Original research

Children's (in)dependent mobility in Portugal

R. Cordovil *, F. Lopes, C. Neto

Laboratory of Motor Behavior, CIPER, Faculdade de Motricidade Humana, Universidade de Lisboa, Portugal

A R T I C L E   I N F O

A B S T R A C T

Objectives: To characterize children's independent mobility in Portugal, by studying the influence of age, sex, school type (primary/secondary) and location (urban/rural). To explore associations between mobility licences and children's actual independent mobility.

Design: Cross-sectional study of 1099 children between 8 and 15 years of age and their parents. Children attended primary (n = 660, 49% boys, 69% urban) and secondary (n = 439, 43% boys, 72% urban) schools.

Methods: The Portuguese version of the child independent mobility survey (Policy Studies Institute, London) was completed. Parents reported the mobility licences granted to their children. Children reported their independent mobility on school journeys and on weekends. Differences were examined in mobility licences and independent mobility by sex, urban/rural setting and primary/secondary schools. Multiple logistic regression models examined the associations between different variables and actual independent mobility.

Results: Secondary school children are granted more licences and have greater levels of independent mobility than primary school children. Only 21% of primary school children and 45% of secondary school children come home from school actively and independently. Overall, sex does not influence the licences granted to children in Portugal but boys have greater levels of independent mobility during the weekends than girls. Children in rural settings report engaging in more activities during the weekend. The number of mobility licences granted to the child was identified as predictor for actual independent mobility on school days and during the weekend.

Conclusions: Portuguese children lack independent mobility. Complementary qualitative research will be important to inform about the better practices to tackle this problem.

1. Introduction

Physical inactivity is considered "the fourth leading risk factor for global mortality".[1] Although there are various correlates of physical activity, some of them show a consistent influence along different stages of lifespan. A review of 108 studies concluded that time spent outdoors is consistently and positively associated with children's physical activity, whereas sedentary behavior after school and on weekends is consistently and inversely associated with adolescent's physical activity.[2]

More recently, Schoeppe et al.[3] confirmed the idea that children's independent mobility, which refers to the degree of freedom they have to move around in their local area without adult accompaniment, is an important correlate of physical activity.

Independent mobility has important implications for children's physical,[4] cognitive[5] and social[6] development.

In 1990, a seminal study published by the Policy Studies Institute (PSI)[7] showed that over the previous 20 years there had been a marked reduction in children's independent mobility in England. The report of the study titled 'One False Move. . . a study in Children's Independent Mobility' challenged the view that the reduction in child fatalities on the roads was mainly attributable to safer roads, showing that it was also due to a dramatic reduction in children's levels of independent mobility over the previous decades (i.e., instead of removing danger from the environment children had been removed from danger). Since then, there has been an international growing concern about the reduction of children's independent mobility. Recently the PSI surveys were repeated in England and international researchers were invited to conduct equivalent surveys in other countries. This study presents the main results of the Portuguese survey.

The study of children's independent mobility in Portugal has not been done nationwide before. Hence it is important to understand how freely Portuguese children interact with their environment

* Corresponding author.
  E-mail addresses: ritacordovil@fmh.ulisboa.pt, cordovil.rita@gmail.com
  (R. Cordovil).

and what factors might be related to their levels of independent mobility. Following the international guidelines produced by PSI, this study cross matched parents' and children's data and examined the mobility licences that parents grant to their children as well as actual indicators of independent mobility (e.g., way of traveling to and from school and number of independent activities during the weekend). The mobility licences are a set of rules defined by parents concerning permission for children to move around independently in their daily physical environment, for example, permission to cross roads or to ride a bicycle independently.[7] The relationship between the mobility licences and children's actual independent mobility is also an important issue that has been addressed by some international partners[8] and that should be explored in the Portuguese sample.

This study aims to describe the levels of independent mobility of Portuguese children; to investigate the influence of age, sex, and area of residence in the different mobility licences and in the number of independent weekend activities; and to analyze the associations between mobility licences and actual independent mobility.

