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Authors' note

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Different Types of Children's Independent Mobility in French Brittany

Diferentes tipos de movilidad autónoma de los niños en Bretaña (Francia)

Running head

Children's Independent Mobility

Título abreviado

Movilidad autónoma de los niños

Abstract

Studies conducted in various countries point out that children's independent mobility has been decreasing over the last decades. This survey was conducted in French Brittany on five sites of varying city size and density. Children mobility is examined through six licences related to outdoor independent movements reported by children aged from 7 to 15 years. From children's declarations, it emerges that there is a clear evolution of independent mobility from primary to secondary school. A cluster analysis permitted to isolate five contrasted types of independent mobility defined by various combinations of licences ranging from a quasi-total dependent mobility to the largest independent mobility. Age is the principal factor significantly associated with each of the five clusters, whereas gender is only associated to one cluster. The type of area and the children's perception of safety in their local area also seem to account for the nature and degree of independent mobility. Overall, these results support the view that a complex array of factors intervenes in the development of children independent mobility, including environmental attributes of the living context such as city size, density and outdoor urban facilities.

Keywords

Independent mobility, children, development, environment, urban areas, safety perception

Palabras clave

Movilidad autónoma, niños, desarrollo, medio ambiente, áreas urbanas, seguridad percibida

Introduction

Over the last century, the environments in which children have been growing up have considerably changed all over the world; in the main, children nowadays live in urban environments. Since the early nineteen thirties, these changes in the children's living environments have elicited researches to understand how children develop and deal with the opportunities and constraints encountered in these urban contexts.

The pioneer study conducted on “the life space of the urban child” by Martha Muchow (Muchow, 1935) in Hamburg has been followed by many other studies investigating the different cognitive and emotional aspects of the transactions that children establish with their urban environments (Görlitz, Valsiner, Harloff, & Mey, 1998; Hart, 1979; Lynch, 1977). Some of these researches examined more particularly how these environmental changes affected children's behaviours (Wridt, 2004). Within this body of researches, the study conducted by Hillman, Adams & Whitelegg draws our attention on children's independent mobility (Hillman, Adams, & Whitelegg, 1990). This study, which explores changes over time in English children's mobility, was the first one to clearly demonstrate a drastic reduction of children's outdoor independent movements within a twenty-year interval—i.e., from 1970 to 1990. This study received a heightened academic attention and has led to the development of policies supporting children's independent mobility (Whitzman, Worthington, & Mizrachi, 2010).

Since 1990, numerous investigations have been carried out to accurately analyse the degrees and forms of children's independent mobility in different countries. On the whole, the studies conducted in western countries consistently report that children's and teenagers' independent mobility is currently quite restricted, many of the children being commonly accompanied by adults to and from school, but also to sport and leisure activities. It has even

been argued that organized leisure activities contributed to less walking and cycling in relation to high time pressure in families, increased access to car(s) and easier access to parents as a 'transport service (Fyhri, Hjorthol, Mackett, Fotel, & Kyttä, 2011). On the other hand, parents' willingness to act as "facilitators" for the transportation of their children is stimulated by the perception of the social and traffic dangers their children might be exposed to while moving without any adult supervision (Veitch, Bagley, Ball, & Salmon, 2006). Children's activities seem to be increasingly controlled by adults and inscribed within very constrained daily and weekly schedules. Regarding the spatial issue, time restrictions and obligations are manifested by frequenting an "archipelago of spaces" which children are unable to visit on their own (Karsten & van Vliet, 2006). This implies that children must be accompanied and taken from one area of activity to another by their parents (Bachiri, Després, & Vachon, 2008). This evolution leads to increased distances between children's places of activities (Witlox & Tindemans, 2006), associated with a reduction of autonomous movement, as well as a declining frequentation of nearby public spaces (Prezza, 2007).

