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Children's independent mobility in Portugal: effects of urbanization degree and motorized modes of travel

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ABSTRACT

This study is aimed to evaluate the impact of urbanization in children's independent mobility in Portugal. Mobility licenses, actual mobility, fear of traffic, stranger danger and sense of community were compared in highly, moderately and non urbanized environments and according to gender. Results showed that increase of urbanization leads to a decrease of children's licenses to independently cross and cycle main roads; go out after dark and go to places other than school. The rising of urbanization leads to an increase of children's mean age for independent active travel; and at the same time a decrease of independent active school-home travel and leisure time activities. Parental fear regarding traffic is the most frequent cause for concern regarding children's safety when they are outdoors. Stranger danger and low sense of community are more prevalent in parents from the highly-urbanized environment. Overall, girls enjoy less actual mobility than boys. The discussion shows that children's freedom of movement in the highly-urbanized setting is very restricted due to a pervasive automobile dependence, proposing a shift from a motorized to a walkable city.

1. Introduction

1.1. Children's independent mobility

Children's independent mobility (CIM) has been a crucial topic of research and one of major importance in children's lives (Hillman et al., 1990; Johansson et al., 2010; Prezza, 2007). CIM refers to the opportunities for children being able to move freely, explore and play in their local physical surroundings at their own pace and time, towards a progressively wider freedom of movement and acquisition of knowledge about the environment (Björklid, 2004). According to Rudner (2011), CIM focuses on the usage of public space by people under 18 years of age on their own, that is without being accompanied by adults.

Several studies acknowledge that children's independent mobility contributes to the overall health and well-being (Fagerholm and Broberg, 2011; Mackett et al., 2005a; Mackett and Paskins, 2008). On this topic, Brown et al. (2008) identified the benefits of children's independent mobility summarized from other European research, such as: development of motor skills; increase in additional physical activity; influence on cognitive development by helping children to increase their way-finding abilities, and also the development of emotional bonds between children and the natural environment. A study conducted by Rissotto and Tonucci (2002) in Italy concluded positively about the role of freedom of movement in acquiring, processing and structuring environmental knowledge. A systematic review of studies done by Schoeppe et al. (2012) showed that children who are autonomous playing outdoors and traveling actively undertake more physical activity than those who are not.

Conversely, many studies refer to the negative effects of constraining children's autonomy and freedom of movement in the context of children's development and overall well-being such as, hindering the acquisition of environmental knowledge (Hillman, 1993); avoiding risk contact interactions in the physical environment and jeopardizing the development of resilience (Gill, 2007). Also, restricting the development of social and motor skills (Hüttenmoser, 1995) as well as spatial and analytical competence (Rissotto et al., 2006) adds to the problem. Equally, reducing the opportunities for outdoor and indoor independent play with peers (Prezza et al., 2001); decreasing opportunities for physical activity (Armstrong, 1993), accompanied with less spending of activity calories (Mackett et al., 2005a, 2005b) and increasing of weight, obesity and sedentary activities among children (Whitzman et al., 2010) lead to further constraints of children's autonomy. Furthermore, a recent study conducted by Pacilli et al. (2013),

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using an integrative model, revealed that loneliness, as a result of weak communities ties, low sense of security and less frequent social activities with peers, is a consequence of children's low independent mobility.

Nevertheless and despite its crucial importance on children's well-being and development, several studies indicate that children's independent mobility has drastically reduced throughout the last decades in many countries, such as Portugal (Arez and Neto, 1999), England and Australia (Carver et al., 2013) and New Zealand (Oliver et al., 2011).

The decrease of CIM seems to be related with a set of environmental and sociocultural transformations that have taken place in industrialized countries over the past few decades. According to Tranter and Sharpe (2012), these changes have a common denominator sustained on the availability of cheap oil, which enabled modern urban societies to favor the widespread use of car on public space. This pedestrian unfriendly urban planning supports the pervasiveness of a motorized car culture, increasing parental concern on children's safety due to the risk of them being involved in car caused accidents, as a consequence of fast and reckless driving and lack of walking facilities and crossings (Malone and Rudner, 2011). Fyhri et al. (2011) carried out a study in Denmark, Finland, Great Britain and Norway, and concluded that longer distances to school, traffic, parents own convenience, children attending organized leisure time activities, more time pressure to families, increased access to car and use of mobile phones for transport arrangements have caused a decrease on children's active and independent mobility. Social fears reported by parents as fear of crime, stranger danger, abduction and being bullied or molested by older children are also documented as obstacles to children's freedom in public space (Alparone and Pacilli, 2012; Gill, 2007; Zubrick et al., 2010).

1.2. Mobility licenses and modes of travel

CIM was first operationalized by the work of Hillman et al. (1990), as a set of licenses granted by parents allowing children to move around autonomously in the environment. This set of licenses is defined as whether children are allowed without adult supervision to: cross main roads, travel the home-school journey, go to other places than school (walking distance scope), ride their bicycle, use public transportation and go out after dark (Carver et al., 2013; Hillman et al., 1990; Kyttä, 1997, 2004; O'Brien et al., 2000). Likewise, children's traveling to places without the accompaniment of adults is associated with active transportation such as walking, cycling and public transport use (Fyhri et al., 2011; Hillman et al., 1990; Sharpe and Tranter, 2010). School and leisure time activities are meaningful places for children (Broberg et al., 2013; Kyttä et al., 2012) and therefore should be accessed and traveled to autonomously and actively (Rissotto and Tonucci, 1999).

