paths, stimulate cycle-pooling and make school environments safer), which is not always compatible with parental demands.

Another issue involves the ability of children to self-complete surveys, specifically in the field of transportation. Different national travel studies include children aged from 6 or from 10 years in their sample. In most cases, the survey design is tailor-made for adults and not adapted to children's travel and activities. Completion of the surveys by the children themselves is almost impossible. The focus of these travel studies is mainly on travel patterns and travel characteristics. Most of them are not interested in opinions and therefore omit children's opinions. In our study, a self-reporting survey for children aged between 10 and 13 years was developed and used.

The remainder of the paper is structured as follows. Section 2 describes the data collection process used to obtain information on children's travel behaviour and opinions on travel. In Section 3, a descriptive analysis of the survey data is completed. The findings are compared with results from other travel behaviour studies in order to check their overall validity. Finally, our major conclusions are summarized in Section 4 and avenues for future research identified.

<sup>2</sup> The education system in Flanders starts at the age of two and a half years with pre-school kindergarten. From the age of six years, children are at school age and start in primary school. Primary schools consist of six grades and upon completion of the sixth grade, children advance to secondary school. These secondary schools also consist of six grades, starting again at the first grade. The grades of the children in our sample correspond to the 5th to 8th grades in the US school system. The children aged 10–13 years can be found in the 5th and 6th grade of primary school and in the 1st and 2nd grade of secondary school.

## 2. Data collection

The first important issue relates to data collection and the design of a suitable questionnaire. The input for the questionnaires was based on an extensive literature review by Meire and Vleugels (2004) and complemented by the results from the qualitative phase (Meire, 2005).

For optimal analysis of the critical factors, three different questionnaires were developed: (i) a questionnaire for the children, (ii) a questionnaire for the parent(s) and (iii) a two-day trip-based travel diary for the children. In what follows, a short description of the questionnaires is given and organizational aspects of the survey are explained.

- The children's questionnaire was divided into different themes to allow for a maximum of logic and reasoning. This was especially important because the children had to complete the questionnaire without any help from an adult. Most of the questions were closed questions, but some open questions were also incorporated to elicit the child's opinion in his/her own words.
- The parents' questionnaire was also constructed thematically. Similar to the children's questionnaire, the composition of the parent questionnaire included the critical factors that emerged from the literature and the qualitative phase. Furthermore, some questions from the children's questionnaire were repeated in the parents' form, enabling a linkage between the answers of the child and those of his or her parents. The parents' questionnaire ended with an open question where concerns and remarks related to traffic and mobility could be made. Parents were not asked to complete a travel diary.
- Every participating child was asked to complete a travel diary over two fixed days. These two fixed weekdays were chosen at random by the researchers. In this diary the child had to record his or her trips, and for each trip the destination, departure time, transport modes used, travel time, whether escorted or not and arrival time, with a maximum of eight trips per day. In order to keep the travel diary form as simple as possible, distance travelled was not requested.

A second important issue has to do with sample selection. A random sample of schools was composed, based on a complete list of all 5th and 6th grades at primary schools and 1st and 2nd grades at secondary schools in Flanders. In total, 198 schools were contacted. At the school level, 48 schools did not wish to participate. These refusals were, however, not linked to specific school characteristics. For budgetary reasons, 76 schools from the 150 participating schools were selected at random. In total, 3049 questionnaires were distributed to the children in the grades mentioned above. It was stated explicitly that the questionnaires were to be completed by the child at home so that schools did not need to reserve school time and classroom bias could be avoided. This action resulted in a gross response rate of 86.7% (2644 questionnaires received). The high response rate may be explained by the 'social pressure' of the schools' initial consent to participate in this project. About 52% of the respondents were girls and the remaining 48% were boys. About 95% of the respondents were part of the target group of 10–13 year olds. The 5th graders accounted for 27.9% of the respondents and 6th graders for 29.3%. First graders from secondary school made up 23.2% of the respondents, while second graders formed 19.5% of the sample. The distribution of these variables was compared to school population statistics (Ministerie van Onderwijs, 2005). Significant differences were found for gender, year of birth, grade and governing board. In order to ensure a better representation of these variables, a weighting scheme was adopted using Weight 2.1 for Windows (Hajnal, 1995), resulting in weighing factors for each respondent. These weighing factors were used in the descriptive analysis.

The encoders received training on the survey content and data cleaning while coding. All instructions were contained in a data-cleaning document that had to be followed rigorously. Coding errors were avoided by the use of closed answering possibilities in the input program. This operation resulted in a net response rate of 83.5% or 2,546 completed questionnaires.

