Children's mobility patterns in the Urban Environment
Case Study - Lisbon

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Abstract

Physical characteristics of Portuguese (mostly littoral) built up areas, as a result of its recent rapid urban expansion and population growth often away from adequate public transportation solutions led to a considerable change in mobility choices. As a rapidly motorising society, Portugal adapted its urban environment as well as traffic and pedestrian circulation conditions to benefit private vehicles and their higher speeds. Economic growth favoured the number of kilometres driven which, despite recent improvements, increased road accidents to unacceptable numbers. Responsibility for urban safe mobility is split amongst different institutions often not yet well coordinated. Road users, who have been adopted busier routines, still show poor awareness towards safer and sustainable road attitudes.

If adolescents' car-oriented lifestyle is to be reversed by making it more active and autonomous whilst still increasing real and perceived road safety and promoting the benefits of sustainable transport modes, a clear understanding of current mobility patterns and their relationship with the built environment and modern existence needs to be carried out. The objectives of the Portuguese research project "Children Pedestrian License" are to diagnose young road users' mobility patterns and to promote responsible, active and safe mobility for this generation. The applicability of some of the methodology developed for this project was examined in a practical way through a case study in Lisbon.

This study involved a comprehensive examination of current commuting patterns in the private school *Colégio Moderno*. This paper explains what data has been collected and describes an in-depth investigation of around 350 set of surveys applied to 3rd through 8th grade children and their respective parents. The analysis offers first insights into the identification of these urban adolescents´ mobility patterns and an understanding of the specificities of inner-city private school students. They tend to have longer commuting distances, regular access to several vehicles per household and stating preferences by bicycle rides which rarely fulfilled. This paper presents and discusses the results for children´s journey home from school and describes how they will be used to contribute to enhance urban mobility choices in Portugal. Lessons from this piloting work have already being used in a

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thorough implementation of the Children Pedestrian License to 120 students in a public funded school (*Escola EB1 n.º 2 da Parede*) in Greater Lisbon.

1. Introduction

Various factors have led to restrictions of movement of vulnerable road users, including perceived or real road safety and security risks, considerably easier access to private vehicles and physical or psychological barriers created by the built up environment (Wittink, 2001). In developed countries, children have been particularly affected by this phenomenon associated to: (1) shrinking number of children per family, (2) parents (particularly mothers) busier life style and (3) rising lack of informal social control.

Urban planning options (McDonald, 2005) – including primacy for networks dedicated to motorised vehicles, urban dispersion (Carvalho & Gomes, 2009) and increased daily commuting distances - associated to widespread access to home technological entertainments, people are been driving away from the public urban space as a place for (more or less) spontaneous social interaction. The environmental, economic, social, gender and age as well as physical and psychological health relationship with children car-oriented daily life, have been analysed through different studies across various disciplines (Hillmand, et al., 1990; Valentine, 1997; McKendrick, 2000; National Research Council, 2005; Pooley, et al., 2005; Johanson, 2006; Brown, et al., 2008; Fyhri, et al., 2011).

The reduced young road users´ exposure to road risk as pedestrians and cyclists has led to fewer child road fatalities in developed societies, like Portugal (ETSC, 2010; ANSR, 2012). However, in Portugal, the number of child road fatalities is still greater than the EU average (Figure 1).

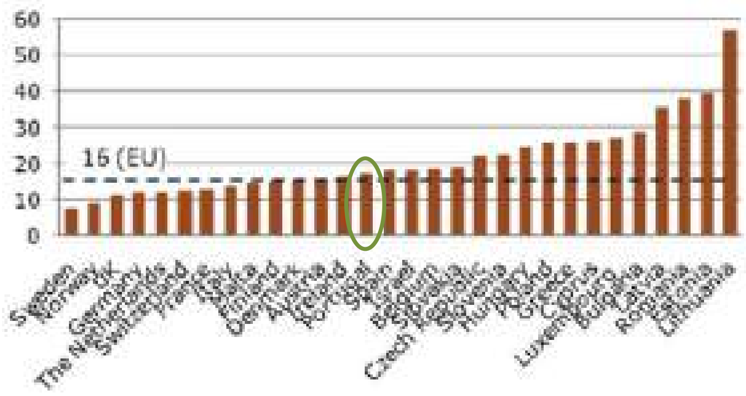


Figure 1. Child Road Mortality. Average values for years 2005, 2006 and 2007 (ETSC, 2009).