However, recent and past data has concluded that most children are being driven to school and to leisure time activities, preventing them of active travel forms (Mackett, 2002; Mammen et al., 2012; Mclaren and Parusel, 2012). On this topic, Hjorthol and Fyhri (2009) show in their study a decrease in children's autonomy when going to leisure activities, these generally being organized and taking place outside the immediate neighborhood. The authors also mention that a large proportion of Norwegian children, between 6 and 12 years old, are driven to organized leisure activities. Simultaneously, they found out that increasing parental anxiety about traffic caused a decrease in children's independence. According to Deka (2013) adults' choice of driving to work significantly increases the probability of children being driven to school and decreases their likelihood of walking and cycling.

1.3. Degree of urbanization and children's independent mobility

According to Johansson (2006) study about CIM to leisure places adopting Küllers Human Environment Interaction (HEI) model, parental decision to allow for child's independent or driven mobility is an emotional process influenced by the characteristics of the leisure activity, physical and social environment, individual parental factors and characteristics of the child. Also, in the study conducted by Alparone and Pacilli (2012), the authors conclude that CIM is influenced by the interplay of personal, environmental and psychosocial variables hinged on the bioecological model of human development proposed by Bronfenbrenner (1979). Based on the previous theoretical models, physical environment characteristics either promote or hinder CIM. Hence, the degree of urbanization is a rather relevant environmental feature that influences parents decision to enable or unable children's independent travel, as well as it may potentiate or hinder children's possibilities to actualize their interactions with the environment. On this subject, Kyttä (2004) notes that characteristics of the environment, as well as the degree of freedom children have to explore it have great impact on how they perceive, act and move in their surroundings. If in the past it was clearer that rural environments afforded better possibilities for children's freedom of movement than more urbanized environments, nowadays, consistent results in many studies confront those earlier findings (Broberg et al., 2013; Carver et al., 2012; Kyttä et al., 2012).

1.4. Aim of study

A considerable amount of research has been produced internationally about CIM and its variation in terms of the urban/rural environment dichotomy. In Portugal, so far, most available data on CIM is of descriptive nature. Preliminary results of an international research show that CIM of Portuguese children occupies the 10th place among a total of 16 countries, led by Finland and followed by Japan and reared by Italy and Sri Lanka, respectively (Bicket, 2013). However, less attention has been paid to the influence of urbanization in children's freedom of movement. Moreover, national research has been scarce in studying how prone the city environment is for children's autonomy and independent active travel. Therefore, the current research closes this gap by addressing children's mobility in the above terms in order to gain a more wholesome perspective of this phenomenon. The purpose of this paper is firstly to characterize psychosocial factors that affect CIM, namely, parental fears regarding children's safety; and perception on sense of community, in the highly, moderately and non-urbanized environments. Secondly, is to assess how children's mobility licenses and actual mobility vary in a highly, moderately and non urbanized types of environment. Lastly, is to draw attention to the specific case of CIM in the highly-urbanized setting (city environment) proposing a shift in the city from a motorized and dependent children's mobility to an active and autonomous one.

2. Methodology

2.1. Participants

Participants were selected from the Portuguese sample (n = 1099, 16 schools involved) which was part of an international comparison research on CIM, led by researchers at *Policy Studies Institute* (PSI), London. According the international CIM research guided by PSI, five types of settlements were indicated, "Inner City", "Urban", "Suburban, "Small Town" and "Rural".

To study effect of urbanization degree in CIM, three types of environments were extracted from the original sample, namely,

"Inner City" (n_1 = 223; 54% boys, 46% girls) as "highly-urbanized"; "Small town" (n_2 = 192, 44% boys, 56% girls) as "moderately-urbanized"; and "Rural" (n_3 = 137, 48% boys, 52% girls) as "non-urbanized". The urbanizing categories of our sample were devised upon population density and other relevant territorial information available in the official web sites of the local councils, and in the Statistics Portugal web site (INE). The "highly urbanized" setting is constituted by the areas that correspond to the center of Lisbon (parish of São João de Brito). This is considered a typical consolidated inner urban area with moderate dense housing, easy access to public transport, different services and cultural areas, and with a population density of 5143.4 people/km^2. The "moderately-urbanized" setting corresponds to the small town of Silves in the south of the country. Silves has a population density of 54.6 people/km^2; limited use of public transportation (due to lack of connections); moderate dense housing, different services and cultural areas; characterized by a loss of active population in the last 30 years due to migratory fluxes. The "non-urbanized" setting corresponds to Redondo in the southeast-central of the country. Redondo is a typical rural area characterized by a concentrated settlement of houses and population and by the desertification tendency of rural spaces. It has a population density of 19.02 people/km^2, restricted access to public transportation (almost nonexistent), few services and lack of cultural areas. For some analysis children were grouped in primary (3rd to 6th grade; M_{age} = 9.81 yrs; SD = 1.45) and secondary (7th to 10th grade; M_{age} = 13.89 yrs; SD = 0.99) school types. In order to conduct this study, Ethics approval was obtained from the Ethics Committee of Faculdade de Motricidade Humana, Universidade de Lisboa, as well as authorization from the General Department of Education from the Portuguese Education and Science Ministry.

2.2. Methods and data collection

The international child independent mobility questionnaires for parents and children used by PSI researchers were translated to Portuguese. Following initial contact and agreement with each school, parental consent for each child and parent participation in the study was requested. Parents were sent a package with a consent form and a parental questionnaire to be completed at home. Children that were allowed to participate have also completed a questionnaire in school. In order to link the correct questionnaires between parents and children, each dyad was linked by a unique and shared code on both questionnaires. Data collection occurred during 2011 (Spring-time) in the moderately and non-urban settlements and in 2012 (Spring-time) in the highly-urbanized one.