2. Methods

The Portuguese versions of the international Child Independent Mobility questionnaires (for parents and children) were translated from the English version provided by the Policy Studies Institute and were completed by children from the 3rd to the 10th grade, aged between 8 and 15 years old. The questionnaires were completed in different public primary and secondary schools located in areas that were considered to be representative of five different areas requested by the international partners, namely: inner city (center of Lisbon, parish of São João de Brito, 223 child–parent dyads, population density 5143.4 people/km^2), urban (Matosinhos, outer area of Oporto, 220 child–parent dyads, population density 4399.0 people/km^2; and Linda-a-Velha, outer area of Lisbon, 72 child–parent dyads, population density 8620.3 people/km^2), suburban (Brandoa, outer area of Lisbon, low economic conditions, 255 child–parent dyads, population density 8020.0 people/km^2), small town (Silves, 192 child–parent dyads, population density 54.6 people/km^2) and rural (Redondo, 137 child–parent dyads, population density 19.02 people/km^2). In order to characterize the school areas, we used several sources of demographic and socioeconomic information available in the official web sites of the local councils and/or parishes, together with the relevant information presented in the Statistics Portugal web site (INE). The areas of the schools were selected to include the north and south of Portugal and coastland and inland. Sixteen schools and 1099 child–parent dyads participated in the survey, which represents a response rate of 65.4%. For the urban/rural comparison, study areas were dichotomized as 'urban' (i.e., previously categorized as 'inner city', 'urban', 'suburban') and 'rural' (i.e., previously categorized as 'small town' and 'rural'). The data collection occurred during 2011 (Spring-time) in all areas except in the inner city area (Spring-time of 2012). Ethics approval was obtained from the Ethics Committee of Faculdade de Motricidade Humana and from the General Department of Education in Portugal.

Following initial contact and agreement with the principal of each school, a package was sent home to parents of the participating children, inviting them and their child to participate by completing the parent questionnaire and consent forms. Each parent questionnaire had a unique code that was linked to their child's questionnaire. Children with parental consent completed the survey at school (guided completion).

To measure mobility licences, parents were asked whether their child was allowed to: (1) cross main roads alone; (2) travel on their own to places other than school (within walking distance of home); (3) travel home from school alone; (4) go out alone after dark; (5) travel on local (non-school) buses alone; (6) cycle on main roads alone. A mobility licences score was computed by summing the licences granted to the child (values range 0–6).

To measure the home–school distance, parents were asked to estimate the distance of their house to their child's school. Response options were: Less than 500 m; 500 m to 1 km; 1–2 km; more than 2 km. For data analysis a dichotomous variable was created relative to the home-school distance (i.e., up to 1 km, more than 1 km).

Children were asked about their travel mode to and from school on the day of the survey in two questionnaire items. Response options were: "Walked most or all of the way"; "Cycled"; "School bus"; "Local bus, train, tram or subway"; "Car"; "Other". Two child questionnaire items also asked about the level of accompaniment on those journeys. Response options were: "Traveled on my own"; "Parent"; "Another adult"; "Older child/teenager"; "Child of same age or younger". A dichotomous variable was created to identify children who traveled actively (i.e., walked or cycled) and independently (i.e., without adult accompaniment) on either journey.

Independent mobility on weekends was measured by the number of unaccompanied activities done by the child during the previous weekend. Children could choose the following activities: visited (1) friend's home, (2) relatives/grown-ups; went to (3) youth club, (4) shops, (5) library, (6) cinema; (7) spent time with friends after dark; (8) went to playground, park or sports field, (9) played sport or went swimming; (10) walked or cycled around; went to (11) concert or disco, (12) church. Children could report up to three "other" activities. Individual items were summed to give a score for independent activities on the previous weekend (possible range 0–15). A dichotomous variable was created to identify children who had done at least one activity without adult accompaniment on the weekend.

Descriptive data analysis was performed to examine the independent mobility of Portuguese children in general and according to age. Chi-square tests were used to investigate the differences in each independent mobility licence and in independent mobility on the school journey according to sex, urban/rural location, or school type (primary vs. secondary schools). The differences on the number of weekend independent activities done by these groups were investigated using independent t-tests.