On the other hand, research carried out elsewhere shows that there is an association between the decrease in children´s pedestrian mobility and the deterioration of physical and psychological health as well as their social skills and autonomy (Cooper, et al., 2005; Mackett, et al., 2005; Viegas, 2010). An international report on children obesity shows that Portuguese children are amongst the weightiest in the world (Rito, 2009).

The authors are not aware of systematic studies on current mobility patterns of the Portuguese population. An accurate diagnose of the real situation including children´s and their care-takers´ preferences and motivations is required to set attainable mobility programmes and identify adequate measures to influence their mobility choices and complement a rare recent report (Cordovil, et al., 2011).

This paper reports on the preparation and establishment of the first pilot-study within the Children Pedestrian License project (Section 2), which is being undertaken at CESUR, *Instituto Superior Técnico* and *Associação Lavoisier*, benefiting from partial funding by *Fundação para a Ciência e Tecnologia*. The main output from this research project is expected to be a tool which, whilst increasing children and adults awareness towards the importance of walking safely and hence contributing to change their habits, systematically identifies children mobility patterns and supports the identification of appropriate engineering, planning and educational measures. The pilot study (Section 3), based at *Colégio Moderno* in Lisbon, was used: (a) to test, in practice, for the receptiveness of key parts of the developed "Children Pedestrian Licence" methodology, (b) to gain depth of understanding of some of its steps, and (c) to modify the initially proposed method where necessary. Data for the exercise was collected in-situ by means of a survey and an in-depth mobility investigation was carried out to assess the scale and nature of everyday travel and associated influencing variables (Section 4). Conclusions and identification of subsequent work are described in Section 5.

2. Children Pedestrian Licence Project

The main purpose of the Children Pedestrian License project is to promote responsible, active and safe mobility for young road users which in turn requires regular identification of their mobility choices in different urban structures. In order to achieve this, an initial methodology was developed against the vague background of a German programme with the same name.

The proposed framework incorporates mobility choices, perception of road safety and security, plus physical activity levels. The methodology is divided into four main phases:

1. *Project Statement*. Key outcomes from this initial stage are a formal agreement for the project implementation between various local organisations and the identification of required resources;
2. *Training Strategy*. Includes a course provided by the local police to roughly half of the children participating in the project. This training includes theory

and also a practical part in the vicinity of the school, with indication of the safest routes to school;

3. *Diagnosis of Mobility Patterns*. Data is collected by carrying out surveys to children and their parents on their perceived risks and mobility choices. Before and after the training by the police (Phase 2), surveys are applied to trainees and their parents as well as to a control group. Data collected is analysed for initial and changes in motivations and real choices, through descriptive and statistical analyses; and
4. Investigation of Relevant Measures. Relevant complementary remedial measures will be identified by multidisciplinary teams with a context sensitive approach.

Each project phase has been broken-down into steps. The subsequent activities to the four stages listed above are the choice of suitable measures and their implementation and monitoring. Each application of the project culminates (although does not finishes) with a public ceremony where trained children are granted a "Pedestrian License" (Figure 2).

Figure 2. Picture of the Children Pedestrian License (in Portuguese).

As part of the piloting application in *Colégio Moderno*, the study here reported was restricted to the Diagnosis of Mobility Patterns (Phase 3) which will be detailed in the subsequent sections of this paper.

3. Methodology

The process for developing the pilot study in *Colégio Moderno*, which focused on the Diagnosis of Mobility Patterns (Phase 3 - Section 2), consisted of three steps: (1) Assembling Data and (2) Data Analysis presented in this Section; as well as (3) the Identification of Mobility Patterns described in Section 4. The project statement, the training phases and the identification of relevant measures are not discussed in this paper as they were beyond the scope of this pilot study. As such, a control group was here unjustified.

3.1 *Colégio Moderno*: general description of its context

The mobility patterns of *Colégio Moderno* students are related to:

- social-economic context of its students;
- its geographic location; and
- urban characteristics of its surroundings.