### 3. Descriptive analysis and comparison

In this part, the obtained results are presented. The results in this paper form just a small part of all available results. In the first subsection some general findings will be presented. The following subsections will deal with more specific findings of the survey (travel behaviour and views on modes of travel, and differences in gender, class group, home location and generations). Each subsection will be followed by a comparison with the outcomes of earlier travel behaviour studies from different countries. The basic idea is to validate our findings but also to show the respects in which the Flanders case differs from other countries.

#### 3.1. General findings

As mentioned earlier, questionnaires completed by 2546 respondents were taken into account for the analysis of the 2004–2005 survey on transportation dependence and autonomy (TDA 2004–2005). Nearly 19% of the children lived in 'a town, in a built-up area', 8% 'in a town, outside a built-up area', 39% 'in the country, in a built-up area' and 35% 'in the country, outside a built-up area'.<sup>3</sup> Some 42% of the children lived not more than 2 km from school, while 19% were located between 5 and 10 km from the school. Almost 9% of the children had to travel more than 10 km to school.

#### 3.2. Travel behaviour

The children reported an average of 2.8 trips on the first day and 2.6 trips on the second day. The difference in the number of trips between the first and second day is significant ( $t = 5.67$ ;  $p < 0.01$ )<sup>4</sup> and probably due to response fatigue. About 41% of all trips were made by car, almost 27% by bike and 13% on foot. Some 43% of the trips were made with an escort by at least one of the parents and 25% were made alone. Trips with friends (and without adults) account for 17% of the trips.

More than 44% of all trip motives<sup>5</sup> were school-related (a home-school or school-home trip). 'Other' accounted for 18% of all motives, which indicated mainly the degree of trip chaining in children's travel. Trips between home and organized leisure activities made up 14% of the trips. Trip duration was rather short: some 66% of the trips lasted no longer than 10 min and 87% no longer than 20 min.

The percentages found in the TDA 2004–2005 survey were similar to the results of the last Flemish Travel Behaviour Study of 2000 (TBS, 2000) (Zwerts and Nuyts, 2002). It found that 58% of the trips by 6- to 11-year-old children were made as car passengers. The average number of trips made during one day was 3.6. In the group aged '12–15 years', the percentage of trips by car decreases to 36.14%. The average number of trips per day was 2.6. These results can be found in Table 1. This comparison shows that

children in this age group are able to self-report their travel behaviour, but as pointed out in Witlox (2007) attention must be given to the potential biases of using self-reporting data in travel analyses.

For an international comparison, studies from the Netherlands, the United Kingdom and the United States were chosen. The methodologies and the age groups of children differ among these studies, but the results are nevertheless indicative and form a basis for comparison.

In the Netherlands, a country that is physically comparable to Flanders, the children's age groups in the MON (Mobiliteitsonderzoek Nederland) study (Ministerie van Verkeer en Waterstaat, 2006) are 0–12 years and 12–16 years. The results are separated into boys and girls. The boys in the first category made on average 2.82 trips per day while the girls made 2.93 trips. In the second age category this number decreases for age groups and gender to 2.71 for boys and 2.79 for girls.

Weston (2005) used the figures from the US National Household Travel Survey (US-NHTS) to take a closer look at teens aged 13–15 years. The percentage of trips made by car was very high (65.7%). The percentage of car trips to school was also rather high (45.7%). In the National Travel Survey of the United Kingdom (UK-NHTS) (Department for Transport, 2006) children aged under 17 years were taken by car on an average of 55% of their trips. The number of car trips to school is perceived to decrease when children become older (from 43% to 22%).

If these different studies are considered as points on a continuous scale, children travel most independently in the Netherlands (lowest share of travel by car), whilst children from the US are at the opposite side. The Flemish children can be positioned between the Dutch and the UK children.

In addition to the focus on the (effective) trips children make, another part of the questionnaire asked for children's views on travel modes. For walking, cycling, car and public transport, children were asked if they agreed or not with the positive and negative propositions based on travel mode characteristics as listed in Table 2.

Walking and cycling were preferred transport modes. Items that contributed to the attractiveness of these modes were the social aspects, including health and environmental aspects, perceptions and experiences *en route*. Following each set of questions children could write remarks on the previous set of questions. For both cycling and walking, these experiences formed the principal part of the remarks, with a wide range of experiences to write about. "You can see birds and other animals, sometimes they are dead", "You can enjoy nature", "Walking is fun because you can smell nature", "The crunching of little stones". On the other hand, some children indicated being responsible: "I feel tall when I'm walking alone", "I can do what I want when I'm alone", "I like it when my mum trusts me".