Logistic regression analyses were performed to examine the associations between different variables and the odds of the child: (i) coming home from school independently (i.e., any travel mode without adult accompaniment); (ii) coming home from school actively and independently (i.e., walking or cycling without adult accompaniment); (iii) doing at least one independent activity on the weekend. Variables considered initially for the first two models were: age and sex of the child, distance from home to school, household access to car, number of mobility licences granted, and urban/rural location. The same variables, except for distance from home to school, were considered for the model related to weekend independent activities. We applied a stepwise selection procedure (backward and forward elimination (likelihood ratio), p in <0.05, p out >0.05). The final model included only factors with $p < 0.05$. Results are presented as odds ratios (OR) with 95% confidence intervals (CI).

3. Results

The sample of 1099 parent–child dyads comprised: 660 primary school children (49% boys, 69% urban) (3rd to 6th grade) and 439 secondary school children (43% boys, 72% urban) (6th to 10th grade), with mean ages 9.8 ($SD = 1.5$) and 13.8 ($SD = 1.6$) years, respectively. Parents who filled in the questionnaire were

mostly mothers/female carers (82%), under 45 years (73%), who were employed (73% full time and 7% part time). According to parental reports about half of the children lived within 1 km of school (49%), and there were no significant differences in distance traveled to school between urban and rural children ($\chi^2(1) = .265$, $p = .639$). Most households had access to at least 1 car (74%), the percentage was slightly larger in rural than in urban households (78% vs 72%), but the differences were not significant ($\chi^2(1) = 3.74$, $p = .058$). Less than half of the Portuguese children went to school (34%) and returned home (42%) not accompanied by an adult, and less than 1/3 traveled actively (walked/cycled) and independently to (26%) and from (30%) school. About 2/3 of the children (67%) reported to have done at least one activity during the weekend which was not accompanied by an adult. The mean number of independent activities during the weekend reported by the children was 2.06 ($SD = 2.28$, median = 1, range 0–12).

The impact of age on the different independent mobility licences is presented in Table 1.

School type (primary vs. secondary), which is closely related to age, is an important variable for children's independent mobility since more secondary school children than primary school children were granted each licence, and more secondary than primary school children went to school (primary: 18%; secondary: 37%) and returned home (primary: 21%; secondary: 45%) actively and independently (all $ps < .001$). Primary school children engaged in fewer independent activities during the weekend ($M = 1.84$, $SD = 2.23$, median = 1, range 0–12) than secondary school children ($M = 2.39$, $SD = 2.32$, median = 2, range 0–11) ($t(1097) = 3.92$, $p < .001$).

The percentages of girls and boys granted the different licences were similar for all licences except for the licence to go on their own to other places other than school, which was granted to more boys (51%) than girls (44%) ($\chi^2(1) = 6.02$, $p = .016$). There were no significant differences in the percentage of girls and boys who traveled actively and independently to and from school. The major influence of sex was on the number of independent activities done during the weekend, which was greater for boys ($M = 2.43$, $SD = 2.51$, median = 2, range 0–12) than for girls ($M = 1.74$, $SD = 2.01$, median = 1, range 0–11) ($t(965) = 4.98$, $p < .001$).

School location (rural vs urban) also influences independent mobility in Portugal. A greater percentage of rural children than of urban school children are allowed to: go to places other than school on their own (53% vs. 45%) ($\chi^2(1) = 6.157$, $p = .014$), go out after dark (17% vs. 10%) ($\chi^2(1) = 9.672$, $p = .003$) and cycle on main roads alone (43% vs 27%) ($\chi^2(1) = 20.170$, $p < .001$). More urban than rural school children are allowed to travel on local buses alone (40% vs 29%) ($\chi^2(1) = 11.295$, $p = .001$). The percentage of children allowed to cross main roads (urban: 62%, rural: 67%) and to come home from school alone (urban: 48%, rural: 48%) was similar for urban and rural children. Rural children engage in more independent activities during the weekend ($M = 2.60$, $SD = 2.51$, median = 2, range 0–12) than urban children ($M = 1.83$, $SD = 2.14$, median = 1, range 0–11) ($t(541) = 4.82$, $p < .001$).