2.3. Measures and data analysis

The influence of gender was analyzed in this present study, in the overall sample and in some cases within the different territorial typologies. In order to characterize psychosocial factors that affect CIM, parental perception regarding children's safety was measured as "reasons to collect children at school", "concern about the risk of the child being injured in a traffic accident when crossing a road"; "sense of neighborhood safety" and "sense of community". In order to study CIM according to the degree of urbanization, children's age for independent active travel, mobility licenses, actual mobility in the home-school trajectory and in weekend leisure time activities were also measured. These variables and questions that were used to compose them and parents'/children's possible answers are depicted in Table 1.

Frequency analysis and Chi Square tests were performed to analyze differences in reasons to collect children at school, mobility licenses and actual mobility on the home-school trajectory among the three research environments and by gender. Univariate analysis of variance (ANOVA) and post hoc Scheffe tests were conducted to compare levels of concern about the risk of the child being injured in a traffic accident when crossing a road, sense of neighborhood safety, perception on sense of community, children's age for independent active travel and actual mobility during weekend leisure time activities. Independent sample t tests were conducted to investigate gender differences in these variables. Also, descriptive statistics were used to calculate the frequency of each independent and non-independent activity and reasons to collect children at school.

2.4. Results

2.4.1. Psychosocial factors that affect CIM

2.4.1.1. Parental fears regarding children's safety: traffic and social danger. In Table 2, findings about main reasons for parents to collect children at school are summarized. According to our results, traffic danger is the most representative concern in all three environments (51.6% in the highly-urbanized, 62.2% in the moderately-urbanized and 66.4% in the non-urbanized). These values are consistent with other findings, in the present study, showing a significant effect of the risk of a child being injured in a traffic accident when crossing a road on the parental level of concern according to the urbanization condition [$F(2,523) = 4.876$, $p = .008$]. Post hoc tests indicated that parents from the highly-urbanized environment are less concerned about traffic than parents from the moderately-urbanized one. The second most cited cause of concern by parents in the highly and moderately settings is danger from adults, with values of 49.3% and 46.8%, accordingly, whereas only 34.3% of parents in non-urban area refer to it. Concerning parental level of agreement about the presence of some young people and adults in the neighbourhood that make them afraid to let their children play outdoors, significant differences were found according to the type of environment [$F(2,505) = 6.012$, $p = .003$]. Post hoc tests indicated that parents in the three environments do not perceive young people and adults in their neighborhood as a threat for their children's safety while they are playing outdoors. Specifically, parents from the non-urbanized environment are more confident that young people and adults in their neighborhood do not pose a threat to their children's outdoor safety than parents from the highly-urbanized setting. The influences of gender in parental fears regarding traffic and social danger were only relevant in the highly urbanized environment, where danger from adults was the most representative reason for parents to pick their daughters up from school. In all other cases, traffic was always the main parental concern. Danger from adults was pointed out as relevant by more parents of girls (56.7%) than of boys (42.1%) ($\chi^2(1) = 4.468$, $p = .035$) in the highly urbanized setting.

2.4.1.2. Perception on sense of community. A significant effect regarding parental level of agreement about most adults in the neighborhood looking out for other people's children was found for the three conditions [$F(2,518) = 5.346$, $p = .005$]. Post hoc tests indicated that parents from the highly and moderately urbanized environments tend not to trust that other adults in the neighborhood supervise other people's children, when compared to parents from the non-urbanized environment that are more convinced about other adults capabilities to supervise their children. No gender differences were found for this variable.

2.4.2. CIM and degree of urbanization

2.4.2.1. Children's age for independent active travel. There was a significant effect of the age for children to travel on their own according to the type of environment [$F(2,527) = 5.56$, $p = .004$]. Post hoc tests indicated that the mean ages were significantly different for

Table 1
List of dependent variables and questions.

Source of variable	Name of variable	Question	Answer	Answer recoding for further analysis
Parents questionnaire	*Reasons to collect children at school*	What are your *main* reasons for picking your child up from school?	List of ten answers (e.g. "concern about traffic danger")[a]	
Parents questionnaire	*Concern about the risk of the child being injured in a traffic accident when crossing a road*	How worried are you about the risk of your child being injured in a traffic accident when crossing a road?	"very"; "quite"; "not very"; "not at all"; "don't know/not sure"	
Parents questionnaire	*Sense of neighborhood safety*	Some young people and adults in the area make you afraid to let your children play outdoors	"agree strongly"; "agree"; "neither agree nor disagree"; "disagree"; and "disagree strongly"	"agree"; "neither agree nor disagree"; "disagree"
Parents questionnaire	*Sense of community*	Most adults who live in the neighbourhood look out for other people's children in the area	"agree strongly"; "agree"; "neither agree nor disagree"; "disagree"; and "disagree strongly"	"agree" "neither agree nor disagree"; "disagree"
Parents questionnaire	*Age for independent active travel*	At what age did you/will you allow your child to independently: cross main roads, travel home from school, travel on local buses, and cycle on main roads?	Age to independently: cross main roads, travel home from school, travel on local buses, and cycle on main roads	Computed mean age of the four licenses into mean value
Parents questionnaire • Primary school children • Secondary school children	*Mobility licenses*	Is your child allowed to independently cross main roads, travel to places other than school (within walking distance of home), travel home from school, go out after dark, travel on local (non-school) buses and cycle on main roads?	Yes/no	
Children's questionnaire • Primary school children • Secondary school children	*Actual mobility in the home-school trajectory*	• Who did you travel to school with this morning?"/"Who will you travel home with today? • "How did you get to school this morning?"/ "How will you go home *today*?	"travelled on my own", "parent", "another adult", "older child" or "child of same age or younger" • "walked most of the way", "cycled", "school bus", "local bus, train, underground or tram", "car" or "other	Independent Active travel to and from school[b]
Children's questionnaire • Primary school children. • Secondary school children	*Actual mobility in weekend leisure time activities*	Which of these activities did you do this weekend? • on your own or with another young person • *with a parent or other adult*	List of twelve options (e.g. went to a friend's home, went for a walk or cycle)[a]	