From the results of all the transport modes, we learned that the social aspect of being on the way (for any mode) was very important to these children, and that it was more important for girls than for boys (see also Fig. 1). 'Being on the way without an adult' and 'doing other things during travel' were items of more importance to boys. These results are in line with the results from Brown et al. (2008), who found that travelling in groups of friends was more important for girls than for boys. This collective independence achieved through peers is often overlooked and can possibly compensate for the loss of freedom.

Most children appreciate the comfort of a car and girls are more responsive to these comfort elements than boys. The older the child, the more he or she appreciates the comfort of the car, but they use it less. Girls and primary school children are more sensitive to the negative environmental aspects of the car, but when it comes to effective travel mode choice, girls are driven to different places far more than boys. This gendered result has also been found by Brown et al. (2008), Rodriguez and Vogt (2009), Fyhri and Hjorthol (2009), and Larsen et al. (2009).

<sup>3</sup> The built-up area' is a legal term in Belgium indicating the area between speed-limit signs that indicate the beginning and the end of this area. Specific traffic (including speed) rules are valid in this area. The categories 'in a town, in a built-up area', 'in a town, outside a built-up area', 'in the country, in a built-up area' and 'in the country, outside a built-up area' equate to 'central city/town', 'suburban area', 'rural town or village' and 'rural, dispersed homesteads'.

<sup>4</sup> Student's  $t$ -test was used to compare two means in this sample.

<sup>5</sup> The variable trip purpose was recoded into trip motives. For trips with the purpose 'going home', the motive was the trip purpose of the preceding trip.

**Table 1**

Children's travel behaviour: comparison of the survey on transportation dependence and autonomy (TDA 2004–2005) and the Flemish travel behaviour study (TBS 2000).

	TDA 2004–2005	TBS 2000	
	Children aged 10–13	Children aged 6–11	Children aged 12–15
Average number of trips per day per person	2.8	3.6	2.6
% trips by car (all trip purposes)	41.55%	58.00%	36.14%
% school trips by car	27.58%	39.20%	19.83%

**Table 2**

List of positive and negative propositions on travel mode characteristics.