Colégio Moderno, is located in the inner city of Lisbon, which is the capital of Portugal. The capital´s population is just over half a million with an average family size of 2.24 and an area of around 84 km^2. The Lisbon Metropolitan Area, has around three million inhabitants representing approximately 27% of the Portuguese population (INE, 2012)

The area surrounding *Colégio Moderno* is considered a typical (probably slightly bigger) inner-city affluent area of Portuguese urban areas. Indeed, *Colégio Moderno* is located in *Campo Grande* Parish, one of the 53 parishes of the capital. *Campo Grande* is a typical consolidated inner urban area with a mixed of residential, services (such as shops, companies and public institutions) and cultural areas (including the Lisbon University, museums and art galleries). Buildings are generally between four and seven floors high with streets catering for access traffic as well as long distance through traffic. The school neighbourhood has sidewalks with high degree of street connectivity. There are pedestrian crossing facilities, though markings are not always well maintained. In the public space, features for people with reduced mobility are irregular.

This area, which is generally flat, is well served with public transports including the underground, buses and commuting trains. Recent bicycle lanes, with little to none commuting use, have been introduced in the main roads of *Campo Grande*. Car parking is charged under a pay and display scheme.

Colégio Moderno is a private renowned school which, therefore, attracts students from a wider area than *Campo Grande*. Indeed, unlike state owned school, private schools area of influence is not regulated and the distance travelled by children as well as the means chosen to do so are potentially different. This school provides paid school bus service to students who request it. Lately a number of private organisations, such as the Automotive Club, have set up regular bus services which are also used by school children, including *Colégio Moderno*.

3.2 Assembling Data

Although an initial scheme for collecting and processing data had been designed within the Children Pedestrian License project, an opportunity arose to merge efforts with the international research project "*Independent mobility as a critical aspect of children development and quality of life- a longitudinal comparison over four decades in England, a cultural comparison over two decades with Germany, and an* *international extension to other countries*" (Policy Studies Group, 2012) coordinated by the Policy Studies Institute at Westminster University, London. This project was being implemented in Portugal by *Faculdade de Motricidade Humana* (FMH). The authors considered that collecting the same variables (partly covering both projects at that stage) would facilitate national and international comparisons and the transferability of knowledge and experiences. They supported FMH in the general set up activities at national level, including survey translation, authorization request from the education ministry and initial survey application, as well being responsible for all the activities related to contacts, data collection and analyses at *Colégio Moderno*, which represents the inner-city study in Portugal.

The process for data collection at *Colégio Moderno* began with contacts establishment followed by delivery of survey forms to school psychologists. Children took home a brief explanation of the study together with the request to participate in it as well as the adults´ survey form. Children, who were allowed to participate in the study, filled in their forms at school and brought back from home their parents filled in forms, which were then collected from school.

Colégio Moderno insisted in collecting data with little support from the project team as a way of decreasing school academic activities disruption. Although their openness and willingness to collaborate is greatly appreciated, it led to one flaw which limited the analyses procedures. The code that should have been inserted in the surveys to allow matching children to their respective parents, failed to be filled in the forms. Information was collected for children and adults, but establishment of their relationship is impossible. Data for children and adults was managed and analysed separately. Although the loss is measureable, some important analysis and subsequent conclusions are still possible.

IST team coded and verified the collected data for *Colégio Moderno*. Data was collected for 327 children, aged 8 to 14, between 3rd and 8th school grades. Children surveys´ had 15 questions grouped into six major categories: journey to and from school; context sensitive walking permission; bicycle and public transportation riding permission and skills; household neighbourhood characterisation and; child´s age and sex. Response rates (94%) for adults' surveys were high; adding up to 306 forms with 17 questions each.

This paper focuses on the analysis of *Colégio Moderno* students' replies.

3.3 Data Analysis

Within the context of the collaboration with PSI/FMH, following initial descriptive analysis at IST, *Colégio Moderno* database was merged with the national database and joined analyses were carried out mainly by FMH with IST support and included in the European report (Cordovil, et al., 2011) (see Assembling Data). For the piloting study within the framework of the Children Pedestrian Licence project, further analyses were carried out to the 327 questionnaires (4 excluded for missing data) applied to *Colégio Moderno* students, here described.

Most parents (83%) claimed that their choice of *Colégio Moderno* was related to the perceived better teaching quality from a high profile private school. Only 9% of the parents referred that it was the nearest school to their home which, most likely, impacts children journeys to and from school.

Descriptive analyses (Section 4) interpreted in the light of previous studies, as well as the school context, have led to the identification of a set of variables to include in two binary regression models considered focusing on their relationship with the students walking home from school.