[a] Multiple choice was allowed.
[b] This variable was computed by merging the variables that inform about the type of accompaniment to and from school ("goes independently (1)/goes with parent (0)") with the variables that inform about the transportation mode to and from school ("goes actively (1)/doesn't go actively (0)"). We considered that children went independently if no adult was accompanying them (i.e., when they went alone, with an older child, or with a child of same age or younger). We considered that they traveled actively when they walked or cycled to and from school.

the three groups of participants. Children from the non-urbanized environment are allowed to travel on their own from the mean age of 11 ($M = 11.05$; $SD = 1.86$), whereas children from the "moderately-urbanized" and "highly-urbanized" environments are only allowed active travel at the mean age of 12 ($M = 11.65$; $SD = 1.58$) and 13 ($M = 12.56$; $SD = 1.43$) years old. Overall, gender does not influence the mean age for children's independent active travel [$t(520) = .642$, $p = .521$].

2.4.2.2. Mobility licenses. Gender did not influence the parental granting of mobility licenses, since there were no significant differences between the frequency of boys and girls granted any of the licenses for the whole sample, between primary and secondary groups, and within the 3 territorial typologies (all $ps > .05$). The results on CIM licenses and degree of urbanization for primary and secondary school children are shown in Fig. 1. In both cases, the percentage of children corresponds to those children who were granted each license by their parents among the total number of children in each of the research groups.

In terms of primary school category ($n_{\text{highly-urbanized}} = 115$; $n_{\text{moderatley-urbanized}} = 124$; $n_{\text{non-urbanized}} = 82$), we found significant results in all independent mobility licenses, except on going out after dark and traveling on local buses. More children from the moderately urbanized setting were allowed to independently travel home from school (30.6%), followed by 23.8% of children from the non-urban and 14.8% of children from the highly-urbanized settings ($\chi^2(2) = 8.445$, $p = .015$). Regarding being allowed to independently cross main roads ($\chi^2(2) = 6.633$, $p = .036$), our findings show that in the non-urbanized and moderately-urbanized groups, a significant percentage of children, 50% and 47.5%, respectively, enjoyed this license, whereas only 33.6% of children from the highly-urbanized environment are allowed to do this. With regard to cycling independently on main roads, the trend is similar to the former license, showing higher percentage of allowed children in the non and moderately urbanized groups (28.4% and 19%) and 11.4% of children in the highly-urbanized setting ($\chi^2(2) = 7.531$, $p = .023$). Concerning going independently to places other than school ($\chi^2(2) = 11.176$, $p = .004$), the highest value of children that are allowed this license is registered on the moderately-urbanized environment (33.9%), followed by the non and highly urbanized areas, with 28% and 14.8%, respectively. With regard to the secondary school children ($n_{\text{highly-urbanized}} = 108$; $n_{\text{moderatley-urbanized}} = 68$; $n_{\text{non-urbanized}} = 55$), we found differences, between the three environments on the licenses to independently go out after dark (52.7% in the non-urban, 30.9% in the moderately-urban, 19.6% in the highly-urban); cycle on main roads (86.4% in the non-urban, 73.1% in the moderately-urban, 42% in the highly-urban) and go to places other than school (92.7% in the non-urban, 83.8% in the moderately-urban, 74.8% in the highly-urban). These results are all statistically significant ($\chi^2(2) = 18.652$, $p < .001$; $\chi^2(2) = 25.746$, $p < .001$ and $\chi^2(2) = 11.176$, $p = .004$, respectively, for each of the former licenses). Regarding traveling independently

Table 2
Parental reasons to collect children at school. Percentage of parents that mention each reason according to the type of environment.

Parental reasons to collect children at school (multiple choice was allowed)	Highly-urbanized environment	Moderately-urbanized environment	Non-urbanized environment	Statistical relevance
Opportunity to spend time with my child	35.3	27.1	29.1	n.s.
Opportunity for exercise or to get out of house	1.4	5.9	5.2	$\chi^2(2) = 6.119$, $p = .047$
Concern about traffic danger	51.6	62.2	66.4	$\chi^2(2) = 8.693$, $p = .013$
Child unreliable or too young	30.2	22.3	18.7	$\chi^2(2) = 6.750$, $p = .034$
Danger from adults	49.3	46.8	34.3	$\chi^2(2) = 8.012$, $p = .018$
Fear of bullying by other children	16.7	16	15.7	n.s.
Opportunity to meet people	9.8	11.2	12.7	n.s.
On the way to an activity for you or the child	20.5	22.3	11.2	$\chi^2(2) = 7.010$, $p = .030$
School too far away	23.7	35.1	37.3	$\chi^2(2) = 9.286$, $p = .010$
Collecting younger sibling first	10.7	9.6	10.4	

Note: n.s. non significant, $p > .05$.