Positive propositions	Negative propositions
<p><i>Walking</i></p> <ul style="list-style-type: none"> <li>You are on the way without an adult</li> <li>You can choose your own way</li> <li>You can do other things while walking</li> <li>You see a lot more</li> <li>On the way you can talk with friends</li> <li>If you walk, you have physical exercise</li> <li>Walking is healthy</li> <li>Walking is environmental friendly</li> <li>It is cheaper to walk than to be brought by car</li> </ul> <p><i>Biking</i></p> <ul style="list-style-type: none"> <li>You are on the way without an adult</li> <li>You can choose your own way when biking</li> <li>You can feel the wind through your hair, you can smell the grass, you can hear the leaves rustle</li> <li>You can do other things while biking</li> <li>You see a lot more</li> <li>On the way you can talk with friends</li> <li>On your bike, you are free to enjoy yourself</li> <li>If you bike, you have physical exercise</li> <li>Biking is healthy</li> <li>Biking is faster than walking</li> <li>Biking is environmental friendly</li> <li>Biking is just fun, you can free your mind</li> <li>It is cheaper to bike than to be brought by car</li> </ul> <p><i>Car</i></p> <ul style="list-style-type: none"> <li>If you are brought by car, you can have a pleasant chat</li> <li>You can take friends with you in the car</li> <li>Going by car is practical, especially when you have to go to somewhere else immediately after school</li> <li>When you have to go to football or music class after school, you can take all your things in the car - that is practical</li> <li>When it rains or snows, you are kept warm and dry in the car</li> <li>If you are brought by car, you reach your destination faster</li> <li>If you are brought by car, you can sleep longer in the mornings than when you have to take the bike or have to go on foot</li> <li>In the car you can listen to music</li> <li>Being brought by car is much more comfortable than walking or biking</li> <li>Traffic is very dense and for that reason it is safer to be brought by car</li> <li>When it is dark outside, I appreciate being brought to and taken from school</li> </ul> <p><i>Public transport</i></p> <ul style="list-style-type: none"> <li>You can have a chat with your friends</li> <li>You have a lot of responsibility, you have to make sure that you take the right bus, tram, underground or train</li> <li>You can go far away on your own, without an adult</li> <li>On bus, tram or underground, nobody tells you what to do: you can do your own thing</li> <li>When the weather is bad, you keep dry</li> <li>You are free, you can take the next bus, tram or train</li> </ul>	<p><i>Walking and biking</i></p> <ul style="list-style-type: none"> <li>Sometimes I have to walk or bike a long way to arrive at my destination</li> <li>On my way there are older teenagers who shout and make silly remarks</li> <li>When the weather is bad, it is not funny to walk or to bike</li> <li>I am afraid of having an accident</li> <li>When I have to bike or to walk I am tired before I arrive at my destination</li> <li>I don't have a bike</li> <li>The bicycle shed in my school is not safe</li> <li>I have to cross a busy street with little pedestrian crossings</li> <li>On the way to my school or hobby, the quality of bicycle tracks is not good - I do not feel myself safe</li> <li>I am afraid of being attacked or kidnapped</li> <li>Walking is slow</li> <li>In my opinion traffic is too heavy, it is too busy on the street to go out alone</li> <li>I do not like to walk or to bike when it is dark without the presence of an adult</li> </ul> <p><i>Car</i></p> <ul style="list-style-type: none"> <li>When you drive a lot, you pollute the environment</li> <li>In the car you can not chat with friends</li> <li>With a car you can get in a traffic jam</li> <li>If you want to go by car, you have to ask your parents or other adults</li> <li>If you are driven around by car too often, you get insufficient physical exercise</li> </ul> <p><i>Public transport</i></p> <ul style="list-style-type: none"> <li>It is usually very busy on the bus, tramway, metro or train, and I do not like that</li> <li>You have no privacy on bus, tramway, metro or train: you can not always do the things you want to do at that moment</li> <li>Sometimes there are scary people on the bus, tramway, metro or train</li> <li>You need money or a buzzy pazz to travel</li> <li>With the bus you can get in a traffic jam, and then it takes a long time to arrive</li> <li>You have to know how the public transport system works: where the stops are, which bus number goes to where</li> <li>On the bus you can be ragged</li> <li>The train, tramway or bus is sometimes delayed and then you arrive too late</li> <li>You can take the wrong train or you can miss the connection with another train</li> <li>The train wobbles all the time, I am afraid that the train will be derailed</li> <li>The school bus takes a long time</li> </ul>

Public transport has to cope with the 'unknown, unloved' problem. Whereas almost all children (more than 92%) indicated that they felt themselves old enough to travel alone by bicycle or on foot, this percentage decreases to 58% for public bus and 39% for train. Children use public transport less than other modes

and the overall appreciation is less positive than for other modes. However, children who use bus or train evaluate the public transport modes more positively (for the positive items) and less negatively (for the negative items), as can be seen in Fig. 2.