Importance of independent mobility during childhood

Such an observed reduction in children's independent mobility can entail detrimental effects on children's health, development and well-being. Because getting lifts from parents involves a very passive form of transport, many studies focused on the consequences for children's health of a decrease of "active" mobility and subsequently of physical activities (Page, Cooper, Griew, Davis, & Hillsdon, 2009). Passive mobility associated to sedentary plays—e.g., screen games—are likely to promote children's overweight and obesity which are linked with a quantity of diseases (Giles-Corti, Kelty, Zubrick, & Villanueva, 2009; MacDougall, Schiller, & Darbyshire, 2009). However, beyond the legitimate interest for children's health, Whitzman and

colleagues stressed that “independent mobility” must not be confounded with “active mobility”, and thus must not be reduced to a narrow public health approach (Whitzman, Worthington, & Mizrachi, 2010). Independent mobility and free access to outdoor spaces contribute to the primary mechanism by which children become familiar with their physical and social environment and appropriate it (Valentine, 2004). Outdoor autonomous movements and development of spatial representations are closely interrelated. On the one hand, the growing ability to conceive spatial relations within the living environment facilitates the child's independent mobility, while on the other hand free movements consolidate the elaboration of cognitive mapping of that living environment (Ramadier & Depeau, 2010; Villanueva et al., 2011). Along with cognitive and motor development free access and movements outdoors seem to have positive effects on the emotional equilibrium and well-being of children (Bagot, Kuo, & Allen, 2007). Moreover, being able to go to friends' homes on their own as well as meeting friends outside without any adult supervision are crucial for the construction of social relationships among peers and more generally for the development of social competences (Delalande, 2009; Prezza et al., 2001).

Factors shaping children's independent mobility

Beyond the general trend pointing to a reduction in children's independent mobility, results of various empirical studies also revealed some variations in the licenses granted to different children. Certainly, age stands as a primary factor of difference in children's independent mobility (Fyhri, Hjorthol, Mackett, Fotel, & Kyttä, 2011; Legendre, 2010); nevertheless, how the diverse components of children's independent mobility evolve with age still requires a closer scrutiny. Gender differences are regularly reported in the literature as well, boys generally showing earlier and more extended independent mobility than girls (O'Brien,

Jones, Sloan, & Rustin, 2000). However, closer analyses suggest that the pathways to attain independent mobility are different in boys and girls, girls gaining a similar level of independence from adults by travelling more in groups (Brown, Mackett, Gong, Kitazawa, & Paskins, 2008). Moreover, the gap between genders in access to outdoor public spaces seems to vary depending on the amenities of the local environment. This draws our attention to the specific urban design attributes that may enable, support or restrict the development of unsupervised travelling to activity places. Urban infrastructure, residential density and streetscape attributes can also shape children's mobility (Oliver et al., 2011). The vicinity of play areas and green spaces in particular are likely to promote outdoor plays and to foster walking or cycling around freely in the neighbourhood (Blinkert, 2004; Burke, 2005; Gearin & Kahle, 2006). Other studies focused on the role of the social characteristics related to the family context. For instance, the type of housing (apartment vs. house) has also been shown to modulate the use of outdoor public space (Legendre & Gómez Herrera, 2011). Moreover, although the results of certain studies may present some variations, factors as income level, parents' socio-cultural background, family-size or sibling-rank seem to intervene in the level of restrictions and licenses applied by the parents to their children's for unsupervised movements (Pooley, Turnbull, & Adams, 2005).

Overall, the findings of the current studies incite to carry out further researches accurately examining the respective role of the various individual, social and geographical factors likely to influence the development of independent mobility. However, the effect of each factor can be modulated by others as they are embedded in complex systems of interdependences (Bronfenbrenner, 1979). Therefore, to gain a more comprehensive image of the development of independent mobility throughout childhood, it seems particularly relevant to set up analyses addressing how these factors combine to generate various profiles of children's outdoor play and autonomous travelling.