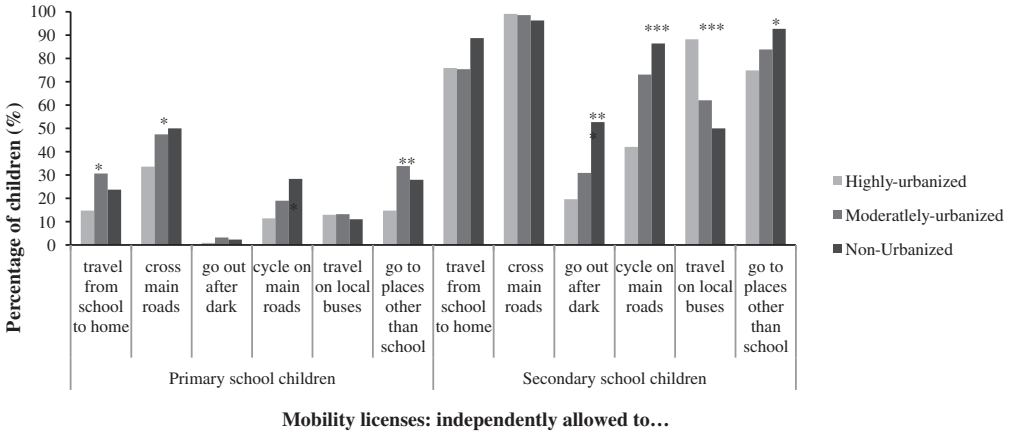

Fig. 1. CIM licenses for primary and secondary school children according urbanization degree.

on local buses, our results are significant ($\chi^2(2) = 28.580$, $p < .001$) among the three settings but with a different trend than the other licenses, since this one is more prevalent in the highly-urban setting (88.2% in the highly-urban, 62.1% in the moderately urban and 50% in the non-urban).

2.4.2.3. Actual mobility in the home-school trajectory. As regards to children's actual mobility when going to school and coming back home, see Fig. 2. We found significant differences in children's independent and active travel from home to school between the three environments, both in primary ($\chi^2(2) = 18.703$, $p < .001$) and in secondary ($\chi^2(2) = 6.551$, $p = .038$) school children. Concerning the primary children, the highest percentage of independent and active travelers occurs in the moderately-urbanized setting (22.6%). In the secondary children, the non-urban typology counts with the greatest percentage of independent and active mode of travel (43.6%). In terms of gender, and only for secondary school children in the highly urbanized area, significant differences were found between the percentage of boys (41.5%) and girls (22.2%) that go to school independently and actively ($\chi^2(1) = 4.590$, $p = .032$). Significant differences were also revealed in the analysis of the school-home trajectory in terms of independent active travel. For the primary group ($\chi^2(2) = 17.031$, $p < .001$), more children from the moderately-urban environment were independent and active on their way back home (27.4%). In terms of gender, and only for primary school children in the moderately urbanized area, significant differences were found between the percentage of boys (38.9%) and girls (19.4%) that go to school independently and actively ($\chi^2(1) = 5.619$, $p = .018$). As regards to the secondary group, more children from the non-urban environment travel home from school independently and actively (60%), followed by those from the moderately and non urbanized environments, 38.2% and 34.3%, respectively. These differences were significant ($\chi^2(2) = 10.380$, $p = .006$).

2.4.2.4. Actual mobility in weekend leisure time activities. Considering the mean number of independent activities, children from the highly-urbanized environment were involved in 2 independent activities ($M = 1.83$, $SD = 2.13$, Median = 1, range 0–12), whereas children from the moderately and non-urban environments took part in 3 independent activities ($M = 2.57$, $SD = 2.37$, Median = 2, range 0–12 and $M = 2.63$, $SD = 2.71$, Median = 2, range 0–12, respectively). The differences between settings were significant [$F(2,549) = 7.579$, $p = .001$]. Differences between gender were observed in the number of independent activities done by girls and boys of the moderately urbanized environment ($t(160) = 3.385$, $p = .001$) and of the non-urbanized environment ($t(120) = 2.314$, $p = .022$). In both environments, girls participated in about 2 non-accompanied activities during the weekend (moderately urbanized: $M = 2.02$, $SD = 2.09$; non-urbanized: $M = 2.13$, $SD = 2.32$), whereas boys participate in about 3 (moderately urbanized: $M = 3.18$, $SD = 2.52$; non-urbanized: $M = 3.20$, $SD = 3.01$).

With regards to mean number of non-independent activities, thus, accompanied journeys (with a parent or another adult) to leisure activities, our results are also significant [$F(2,549) = 11.823$, $p < .001$]. The highest number of non-independent activities is 4 and belongs to children from the moderately-urban setting ($M = 4.10$, $SD = 3.41$, Median = 3, range 0–12), followed by 3 non-independent activities for children from the highly-urban group ($M = 3.09$, $SD = 2.98$, Median = 2, range 0–12) and from the