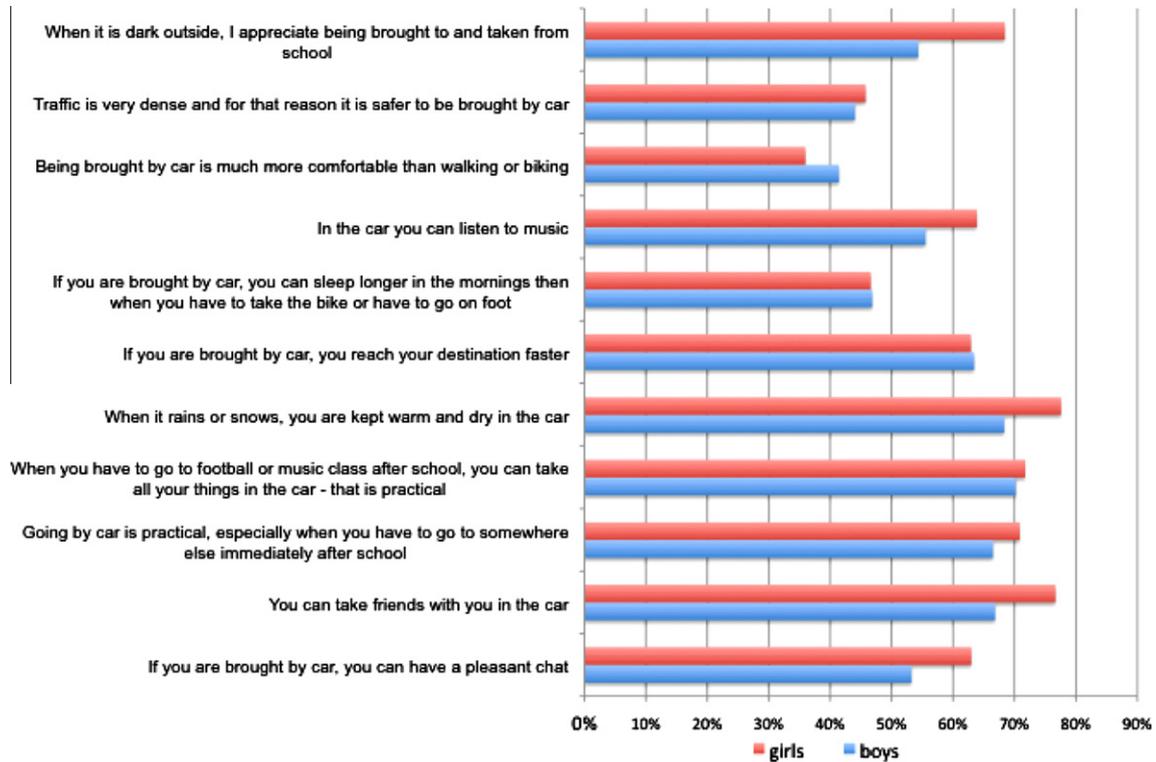


Fig. 1. Percentage agreement on propositions about the car for boys and girls.

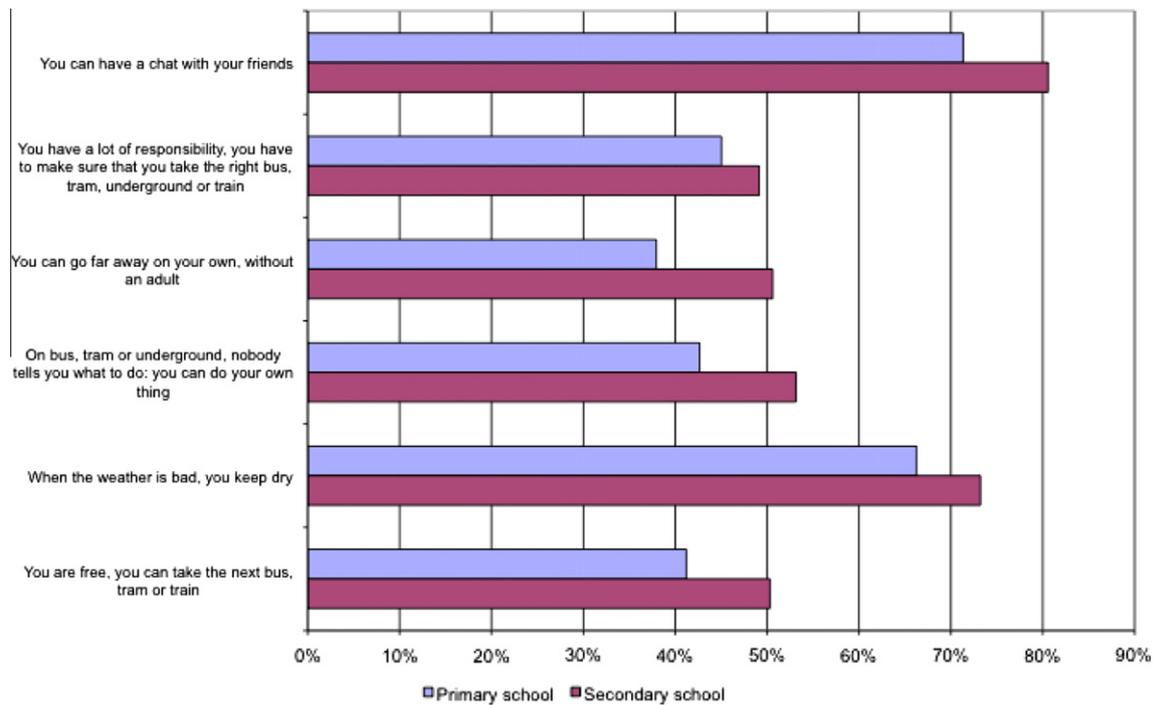


Fig. 2. Percentage agreement on propositions about public transport for primary and secondary school children.

Secondary school children tended to use public transport more often (partly explained by the greater distance to school) and the older the child, the more they appreciate the characteristics of these modes.