One of the questions of the questionnaire was whether the child was going to return home from school walking all or most of the way (or was going to return home by any other mode on the day she/he answered the questionnaire). This resulted in a binary variable, Y, which was taken as a very close proxy for children that usually walk home from school. It was, therefore, chosen as the response (dependent) variable in the first binary regression model developed to identify which factors $\mathrm{x} = (\mathrm{x}_1, \dots, \mathrm{x}_\mathrm{p})$ seem to be important in its explanation:

$$Y_i \sim Bin(1, \pi_i), \qquad \mu_i = E[Y_i|\boldsymbol{x}_i] = \pi_i,$$

$$logit(\pi_i) = log\left(\frac{\pi_i}{1-\pi_i}\right) = \beta_0 + \beta_1 x_{1i} + \cdots + \beta_p x_{pi}, \;\; i = 1, \dots, 323$$

From within the list of available variables and their respective descriptive analysis, the first set of candidate covariates was constituted by those that were more prone to influence the usual student´s mode of transportation from school. The variables considered are presented in Table 1.

Table 1. Initial variables considered in the regression models.

Variable	Children´s characterisation
x_1	age
x_2	sex
x_3	allowed to cross alone a busy street
x_4	travelled on her/his own to school on that day
x_5	allowed to use public transportation by him/herself
x_6	travelled to school with her parents on that day
x_7	travelled to school with another adult on that day
x_8	travelled to school with older child(ren)/teenager(s) on that day
x_9	travelled to school with other same age or younger child(ren) on that day

Results from fitting this first model (Section 4) justified the development of a second regression model. This model adopted as a binary dependent variable, Y, whether the child "was going to return home from school walking (all or most of the way) or by public transportation" or else "was going to return home by any other mode". It was assumed that public transportation users are at a certain point of their journey also a pedestrian which is the base for merging both classes of road users.

Models were first estimated numerically by maximum likelihood, using the statistical software R-project. Afterwards an automatic variable selection procedure based on the relative goodness of fit measure Akaike information criterion, AIC, was implemented in order to choose the most relevant covariates (Akaike, 1974). AIC compares the goodness of fit of different models where each covariate is successively included and deleted.

These analyses contributed to the identification of key aspects of students' mobility patterns in their trip home from *Colégio Moderno*.

4. Results and their discussion

Roughly half (161) of the 323 surveyed children were girls. Two classrooms per grade participated in the study. As the students each grade are homogenous in terms of age, the distribution per age of the surveyed children is very regular between the usual 8 years-old third graders and 13 years-old typically in the eighth grade. For some analyses, three age-group classes have been considered: 8-9 years old (primary school), 10-11 years old (middle school) and 12-13 years old (high school). The sample has one child in the 3rd grade who were 7 years old and was merged with 8-9 years old group for analysis purposes, and twelve 14 years old and one 15 years old children whom for some reason have not progressed into subsequent grades and have been merged with 12-13 years old group for analysis purposes. The number of children per age group is as shown in Table 2.

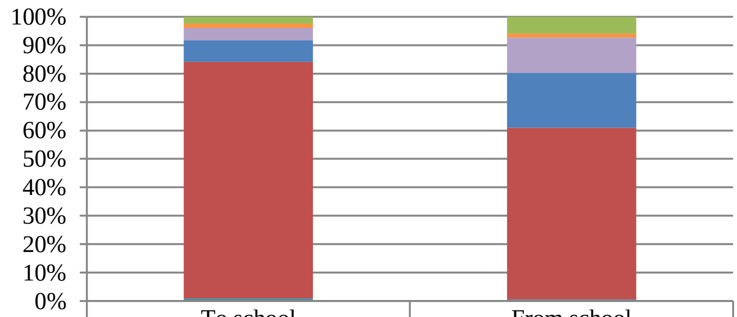
Table 2. Number of children surveyed per age group.

Years-old	Number of children
8-9	92
10-11	110
12-13	123

Analysis on mobility choices by children's gender has led that to no statistical significant differences in any of the age groups.