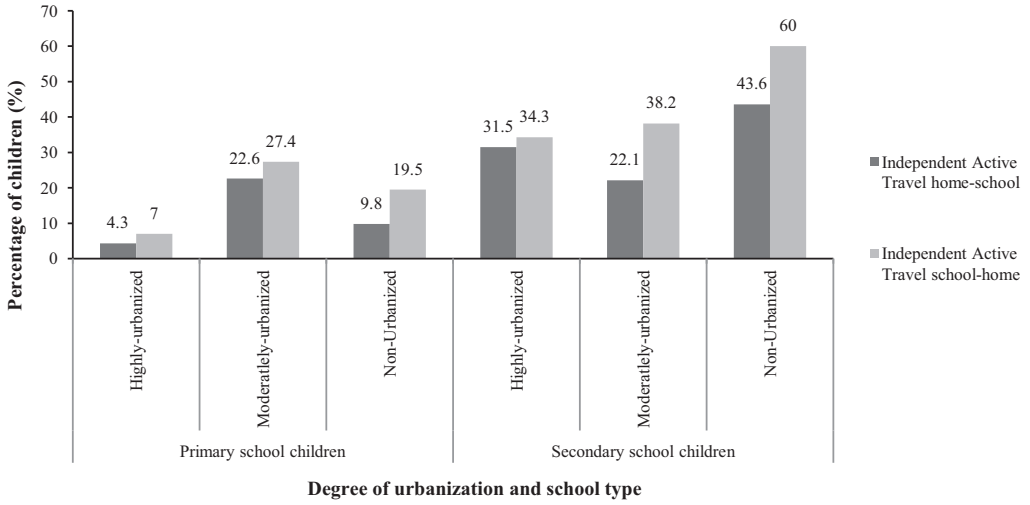

Fig. 2. Children's actual mobility in the home–school/school–home trajectory according degree of urbanization.

non-urban environment ($M = 2.73$, $SD = 2.48$, Median = 2, range 0–12). Non-urbanized area congregates the least number of non-independent activities. This result is not surprising if we consider previous findings on mean number of independent activities. No gender differences were found in the number of non-independent activities for any of the settings. The percentages of independent and non-independent activities done by children in each environment are presented in Tables 3 and 4, respectively. Each value corresponds to the percentage of children that took part in a certain activity, within each study group. Children were free to choose more than one option and could report to have done the same activity both independently or accompanied by adults.

2.5. Discussion

2.5.1. Environmental and psychosocial factors that affect CIM

In terms of parental concerns regarding children's safety, our results show that fear of traffic is the most prominent one in all three environments. In the non-urbanized setting more parents are concerned about this than in the other two settings. One possible reason to explain this is that children in the non-urbanized areas may be less exposed to traffic circulation than the other children. Consequently, their parents may look at them as less competent to deal with traffic issues, what might increase the percentage of parents of this group who feel this type of concern. In relation to the risk of children being injured in a traffic accident when crossing the road, our findings reinforce the former, showing that parents are strongly concerned about it. In terms of traffic concern and degree of urbanization, our findings show that this type of parental concern becomes more frequent as the urbanization degree of the environment decreases. This is consistent with Tillberg Mattsson (2002), who found that Swedish parents in the countryside environment are more worried about traffic as a threat for children's safety when they are outdoors than parents from the town environment. Conversely, Shaw et al. (2012), using the same methodology adopted in the present study, found that parents from a rural village in England are less concerned about children being at risk due to traffic danger than parents from the inner-city area. Moreover, Johansson (2006), based on a model of Human–Environment Interaction, concluded that attitudes towards driving children to places are based on parents' perceptions of environmental factors, namely, traffic danger. Stranger danger was found to be a significant cause of concern amongst the three types of environment. Our results show that frequency of perception of danger from adults accompanies the decrease of urbanization degree. As to the gender differences related with danger from adults, our most interesting result is found in the highly urbanized environment. In this setting, stranger danger is more referred by girls' parents than by boys' as cause of concern when children are out by themselves. However, overall we found that parents are not afraid to let their children play outdoors because of the presence of other people in their neighborhood; and, specifically, parents from the non-urbanized environment are more at ease with the presence of other people in their neighborhood than parents from the highly-urbanized setting. These results about parental perception of social danger are consistent with those found by Prezza et al. (2005) in Italy revealing that perception of social danger was higher in mothers who live in larger urban contexts and who have more personal fear of crime and a lower sense of community. Also, our findings concur to those of many other studies referring that perception of stranger danger and traffic related concerns are alleged by parents as inhibitors for children's independent and/or active commuting to school (Björklid, 2004; Davison et al., 2008; Lam and Loo, 2013). With regard to parental perception on sense of community, Prezza et al. (2001) argue that stronger neighborhood relations, together with sense of belonging and of community enable more shared control and surveillance for children and help parents to perceive neighborhood as a safe place for their children to move about freely.

Our most relevant finding is that parents from more urban environments do not perceive a mutual surveillance network that gives security to children when they are out by themselves in their neighborhood. Furthermore, this may suggest that sense of community decreases with increase of urbanization degree. This concurs with other studies that have reported stronger sense of community in rural and small town areas than in typologies with a greater degree of urbanization (Obst et al., 2002; Roussi et al., 2006). However, other studies have shown the opposite, revealing that in places with a high degree of urbanization, the sense of community is greater that in less urbanized contexts (Prezza et al., 2009).

2.5.2. CIM and degree of urbanization

Children's mean age for independent active travel was found to diminish with the decrease of urbanization (13, 12 and 11 in the highly, moderately and non urbanized environments, respectively). The highly and moderately urbanized results are consistent with some findings of a recent research conducted in the state of

Table 3
Children's leisure activities accessed autonomously or with another child in each environment. Percentage of children that mention each activity according to the type of environment.

Independent activities (multiple choice was allowed)	Highly-urbanized environment	Moderately-urbanized environment	Non-urbanized environment
Went to a friend's home	24.2	39.6[a]	35
Visited relatives or grown-ups	10.8	17.7[a]	9.5
Went to a youth club	9.9	13	16.8[a]
Went to the shops	12.6	13.5[a]	10.9
Went to a library	10.3	21.9	25.5[a]
Went to a cinema	10.3	8.9	15.3[a]
Spent time with friends outside after dark	19.7	25	29.9[a]
Went to a playground, park or playing fields	21.1	24	28.5[a]
Played sport or went swimming	19.7	33.9[a]	27
Went for a walk or cycled around	25.6	34.9[a]	34.3
Went to a concert or nightclub	6.7	5.7	13.1[a]
Visited a place of worship	4.9	8.9	11.7[a]

[a] Maximum percentage of children found in each activity.