### 3.3. Differences between children: boys and girls

Boys and girls differ in the way they travel. Table 3 gives an overview. Firstly, girls make on average 2.96 trips per day, while

**Table 3**  
Average trips per day and trip modes for boys and girls (TDA 2004–2005).

	Boys	Girls
Average trips per day <sup>*</sup>	2.76	2.96
<i>Trip modes</i>		
On foot	12.00%	13.91%
Bike <sup>**</sup>	32.09%	21.63%
Car passenger <sup>**</sup>	36.64%	46.40%
Scooter/moped passenger	0.03%	0.28%
Skateboard <sup>**</sup>	0.98%	0.18%
Scheduled service bus/tram	5.57%	5.28%
School bus	1.55%	1.27%
Train	0.51%	0.47%
Other/not reported mode	10.63%	10.64%

<sup>\*</sup> Difference significant at  $p < 0.01$  ( $t$ -test for means).

<sup>\*\*</sup> Difference significant at  $p < 0.01$  ( $Z$ -test for proportions).

the boys travel less with 2.76 trips per day ( $t = 2.84$ ;  $p < 0.01$ ). However, the small difference in number of trips hides other interesting differences in mode use and in escorting.

Almost 46% of all the trips girls make are as car passengers. For boys, the car accounts for 37% of their trips ( $Z = 4.67$ ;  $p < 0.01$ ).<sup>6</sup> On the other hand, boys use the bicycle for 32% of their trips compared to 22% for the girls ( $Z = 5.62$ ;  $p < 0.01$ ).

A closer look at the trip to school reveals that the bicycle is the most important travel mode for both boys and girls. Here again, a significant difference between boys and girls for bicycle ( $Z = 3.49$ ;  $p < 0.01$ ) and car use ( $Z = 4.48$ ;  $p < 0.01$ ) was found. The questionnaire specifically asked for presence of an escort on the home-school trips. Boys travelled to school more often alone (35%) versus 22% of the girls. More than 31% of the girls came to school escorted by their parents compared to 24% of the boys (of course this results from the fact that more girls than boys are escorted to school). Furthermore, girls more often travel accompanied by (school) friends than boys. Collective independence through peers for girls was found in Flanders (Brown et al., 2008).

If these results are compared with other studies, identical trends were found in the UK (Department for Transport, 2002). They also found that girls make more trips than boys and that boys are more likely to make trips by bicycle. Unlike the situation in Flanders, bicycle use among children is rather low in the UK. The same results hold for the Netherlands: as indicated above, girls make more trips per day than boys, in both age groups (0–12 years and 12–16 years, respectively).

#### 3.4. Differences between children: class group

Differences in age groups were already found in the studies mentioned in Section 3.1. The age groups used in these studies were rather large. In our study, analyses were performed for the different ages in the sample. For reasons of clarity, the school level (primary or secondary school) was used here, which results in a less gradual transition of the results compared to analyses based on age groups (see Table 4).

On average, 5th and 6th graders (primary school) made 2.98 trips per day, which significantly differed from the 2.72 trips of the 1st and 2nd graders (secondary school) ( $t = 3.67$ ;  $p < 0.01$ ). Primary school children (aged 10–11 years) made 48% of their trips by car and 23% by bicycle. More than 14% of their trips were made on foot, while the public bus accounted for 1%. The share of trips by car decreased to 33% for the children in secondary school (aged 12–13 years). At the same time, bicycle use and public bus use

<sup>6</sup> The  $Z$ -test for proportions is used to compare the proportions from two independent groups to determine if they are significantly different from one another.

**Table 4**  
Average trips per day and trip modes for the different school levels (TDA 2004–2005).

	Primary school	Secondary school
Average trips per day	2.76	2.96
<i>Trip modes</i>		
On foot	13.89%	12.01%
Bike <sup>**</sup>	22.88%	31.34%
Car passenger <sup>**</sup>	48.62%	33.25%
Scooter/moped passenger	0.18%	0.12%
Skateboard	0.73%	0.44%
Scheduled service bus/tram <sup>**</sup>	1.28%	10.23%
School bus <sup>**</sup>	2.10%	0.58%
Train <sup>*</sup>	0.16%	0.87%
Other/not reported mode	10.17%	11.16%

<sup>\*</sup> Difference significant at  $p < 0.05$  ( $Z$ -test for proportions).

<sup>\*\*</sup> Difference significant at  $p < 0.01$  ( $Z$ -test for proportions).

increased to 32% and 10%, respectively. The shift in age leads to a shift in mode use and, more particularly, to a shift towards more independent travel modes. The difference in escorts during trip making is also clear: children in primary school made more than 50% of their trips escorted by parent(s) and 21% alone. Secondary school children made 33% of their trips alone. They were escorted by their parents for 33% of trips and made 25% of their trips with their friends. Here again, the shift to more independent travel when growing older is clear.