Aims of the study

The general objective of this study is to investigate how children's independent mobility develops between age 7-15. The degree of independent mobility is assessed through the examination of children's statements about six licences related to outside trips without adult supervision. The objective is to provide a detailed picture of the current state of independent mobility in primary and secondary school children of French Brittany (North-West of France). In this respect, the study contributes to an international survey carried out in 16 countries (Shaw & Watson, 2010). The international survey was initiated by the Political Study Institute of London as an extended geographical replication of the original study of Hillman & al (1990). It is noteworthy that the comparison between countries is not the only aspect of the geographical extension. Within each country—accordingly in French Brittany—the survey was carried out in five areas ranging from the inner district of a big town to a rural area. Thus, the effect on children's independent mobility of the urban density of the dwelling area can be assessed.

The specificity of the approach presented in this paper is to examine whether the six licences of independent mobility evolve from non to all licences gained in a unique pattern of development, or if different patterns of development can be observed. In the first case, the number of licences reported by children or parents would mainly grow depending on age and the succession of stages towards independent mobility would only show minor differences, starting for instance with the freedom to cross roads on their own and ending with the licence to go outside after dark. Conversely in the second case, various types or profiles of independent mobility would be observed leading to “full” independent mobility through different pathways. For example, some children could report a large autonomy of movement in the local neighbourhood but not the licence to go to school on their own, whereas other children of the same age would report a reverse pattern. This would evidence that beyond age, the access to a

particular set of licences is tangibly modulated by other components of the living context. Therefore, the objective is twofold: firstly to identify and define the different profiles of independent mobility reported by the children, secondly to find out whether particular arrays of individual, social or environmental factors are associated with these different profiles.

Methodology

The survey on children's independent mobility carried out in France is part of a larger international survey launched by a team of the Political Study Institute in London. It replicated the survey conducted from 1971 to 2010 concurrently in England and Germany (Shaw et al., 2013).

Questionnaires

Two questionnaires were used for this survey: "*How you get about*" and "*How your child gets about*". The first one was designed for primary and secondary school children (7 to 15 years), and the second one was designed for the parents or guardians of these children.

The main objective of both questionnaires was to assess children's independent mobility through the examination of six **licences**: (1) Licence to cross roads alone, (2) Licence to travel to and from school alone, (3) Licence to go on their own to places other than school, (4) Licence to cycle on main roads, (5) Licence to use buses, (6) Licence to go out after dark.

The questionnaire "*How you get about*" asks children how they travel around and whether they are accompanied by an adult on these journeys. For instance, the children's questionnaire covers their school journey; it details who accompanied them and if for that journey they were walking, cycling, taken in a car or used public transport. Similarly, it covers their accompanied and unaccompanied activities at the weekend and after school activities. Some questions deal with the child's fears and perceptions of the neighbourhood.

The questionnaire "*How your child gets about*" focuses on parents' involvement in their child's travel and on attitudes and concerns they have about their child's independent mobility outside the home. Although the present analysis relies mainly on the children's questionnaires, we used the parents' questionnaires to collect information on the household attributes (socio-economic conditions, bi or single parent household, car ownership....) as well as on the dwelling environment (parental perceptions of the living area, availability of green spaces in the neighbourhood...).

Questionnaire proofing

The British version of the two questionnaires was translated into French and then adapted in order to take into account French specificities and cultural differences. Once translated, the questionnaires were tested with children of different ages and genders as well as with their respective parents; this led to further minor adjustments. Overall, French questionnaires were largely similar to the Anglo-German questionnaires in order to make possible an international comparison.

Survey Procedure

The children's questionnaires were completed in their respective schools. Two researchers were present in the classroom. They introduced the general aims of the study and explained how to fill up the questionnaire. The children then completed the questionnaires by themselves. The two researchers answered any individual questions and helped the younger children to fill in the questionnaire when necessary. The parental questionnaires were also distributed in the classrooms so that the children took the questionnaire home to their parents. Once the parents had completed the questionnaire, children brought them back to school.