Table 4
Children's leisure activities accessed with a parent or another adult in each environment. Percentage of children that mention each activity according to the type of environment.

Non-independent activities (multiple choice was allowed)	Highly-urbanized environment	Moderately-urbanized environment	Non-urbanized environment
Went to a friend's home	20.2	31.3[a]	16.1
Visited relatives or grown-ups	52.5	55.7[a]	54.7
Went to a youth club	15.7	21.4	24.8[a]
Went to the shops	52.5	69.3[a]	47.4
Went to a library	11.2	21.4[a]	5.1
Went to a cinema	19.8	37.5[a]	10.9
Spent time with friends outside after dark	12.6[a]	9.8	8.8
Went to a playground, park or playing fields	21.5	32.8[a]	24.1
Played sport or went swimming	26	31.8[a]	10.9
Went for a walk or cycled around	25.6	34.4[a]	19.7
Went to a concert or nightclub	13.9	23.4[a]	16.8
Visited a place of worship	23.8	22.9	29.2[a]

[a] Maximum percentage of children found in each activity.

Victoria (Australia) where parents (with children aged under 18 living at home) said that, on average, children should be over 12 years old to walk or cycle alone and nearly 14 years old (13.8) to go independently on public transport; and parents of primary school children reported 11.6 years old for traveling to school independently (VicHealth, 2011). It is important to outline that in the former research variables no difference was found between the rural and urban areas of Victoria. Regarding the effect of urbanization on children's mean age for independent active travel, our results are similar to Kyttä's (1997) results in a study comparing CIM in the urban, small town and rural Finnish environments. The researcher found that mean age for parents to allow their children to go out alone was 5.6 in the city, 4.5 in the small town and 4.3 in the rural village. Nevertheless, the mean age for Portuguese children to move independently nearly trebles in two of the settings and is over the double in the other one. With reference to primary school children's mobility licenses, we found that an increase of urban degree corresponds to a decrease in the percentage of children that are allowed to independently cross main roads and cycle on them. Moreover, the non-urbanized environment is the most capable for allowing children the former two licenses. The same result was found in Shaw et al. (2012), where primary school children from the rural setting had the highest levels of independence for these two licenses, as well as for going to places other than school. Conversely, our results show that a highly-urbanized area is the least friendly for young children to be allowed the independent mobility licenses, except for the case of traveling alone on local buses, probably due to the fact that the city environment has better link of public transport than the other surveyed settings. These findings are similar to those found in an urban core area of Hong Kong, where children aged 6–12 years old showed the lowest levels of independent mobility when compared to rural and government-planned new town environments (Lam and Loo, 2013).

Concerning gender differences in the age for independent active travel, we found no difference between boys and girls. This result contrasts with those from previous studies (e.g., Brown et al., 2008; Mackett et al., 2005b), which mention that boys became independent at an earlier age than girls. As regards to mobility licenses for the secondary school children, our findings show that a great majority of young people are granted all six independent mobility licenses, except going out after dark for the highly and moderately urbanized environments and cycling on main roads for the highly-urbanized group. Previous research carried out by O'Brien et al. (2000) in different urban settings also concluded that a great majority of secondary school children are allowed to freely navigate their environment. Specifically, we found that lower degree of urbanization allows more children to independently go out after dark, cycle on main roads and go to places other than school. The previous author also found that children who live in non-urbanized or low-density environments enjoy greater freedom to move around than children from highly-urbanized or high-density areas. On the contrary, as for traveling independently on local buses, our findings show that more children are allowed this license as urbanization degree increases. A possible reason for this finding is having higher availability of public transport in the city area. Overall, with regards to actual mobility in the home-school journey, percentages of primary school children that travel autonomously and independently to and from school are low. These results are consistent with parental findings on the license for children to go home from school independently (just over 30%), mentioned in Section 2.4.2. of the current paper. As to mobility licenses according the sex of the child, gender was not found to be an influential variable for the whole sample, between primary and secondary groups or within the three types of environment. Likewise, Kyttä's (2004) research on children's independent mobility and affordances did not show gender differences in

mobility licenses. Also, a more recent study conducted by Carver and colleagues did not reveal any gender differences in the mobility licenses of primary school children in England and Australia (Carver et al., 2013).