In the UK study (Department for Transport, 2002), it was found that 29% of the children aged 10–13 years were accompanied by an adult during their home-school trips. In our study, 31% of the children were escorted (44% of primary school children and 18% of secondary school children). For the US and the Netherlands, no comparable results were found, as escorting was not included in the travel behaviour studies.

#### 3.5. Differences between children: home location

Obviously, spatial characteristics have an influence on travel behaviour (Handy et al., 2002; Van Acker et al., 2007; Saelens and Handy, 2008; Hammadou et al., 2008), and this also applies to children's travel behaviour. For example, the availability of different transport modes is totally different for city centres and the countryside, and thus influences travel mode use.

Fig. 3 shows the travel mode to school for the four available areas (see Section 3.1 and footnote 5). For all four areas, the bicycle is the most important travel mode. However, the differences with other travel modes are obvious. A high share of car use is found outside the built-up areas and walking to school accounts for almost 30% of modes in town built-up areas. Moreover, the tram is reserved for urban environments, while the public bus is spoken about as relatively more important to children who live in a built-up area in the country.

For policy-makers, the travel differences found by home locations are useful to differentiate actions that promote sustainable transport. This could be possible for home-school trips in particular. Home-school distance is rather low for primary school children, so it would be possible to focus on cycling and walking in rural areas. In urban areas, an important role could be reserved for public transport when walking and cycling are not possible.

#### 3.6. Children and their parents

Parents are an important influence on the travel behaviour of the child. Different questions in the children's questionnaire asked for the influence of the parents on the child's travel behaviour. In addition to the current mode of travel to school, the child's preferred mode of travelling to school was requested and if the

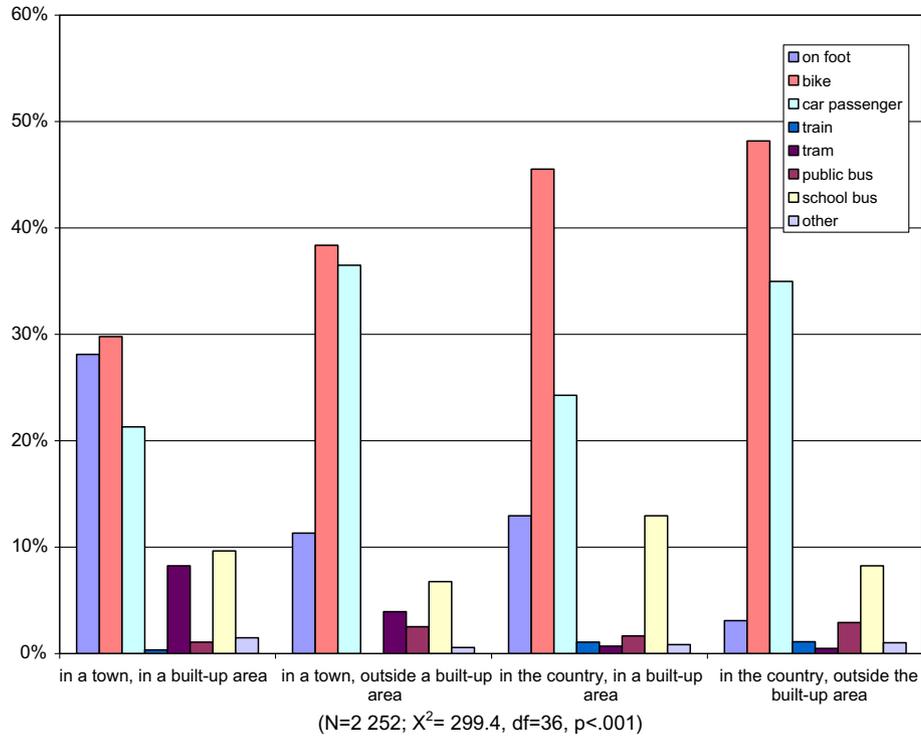


Fig. 3. Travel mode to school for four different home locations.