Participants

A total of 947 children participated in the French survey. Specifically, in primary school 484 children—48,8% girls, 51,2% boys—filled up the questionnaire, age ranging from 6 to 12, *mean* = 8,79 (*sd* =1,27). In secondary school 463 young people—49,7% girls, 50,3% boys—responded to the questionnaire, age ranging from 10 to 16, *mean* = 12,9 (*sd* =1,29).

Survey Areas

The survey was conducted in different types of living environment varying in relation to the size and density of the dwelling area. Five types of areas were considered: (1) inner district of a major city, (2) suburban area of a major city, (3) small town, (4) rural market town and (5) rural area. In each area the number of children who participated in the survey approached 200, one hundred respectively in primary and secondary schools. However, in the rural area the sample was smaller: 140 children, 69 primary and 71 secondary school children.

In the French survey, the five types of areas were selected in the same region, namely the district (*département*) of Ille-et-Vilaine in French Brittany. Therefore, the survey design, which gathered data from different types of areas, was likely to provide a comprehensive picture of the independent mobility of the children living in that particular region. Furthermore, insofar as the data were collected in a homogeneous geographical feature (i.e., similar political, cultural, physical and climatic environment), the design enhances the possibility to assess the specific impact of city size and urban density on children's independent mobility.

Results

The Six Licences of Independent Mobility

The figure 1 shows that whatever the licence considered, secondary school children [Ssc] have a larger degree of independent mobility than primary school children [Psc]. However,

the gap between the secondary and the primary school children varies depending on the type of licence. Three subsets of licence can be distinguished.

The first licence subset is the most largely shared by both secondary and primary school children. Almost 85% of the Ssc can cross major roads and go to places other than school on their own. Contrastingly, only a half of the Psc declared to have the licence to go on their own to other places than school, although this licence is the most largely widespread among them. Furthermore, no more than 40% of these younger children declared to cross major roads on their own, despite the fact that it is the second ranking licence for this age group.

[Insert Figure 1 about here]

The second set of licences shows the larger gap between primary and secondary school children; it includes the licence to cycle on main roads and the licences to use public transport such as buses or underground. While nearly 70% of the older children use public transport and cycle on main roads on their own, for the younger children these percentages plummet to 10% regarding the use of bus or metro and to one fourth for cycling on main roads.

Contrastingly, the third set of licences shows the smaller gap between primary and secondary school children. Regarding that third set, the minor gaps are due to the low percentages of Ssc who declared to go out after dark (5%) and to go to and from school on their own (33,7%). It might seem surprising that only one third of the Ssc go to and from school on their own, but the secondary schools cover large catchment areas and are generally far from children's homes. Therefore, among the secondary school children, school bus is the prevailing mode of transport (> 40%) to go to and from school, while 15% of these children are driven by their parents. Regarding the primary school children, whose school is seldom far from their homes, the low percentage of those who hold the licence to go to and from school clearly refers to a limitation in children's independent mobility. It may be in relation with parental fears of traffic injuries and

perceived social risks: most of the parents of Psc (83,1%) are worried about the risk of their child being injured in a traffic accident and 30% of them think that some young people and adults in the area can be dangerous for their children. Finally, regarding the licence to go out after dark, very few Psc declared they can do so (2,0%).

Types of Children's Independent Mobility and Associated Factors

In order to examine the potential impact of different factors on the children's independent mobility, we carried out a Hierarchical Cluster Analysis [**HCA**].

Since a preliminary examination of the bivariate correlations among the six licences displayed a complex array of significant positive and negative correlations, it seemed useful to check whether it was possible to distinguish several clusters of children defined by different combination of licences. Subsequently, the first stage of the **HCA** was designed to determine how the six licences combine together to shape distinct profiles of children's independent mobility. This was achieved by entering the six licences as the active nominal variables in the **HCA**¹.