Moreover, present scores of children's mobility licenses corroborate findings from a study conducted in Portugal, where areal characteristics were found to significantly influence parental granting of these licenses (Cordovil et al., in press). Not surprisingly, independent active travel was found to increase with age. Such finding reinforces Carver et al. (2013) results in urban and rural areas of England, and is consistent with evidence shown in the program "We go to school alone" (Prezza et al., 2010). However, Carver et al. (2012) found that older boys from rural environment show significantly lower levels of independent and active commuting to and from school than younger ones. In both primary and secondary children in all three environments, coming home from school is when children are more active and independent. A possible reason for this might be due to parents' lack of time to pick children up at the end of the school day as a result of work commitments. In one hand, such finding concurs with Shaw et al. (2012) regarding English secondary school children's mode of travel from school to home; in the other hand, Björklid and Gummesson (2013) did not find any significant differences in children's answers regarding accompaniment to and from school. For the secondary school children, independent and active travel from school to home drops as the degree of urbanization increases. This is different from the results of a review on children's active commuting to school stating that children from the urban milieu are more likely to walk or cycle to school than children from rural environments (Davison et al., 2008). Concerning actual mobility during weekend leisure activities, our findings show that the mean number of non-independent activities is higher than the mean number of independent activities in the three environments. Mean number of independent activities was quite low (between 2 and 3). Moreover, a decrease of urbanization degree corresponds to an increase in the mean number of this type of activities. This result contrasts with Tillberg Mattsson (2002), who found children's independent travel to leisure activities to be higher in more urbanized type of milieu. Also, Kyttä (1997) did not find any significant differences among rural, small town and city environments, in the proportions of children's independent journeys to outdoor activities. In the present study, moderately-urbanized environment afforded highest participation of children in independent leisure time activities. This finding is coherent with Kyttä et al. (2012), who concluded that moderate urban density offers very high possibilities for children's independent use of it, promoting active behavioral patterns and access to meaningful places. According to our results, the most common independent activities accessed by children were going to a friend's house; going for a walk or cycling around; and playing sports or swimming. All of these values were registered in the moderately urbanized setting. These activities are somewhat consistent with those found by Björklid and Gummesson (2013), namely "going to a friend's home" which was, in both cases, the most common activity. As to non-independent activities, the majority of the maximum values were also concentrated in the moderately-urbanized setting, namely, going to shops; visiting relatives or grown-ups and going to the cinema. Based on our findings, when on their own or with the company of peers, children report accessing leisure activities where they can be more physically active (i.e., sports, walking, cycling), whereas in the company of adults they engage in more sedentary activities (like shopping), probably dictated by the adults' own convenience and needs. Regarding the effect of gender on the actual mobility in the home-school trajectory, in the highly and moderately urbanized settings more boys than girls travel to school independently and actively. However, these differences are only found in the secondary group of children for the highly urbanized setting and in the primary group for the moderately urbanized setting. During weekend leisure time activities, boys from the moderately and non urbanized environments, engage in a higher number of independent activities than girls. Overall, these gender differences in terms of actual mobility are similar to the findings of Fyhri and Hjorthol (2009) who showed that boys have a higher mobility index than girls when going to school and to leisure activities.

Although this study is noteworthy of the impact of urbanization in children's independent mobility, it also has some limitations. The type of questions of the survey, which focused specifically on actual mobility in the home-school journey and during weekend leisure time activities, are specific to the day the questionnaire was filled and to the previous weekend, respectively. This fact could present some bias in terms of the representativeness of the usual daily and weekend mobility. Moreover, complementary qualitative research should be conducted, in order to gain a more in-depth grasp about the links between children's independent mobility and degree of urbanization.

2.5.3. A need for a change of CIM in the highly urbanized environment: from a motorized city to a walkable one

In the highly-urbanized environment, our findings show that children's mean age for independent active travel is 13 years old, the highest from the three settings. Regarding mobility licenses, we found that the lowest percentage of secondary school children allowed to independently go out after dark, cycle on main roads and go to places other than school occurs in the city setting; as to primary school children, the minimum percentage allowed to independently cross main roads and cycle on them, and to go to places other than school takes place in the former setting. In terms of actual mobility, the smallest value of secondary school children that return home from school actively and independently occurs in the highly-urbanized group, as well as the least mean number of independent leisure time activities. Moreover, the city environment registered highest level of parental concern regarding strange danger; strong concern regarding traffic; and lowest parental sense of community. These results show that CIM in the city of Lisbon is quite restricted, meaning that this conspicuous highly-urbanized environment does not seem to gather enough requirements and opportunities for children's and young people's independent movement and autonomous environmental experiences. Simultaneously, it is very relevant the fact that in the Great Lisbon, 20.5% of its population is composed of children and young people, aged between 0 and 14 years old (Pordata and Statistics Portugal, 2011). Therefore, such city's unfriendliness towards children's independent and active movement should be a topic of major concern. Churchman (2003) recommends that cities and neighborhoods should physically and socially provide opportunities for children's independent travel, play and use of public space. Additionally, Burdette and Whitaker (2005) and Mainella et al. (2011) call the attention for the need to reinstall free outdoor play back into children's lives due to its therapeutic value in terms of child development, well-being and happiness. Moreover, Weston (2010) claims that the primary reason cities should designed for young people (11–15 years old) to independently travel within them is because the area of the brain related to spatial perception and analysis is developing in this period of time and freedom of movement is determinant for such development to occur. Therefore, it is our opinion that changing the city's paradigm of child mobility from driving to walking should become a public health goal.

3. Concluding remarks

In this study we have shown that an increase of urbanization degree leads to a general decrease of children's independent

mobility. Gender did not influence the independent mobility licenses. Nevertheless, boys have higher levels of actual mobility than girls. Parental perception of stranger danger is more frequent in parents from the city environment as well as a lower sense of community. We have also shown that parental fears regarding traffic and stranger danger are the most frequent among the three environments with different degree of urbanization. According to our results, children from the city environment are those whose quest for independence and autonomy is more at risk. We believe that children's daily chauffeuring and escorting in public space, as a result of a pervasive motorized culture and of cultural specific factors, strongly contribute for this decrease of CIM. In this way, instead of exploring the city environment at their own pace and freedom, actively moving from place to place, children are sightseeing the territory in the back seat of automobiles. Their vision of the environment is a motorized one where meaningful places are isolated islands, excluded from each other. Furthermore, children's bodies are being excluded from freedom of movement and their interactions with the physical environment are severely restricted. Consequently, children's autonomy, health and development are at risk. Hence, in order to reverse this body-space alienation and concomitantly rescue both children's and the city's well-being, a shift from a motorized city to a walkable one is not only advisable, as it is desperately needed.

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