The survey considered various options for children to travel to and from school: on foot, by bicycle, school bus, public transportation (including local bus, train and underground), car, as well as other ("other" responses were identified as taxi and motorcycle). Answers on children´s modes used to go to school and from school are presented in Figure 3. Most children travel to and from school by car, 83.2% and

60.3%, respectively. Public transport is the second most used mode (7.6% and 19.4% on the journey to and from school, respectively) followed by the school bus which has a share of 4.3% and 12.3% to school and from school, respectively. Non-motorized modes (on foot and by bicycle) have lower modal share, 2.4% and 5.8% on the journey to and from school on foot, respectively, and 1.5% and 1.5% on the journey to and from school by bicycle, respectively. The differences in the transportation modes to and from school are statistically significant ($\chi^2(5)$ =45.95, $p<.05$).



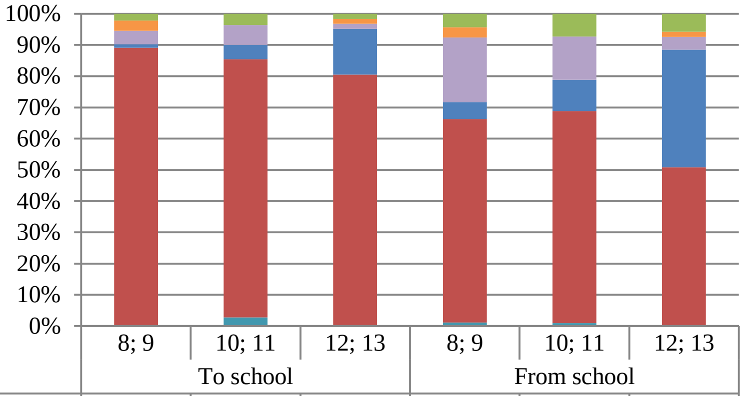
	To school	From school
on foot	8	19
by bicycle	5	5
school bus	14	40
public transportation	25	63
car	272	196
other	3	2

Figure 3. Travel modes, to and from school.

When asked how they would prefer commuting to school, about half (151 out of 320) of the children indubitably believe that bicycle would be their first choice. Car and public transportation (22% and 19%, respectively) were indicated as a second preference. Only 23 children would prefer walking. The difference in choice between the two more active travel modes (7% and 47% for walking and cycling, respectively) might indicate an accurate child awareness towards journey length. Indeed, according to parents´ surveys, 53% of the children travel longer or much longer to school than they did when they were their children´s age.

Interestingly, as children grow older they gradually and slightly lose interest by bicycles (58, 53 and 41 children for 7-9, 10-11 and 12-15 years old, respectively) and show increasing preference for traveling by public transportation (8, 19 and 35 for each age group, respectively) and private vehicle (11, 24 and 34 for each age group) instead.

Figure 4 shows that children´s age does impact their actual transportation mode to and from school. Comparing (A) the modes which allow autonomous mobility (on foot, by bicycle and by public transport) with (B) the modes linked to adult supervision (car and school bus) there is a modal transference from A to B as the children grow older. For example, the car share in the journey from school of younger children (8 and 9 years old) is 64.8% and the public transportation share is 5.5% whilst for older children (between 12 and 15 years old) is 50.8% and 37.7%, respectively. The differences in the transportation modes to school according to age groups are statistically significant ($\chi^2(10) = 29.01$, $p<.05$), as well as the differences in the transportation modes from school according to age groups are statistically significant ($\chi^2(10) = 56.49$, $p<.05$).



	To school			From school		
	8; 9	10; 11	12; 13	8; 9	10; 11	12; 13
on foot	2	4	2	4	8	7
by bicycle	3	0	2	3	0	2
school bus	4	7	2	19	15	5
public transportation	1	5	18	5	11	46
car	82	91	99	60	74	62
other	0	3	0	1	1	0

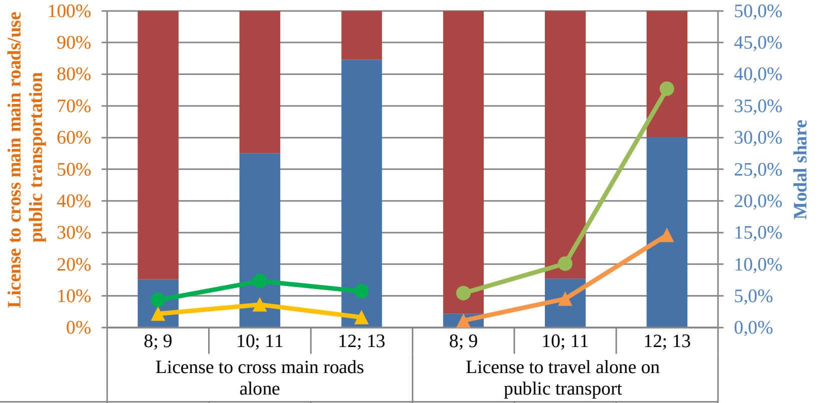
Figure 4. Modes to and from school by age groups.