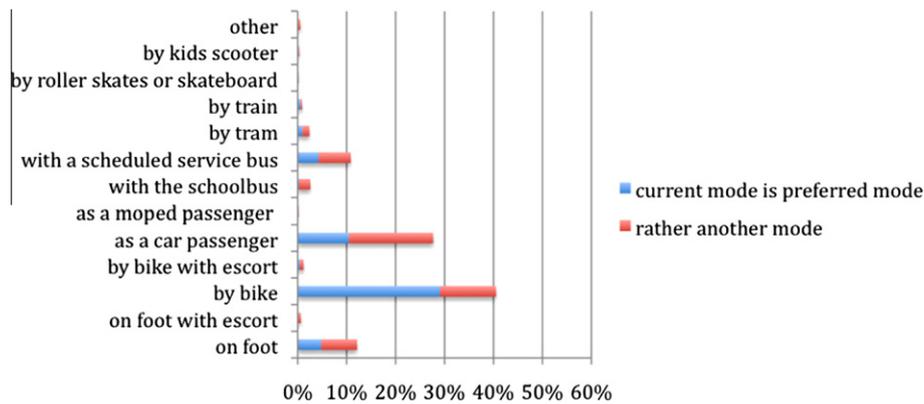


Fig. 4. Preferred mode to school as percentage of current mode to school percentage.

child did not use this preferred mode, the reasons why the child did not use it were requested. The results are shown in Fig. 4.

More than 49% of children indicated they would like to go to school in a different way, preferably by bike. The reasons for the non-use were requested in an open question, but the broad lines are clear. Children indicated traffic and social safety as the most important reasons for using another travel mode, followed by the home–school distance. However it is unclear to what extent it is their own opinion, as they state: “My mum finds the distance too long and too dangerous”, “My mum is afraid that something might happen”, “My mum is too worried”. Mothers are mentioned more than fathers or parents as an ‘influencing factor’, indicating that mothers have a greater protective and decisive influence on the child’s mode choice than fathers. This is not remarkable, since mothers take on more escorting responsibilities compared to fathers (Sener and Bhat, 2007; Zwerts et al., 2007; McDonald, 2005). Furthermore, children were asked ‘who or what decides how you go to school’. About 47% of children (N = 2372) indicated

that their parents decide for them on how to go to school. This percentage turns from 56% in primary school to 36% in secondary school, indicating again the influence of age in the process to transport autonomy. About 80% of the parents agreed with the child’s current travel mode to school. In answers to the open question, parents indicated traffic and social safety as important factors in the mode choice decision “The road from home to school is too dangerous with fatal accidents every year”, “Dangerous route”. However, in answers to this open question, parents also draw attention to independence and the need to develop traffic experiences: “Development of independence, fighting spirit, and health”, “Learning to become independent”, “The maturity of the child: Jolien is capable of going alone to school. She is attentive to traffic safety and she is able to do things independently”. The same items were also found by Ross (2007) in Scotland, specifically for journeys to school.

In order to develop an idea of how parents view their children’s travel autonomy, it was asked how far the child felt he or she was allowed to travel on their own. This indicative distance was mea-

sured as follows: the same street, some streets further away (same neighbourhood), the other side of the village or town, or another village or town. Most of the children indicated that their parents did not allow them to travel independently (65%). However, most parents (N = 2178) state that the same street and the same neighbourhood are allowed for independent travel. For 54% of children this independent travel could not be made by public transport, and for 53% not when it is dark outside. For 'the other side of the village or town' parents are hesitant to allow independent travel, regardless of the mode used. At the same time, parents are more confident with their children going to school alone on foot and by bike than by public transport. Apparently, the 'unknown, unloved' image of public transport applies for the parents too.

#### 4. Conclusion

In this paper, an overview was given of the most important findings in our study. Firstly, the trip data and comparisons of the outcomes with other studies and surveys in other countries were reported. The results show that children aged from 10 to 13 years were able to self-report their travel behaviour in a conscientious way. Further, it was found that boys travel more often and more independently than girls, that secondary school children travel less often but make more independent trips compared to primary school children and that the home location greatly influences the child's transport mode to school. The importance of the social aspects of travelling for children is an item to keep in mind. The results are in line with earlier results found in other studies and countries.

Parents and children do agree on most items concerning independent travel, but children are not aware of how gradually their parents think about independent travel. Most parents think in different distance zones (the same street, same neighbourhood, the other side of the village or town, another village or town), the farther the distance from home, the more restrictions to independent travel. Both parents and children look rather negatively at public transport. Informative and educative actions can help to convince both parents and children of the positive features of these transport modes.

The results of this study have contributed to the creation of a framework for participation of children in local mobility plans and environmental-planning processes, where children's opinions were taken into account in different pilot projects. Moreover, the Flemish public bus company has used the results for a new marketing campaign for the youth season concession ticket. However, different policy actions remain possible. Sustainable transport use is one such action that can be elaborated on at different (policy) levels.

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