The results of the multiple logistic regression models are presented in Table 2. As expected, the distance from home to school is a strong predictor for coming home independently. In fact, considering the children that live more than 1 km away from the school, only about 30% of return home independently and only about 11% return home actively and independently. Being older and living in a household with no access to a car also increases the odds of children coming home from school actively and independently. However, after the distance to school, the number of mobility licences granted to the child is the most important variable for predicting independent and active and independent mobility in the school-home journey. Children with more independent mobility licences and particularly boys are also more likely to engage in at least one independent activity on the weekend. Urban or rural location was not

a significant variable for predicting children's independent mobility in the school journey or on weekends. Despite the previously reported tendency for rural children to do more independent activities during the weekend than urban children, the urban or rural location failed to reach significance to be included in the multiple logistic regression model ($p = .059$).

4. Discussion

This study is the first large scale analysis of children's independent mobility in Portugal. Our main findings corroborated the results of previous studies in other countries that report low levels of children's independent mobility and an increase in car use in modern society.[9–11] During school days only 30% of Portuguese children, from 8 to 15 years of age, travel home from school actively and independently. On weekends, 67% of the children engage in at least one independent activity outside their home, but no more than one independent activity for most children (median = 1). These results confirm a tendency for children to engage in sedentary activities within the home setting[12] and raise concerns about children's overall physical activity levels. The recommended 60 min of daily moderate-to-vigorous physical activity[1] are more difficult to attain if children have low levels of independent mobility and active travel.[3]

Of all the variables analyzed, age is the most directly correlated with children's levels of independent mobility in Portugal. As children grow older they are granted more licences of independent mobility and their levels of actual independent mobility also increase, both on the school journey and on weekends. International partners[8,13] also report an increase in the number of independent mobility licences with age, but in Australia (unlike Portugal and England) fewer secondary than primary schoolchildren travel independently and actively on school journey.

Sex was not an influent factor on children's independent mobility on the school journey. There were no differences in most of the parental reports of the six independent mobility licences according to sex, which contradicts the results from previous studies.[7,10,6] Sex only influenced the licence to go on their own to other places than school, which is granted to more boys than girls in Portugal. Maybe for that reason, boys were 1.4 times more likely than girls to engage in an independent activity outside their house during the weekend.

Area characteristics also influence the independent mobility licences granted to children in Portugal. More rural than urban children are allowed to go to places other than school, go out after and cycle on main roads on their own. Rural children also tend to engage in more activities during the weekend. However, having a greater number of mobility licences and being a boy are the best predictors for engaging in more independent activities during the weekend. The influence of area characteristics has been reported in previous studies[7] and is correlated with economical, social and cultural differences between the families of those areas.[5]

The relationship between the mobility licences and children's actual independent mobility was also explored. Based on multiple logistic regression model estimates, we found strong associations between the mobility licences and different indicators of independent mobility, on school days and on weekends. More specifically, for each additional independent mobility licence granted to children in Portugal, their odds of coming home from school independently increase 2 times, their odds of coming home from school actively and independently increase 1.7 times, and their odds of doing at least one independent activity on the weekend increase 1.5 times. To our knowledge the relationship between mobility licences and actual mobility on school days and weekends has not been much explored in the literature. A previous

Table 1
Percentage of children who are granted the different mobility licences according to age.