The differences per age in mode of transportation used to commute is associated with children´s gradual increased authorization for being more autonomous road users in terms of crossing streets, using public transportation and travelling by themselves.

Figure 5 shows clear differences in children's license to cross alone by age groups, what they perceived to be, busy roads. Only 15.2% of the younger children are allowed to cross main roads whilst in the older age group this value raises to 84.6% (5.6 times more). The differences in license to cross main roads by age groups are statistically significant ($\chi^2(2) = 102.21$, $p<.05$).

Permission to travel alone on public transportation by age shows a similar pattern, increasing from 4.3% to 60.2% of children allowed from the younger age group to the older age group, respectively (see Figure 5). The differences in permission to travel on public transport by age groups are statistically significant ($\chi^2(2) = 94.52$, $p<.05$).

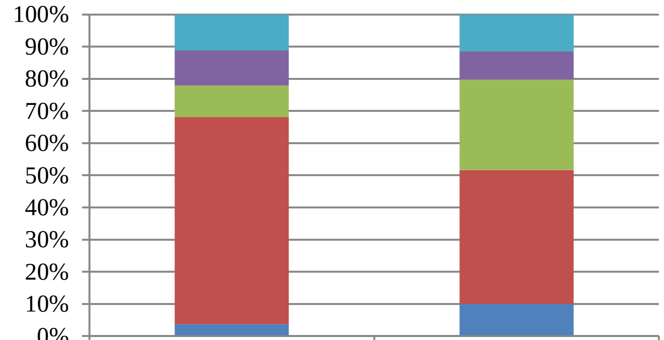
Although permission to cross main roads and use public transportation without adult supervision rises with age, the proportion of children who actually walk does not increase accordingly. On the other hand, there is a disproportionate increase of public transportation riding. Indeed, about 2/3 of children who are allowed, do use public transportation on their way home either with or without adult supervision (Figure 5)



	8; 9	10; 11	12; 13	8; 9	10; 11	12; 13
not allowed	78	49	19	88	93	49
allowed	14	60	104	4	17	74
to school on foot	2,2%	3,6%	1,6%			
from school on foot	4,3%	7,3%	5,7%			
to school by public transportation				1,1%	4,5%	14,6%
from school by public transportation				5,4%	10,1%	37,7%

Figure 5. License to cross main roads and to travel on public transportation alone by age groups (bars and Y-axe on the left) and modal share actually chosen (line and Y-axe on the right).

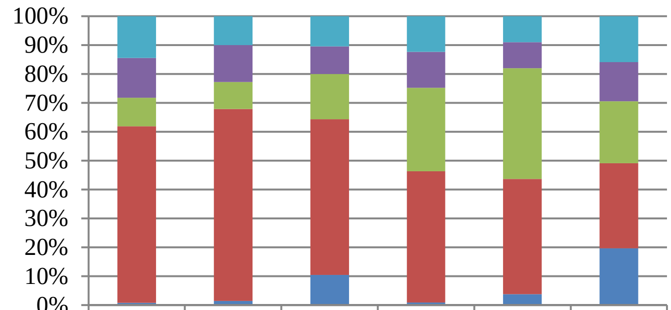
Figure 6 shows children travel autonomy from adult supervision on their journey to and from school for which differences were found between the two different journeys ($\chi^2(4)$ =70.06, $p<.05$). This was a multiple choice question. On the journey to school most children travelled with adult supervision (parents or other adult, 74.2%) whereas only 3.7% travelled on their own. However, on the journey back home there is an increase in the proportion of children who travelled on their own to 10.0%, as well as decrease in the children travelling with adult supervision to 69.8%.



	To school	From school
Child of same age or younger	48	45
Older child/teenager	47	34
Another adult	42	110
Parent	277	163
Travelled on my own	16	39

Figure 6. Travel autonomy to and from school.

An increase on the number of children who travelled on their own can be observed, on both journeys to and from school, as the children grow older (Figure 7). There are statistically significant differences both on their way to ($\chi^2(8)$ =24.75, p<.05) and from school ($\chi^2(8)$ =49.43, p<.05).



	To school			From school		
	8; 9	10; 11	12; 13	8; 9	10; 11	12; 13
Child of same age or younger	19	14	12	15	12	26
Older child/teenager	18	18	11	15	12	22
Another adult	13	13	18	35	51	35
Parent	80	93	62	55	53	48
Travelled on my own	1	2	12	1	5	32

Figure 7. Travel autonomy to and from school by age groups.

To enhance understanding on the role of the various factors in children´s mobility patterns suggested by the analyses just described, two binary models have been further developed (Section 4).

The first model focus on the relationship between “walking from school” / “not walking from school” and the described independent variables identified as the only relevant ones (see Methodology):
(1) the child is allowed to cross alone a busy street (x_3),
(2) the child did travel on her own to school on the questionnaire day (x_4), and
(3) the child is allowed to use public transportation on his/her own (x_5).

$$\widehat{logit(\pi_i)} = -1.37 + 1.38x_{3i} - 1.36x_{4i} - 1.44x_{5i}$$

Model 1 - “walked from school” / “not walked from school”.

This final model was found to be a good fit through a Pearson qui-square test (p-value= 0.6644). It was further checked for anomalous high residuals or influential points and none were spotted.

Assuming, then, this model as adequate for the data under analysis, odds ratios were estimated for each variable and are presented in Table 3, together with corresponding credible intervals (CI).

Table 3. Estimated odd ratios for Model 1 and corresponding confidence intervals.

	Variable	Odd Ratio	Confidence Interval
x_3	allowed to cross alone a busy street	0.26	95%, CI: 0.06;1.33
x_4	travelled on her/his own to school on that day	3.97	95% CI: 1.12;16.17
x_5	allowed to use public transportation by her/himself	0.24	95% CI: 0.06;0.88

This translates in that, holding x_{3i} and x_{5i} fixed, the odds of a child returns home walking is 3.97 times larger if he/she had travelled by on his/her own to school and, holding x_{3i} and x_{4i} fixed, the odds of a child returns home walking is 0.24 times smaller if he/she is allowed to use public transportation. The odds relating to being allowed to cross alone busy streets are not significant as the correspondent CI includes the odds ratio value of 1.

As the number of children walking back from school all or most of the way (19) was small, a second model was considered for explaining the binary variable indicating whether children have walked or used public transportation in their way home (82 in total).

For this second model the variables that showed to be relevant are:
(1) age (x_1).
(2) the child is allowed to cross alone a busy street (x_3),
(3) the child did travel on her/his own to school on the questionnaire day (x_4), and
(4) the child is allowed to use public transportation on his/her own (x_5).
(5) the child travelled with parent to school on the questionnaire day (x_6).
(6) the child travelled with other adult to school on the questionnaire day (x_7).

$$\widehat{logit(\pi_i)} = -3.68 + 0.24x_{1i} + 0.67x_{3i} - 1.10x_{4i} - 2.40x_{5i} + 2.16x_{6i} + 1.96x_{7i}$$

Model 2 - "Walked or used public transportation from school" / "Not walked nor used public transportation from school".

This final model was found to be a good fit through a Pearson qui-square test (p-value= 0.431). It was also checked for anomalous high residuals or influential points and they were inexistent. So, considering once again this model as adequate for the data under analysis, odds ratios for each variable were estimated (Table 4).

Table 4. Estimated odd ratios for Model 2 and corresponding confidence intervals.

	Variable	Odd Ratio	Confidence Interval
x_1	age	1.28	95%, CI: 1.00;1.63
x_3	allowed to cross alone a busy street	1.95	95%, CI: 0.83;4.82
x_4	travelled on her/his own to school on that day	0.33	95% CI: 0.08;1.20
x_5	allowed to use public transportation by her/himself	0.09	95% CI: 0.04;0.20
x_6	travelled to school with her parents on that day	8.67	95% CI: 2.34;39.48
x_7	travelled to school with another adult on that day	7.09	95% CI: 1.62;39.17

This translates in that, holding x_{3i}, x_{4i}, x_{5i}, x_{6i} and x_{7i} fixed, an increase of 1 year in the child age results in an increase of the odds of a child returns home walking or public transportation of about 28%; holding x_{1i}, x_{3i}, x_{4i}, x_{6i} and x_{7i} fixed, the odds of a child returns home walking or by public transportation is 0.09 times smaller if he/she is allowed to go on local buses; holding x_{1i}, x_{3i}, x_{4i}, x_{5i} and x_{7i} fixed, the odds of a child returns home walking or by public transportation is 8.67 times larger if he/she child did travel to school with his/her parents; holding x_{1i}, x_{3i}, x_{4i}, x_{5i} and x_{6i} fixed, the odds of a child returns home walking or by public transportation is 7.09 times larger if he/she child did travel to school with other adult. The odds relating to being allowed to cross alone main streets as well as sex are not significant as the correspondent CI clearly includes the odds ratio value of 1.