Mobility licence	Children granted the licences by age group (%)							
	8 yrs	9 yrs	10 yrs	11 yrs	12 yrs	13 yrs	14 yrs	15 yrs
Allowed to cross main roads	13.8	25.6	45.6	64.2	83.3	98.6	96.4	98.6
Allowed to go on their own to places other than school (usually goes alone/varies)	9.3	13.8	23.9	41.7	57.9	76.3	78.8	87.0
Allowed to come home from school alone	6.1	9.1	30.2	45.5	62.6	79.1	85.7	85.5
Allowed to go out after dark	0.8	1.0	2.6	2.8	8.7	15.6	27.4	41.8
Allowed to use buses	0.8	4.0	14.0	16.4	36.1	65.0	76.1	88.8
Allowed to cycle on main roads (if cycle owner)	4.0	12.2	10.6	25.0	34.1	52.2	65.8	76.8

Table 2
Multiple logistic regression model estimates for coming home from school actively and independently, for coming home from school independently, and for doing at least one independent activity on the weekend.

	Coming home from school independently[a]		Coming home from school actively and independently[b]		Doing at least one independent activity on the weekend[c]	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Age (years)	1.24	(1.09; 1.42)**	1.22	(1.05; 1.41)**	ns	
Distance home-school: up to 1 km (Ref. >1 km)	5.46	(3.49; 8.53)***	16.03	(9.70; 26.51)***	nc	
Household access to car: no (Ref. yes)	1.88	(1.16; 3.04)*	1.74	(1.08; 2.81)*	ns	
Mobility licences (n)	2.00	(1.70; 2.35)***	1.65	(1.39; 1.96)***	1.47	(1.34; 1.61)***
Sex: boy (Ref. girl)	ns		ns		1.44	(1.04; 1.99)*
School setting: rural (Ref. urban)	ns		ns		ns	

OR, odds ratio; 95% CI, 95% confidence interval; Ref., reference category; ns, non significant variables (not entered in the model after the selection procedure); nc, variable not considered for this model.

* $p < .05$.
** $p < .01$.
*** $p < .001$.
[a] Hosmer–Lemeshow goodness-of-fit test statistic = 9.724, $p = 0.285$, correct predictions = 82.9%.
[b] Hosmer–Lemeshow goodness-of-fit test statistic = 7.832, $p = 0.450$, correct predictions = 85.2%.
[c] Hosmer–Lemeshow goodness-of-fit test statistic = 9.859, $p = 0.131$, correct predictions = 70.6%.

study[8] found strong associations between mobility licences and walking/cycling independently to/from school, but the association between mobility licences and independent activities on the weekend were less clear than in our study. Living close to school (up to 1 km) and having no car in the household significantly increase the odds of children coming home from school actively and independently. These results are in line with previous research that considered trip distance as the determining factor in travel mode choice[14,15] and in the odds of taking up and maintaining active commuting.[16] Besides trip distance, car ownership has also been previously identified as negative correlate of active transport.[17]

Although this study provides an important picture of children's independent mobility in Portugal, it also has some limitations. The cross sectional design and the type of questions of the survey, which focused specifically on that day or on the previous weekend, might present some bias due to atypical behavior or seasonal influences in the levels of independent mobility. On the other hand, to better understand the correlates of independent mobility, complementary qualitative research might be necessary.

5. Conclusions

This study highlights the low levels of independent mobility among Portuguese children on the school journey and on weekends. Only 21% of primary school children and 45% of secondary school children come home from school actively and independently and the median number of weekend independent activities is 1 for primary school children and 2 for secondary school children. The fact that children are frequently driven to school and other destinations has a negative impact on their overall levels of physical activity.[18] This is an important public health concern since it has been shown that both independent mobility and active travel

confer important health benefits for children.[3] After this first large scale analysis, complementary qualitative, child-centered and local sensitive research will be important to inform about the better practices to promote children's active and independent mobility during school days and weekends.

Practical implications

- Less than 1/3 of Portuguese children travel actively and independently on the school journey.
- Primary school children have lower levels of independent mobility than secondary school children. Parental concerns about independent mobility at younger ages should be addressed and parents should be informed about the physical, cognitive and social benefits of active and independent mobility.
- There are strong associations between the number of mobility licences granted to children and actual independent mobility on school days and during weekends.
- Programs to promote children's active and independent travel in Portugal should be local sensitive and age sensitive but should mainly target primary school children, urban areas and weekend activities for girls.

Acknowledgements

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