Results here presented have confirmed expectations - which were both common sense and supported by knowledge developed in the literature (Section 1) - towards children's current dominant use (71.8%) of cars for commuting. The fact that 177 out of 305 of the surveyed households have regular access to two or more vehicles (while only 26 claim no systematic access to car) might have exacerbated this difference in relation to non-private schools. The same socio-economical basis might have impacted other results (in relation to gender, available adult supervision and average travel distance) and will need to be compared with other national contexts. The willingness to participate in the project and the receptiveness to potential changes to mobility choices are further key aspects for which longitudinal cross-national studies are required.

5. Conclusions

Whilst private cars can have a positive role to play in children´s lives - facilitating safer and more comfortable access to many learning and leisure destinations, the problems generated by children car-dependency for daily commuting are leading to an increase of physical, psychological and social problems and a decrease in the quality of the urban environment.

This paper reports a stage in the development of a methodology aiming at contributing to children's safe autonomous mobility by both developing children´s skills and adults´ perceptions and willingness to accept children´s autonomy. The work summarises the framework´s most relevant characteristics and describes their partial use in a pilot study, in a private school, in Lisbon. The early results show a real prospect of achieving a methodology that will be adequate to current Portuguese context and transferable to other countries. However, at the present national economic circumstances, it is difficult to assess the extent of readiness to implement the complementary required planning, transportation and educational measures to attained noticeable changes.

The study provides a description of dominant variables influencing the choice of walking, both in isolation or combined with public transportation, of students at *Colégio Moderno*. Although 207 (67.9%) parents claimed to have walked or used public transportation to school when they were children, from analysis of children´s replies to the survey, it emerged that, in their way home from school, most are driven and only (5.8%) walk all or part of their way. Results show that age is the single most contributing factor of the variance in adult free supervision mobility. Results seem to point to commuting distances as a likely reason for students not to walk to school. Gender does not emerge as playing a role on mobility choices. Although there are significant differences between modes used by children to go and return from school (possibly associated to other family members schedules), the chances of walking home is higher if the child also walked in the morning.

It was acknowledge that the methodology is being applied from the scratch and that problems which could emerge from this pilot application would be used in the revaluation of the initial proposal. Based on in *Colégio Moderno* pilot study in 2010/11, the surveys were refined to include for example the distance household-school and more socio-economic variables. Data collection is being repeated in *Colégio Moderno* which will also going to allow matching children replies to those of their parents. An on-line version of the questionnaire, which has been recently implemented, is being tested.

The refined methodology, in its more complete version, is being replicated in a public funded primary school in *Parede* (Greater Lisbon) with the support of *Cascais* Local Authority. Data for the training and the control group are being collected and will be analysed. One important aspect of this project is to raise visibility of the travel behaviour of children and the roles of their parents in a country where that has not yet been a priority.

The Children Pedestrian Licence project and associated methodology has the potential to become a valuable tool for improving attitudes regarding road safety by providing children with skills for safe autonomous mobility for at least three reasons:

1) Firstly, human error is the biggest contributing factor to road accidents. It is, therefore, important to train children from an early age on the importance for adopting a safe responsible behaviour as pedestrians increasing later the probability of embracing a similar attitude as drivers.
2) Children are also a good vehicle to influence adults' behaviour and perceptions. Based on anecdotal evidence in other areas which required relatively quick change of adults´ habits (such as recycling and smoking), it is expected that this project will bring positive impacts not only on children but also on the school community, parents, teachers and citizens in general.
3) Thirdly, as it has a comprehensive set of questionnaires, it will be a good sourced for systematic monitorisation of travel patterns of children and their families. Comprehensive analysis of available data make deepen the understanding of physical environmental, social and individual contributor factors to parents´ choice for their child mobility which in turn generates better opportunities adjusting policies to prevailing circumstances.

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