The second stage of the **HCA** was designed to find out which factors were associated with particular profiles of independent mobility. This objective was achieved by entering in the **HCA** a set of illustrative nominal and scale variables related to individual and environmental factors. Specifically, regarding individual factors, gender, age and types of school attended were added in the analysis, as well as variables providing information on the children's perception of safety (secure-insecure score), the number of activities undertaken in the week, and the range of activities they attended on their own or with friends. Regarding the environmental factors we

¹ The **HCA** procedure is based on Ward's method of aggregation. The procedure relies on the first 5 factors of the initial factorial analysis that together account for 89.8% of the inertia (total variance). Software Spad N[®].

added as illustrative variables: the type of area (mostly urban to mostly rural), the type of housing (flat vs. house), the absence of suitable outside spaces where the child could play, the presence of a garden, of a quiet residential road, of shared communal spaces and of parks reachable either with or without crossing a main road. Were also added as illustrative variables some variables related to attributes of the household: number of cars per household, number of people in the household, mono or single parent household and the number of working parents (0, 1, 2).

[Insert Figure 2 about here]

The Five Contrasted Types of Independent Mobility

Five clusters emerged from the **HCA**. The inter-cluster inertia account for 66.8% of the total inertia: inter-cluster inertia = 0.775, total inertia = 1.160. The intra-cluster inertia ranges between 0.045 and 0.094. This means that these five clusters present a good internal cohesion while the partition itself accounts for a large part of the inter-individual differences regarding the six licences. Figure 2 displays the cluster tree with a summary of the main characteristics of each of the five clusters.

Cluster #C1: Highest dependent mobility.

This cluster regroups 163 children (17.2%). The intra-cluster inertia (0.045) is the lowest of the five clusters. This signifies that Cluster #C1 is the most homogeneous, the licence profiles of the children in the cluster being quite uniform. The distance to the origin² is intermediate (0.070), this means that this cluster is neither typical nor particularly atypical.

The main distinguishing attribute of the children making up Cluster #C1 is that none of them declared that they went to other places than school with friends or on their own. Similarly, none of them declared having the licence to cross main roads. Interestingly, a large percentage of

² Distance to the origin refers to the distance to the centre of the factorial space defined by the cloud of the individual licence profiles of all the children participating in the French survey.

these children responded that they “don't know if they have the licence to cross main roads” (40.5% vs. 13.8% for the whole sample of children³). Moreover, Cluster #C1 is characterized by the lowest percentages of children granted the licences to use buses (2.5% vs. 31.4%), to go out after dark (3.1% vs. 18%), and to go to school on their own (9.8% vs. 28%). The only exception is for cycling on main roads, the percentage of children who declared to have the licence is not the lowest, (16.6% vs. 45.4%). The latter result does not seem to be fully congruent with the rest of the children's profile in Cluster #C1. The important percentage of these children who responded that “they don't know if they have the licence to cross main roads” suggests that they may have some difficulties to differentiate main roads from secondary roads. It may also be that they were accompanied by an older sibling they forgot to take into account when responding.

Children of Cluster #C1 are principally attending primary school (72% vs. 51.1%), and their mean age (9.8 years) is lower than the mean of the whole sample (10.8). However, age may not be the only factor accounting for their particularly high dependent mobility. It emerges that these children are over-represented in the rural market town—*Combourg*: 32.5 vs. 21.2%—whereas they are under-represented in the major city—*Rennes*: 6.7% vs. 20.4%. They are particularly under-represented among the Ssc of *Rennes* but also among the Ssc of the suburban new town—*Le Rheu*. One can also note that a large percentage of the children of cluster #C1 lives in a house (65.6% vs. 53.4%) with a garden (65% vs. 54.3%). On the other hand, the local areas in which they live seem to provide fewer parks or playgrounds reachable without crossing a main road (58.9% vs. 49.5%), and a larger percentage of these children's parents consider that there is no suitable outside space where children can play. Children of Cluster #C1 practised

³ Hereafter in this section the first percentage will account for the considered cluster and compared to the percentage observed for the whole sample of children involved in the survey (exceptions will be explicitly signalled).

The tests for the differences are significant for all the comparisons commented in the text.

fewer activities (2.79) than the other children (4.36). This supports the view that the areas in which they live provide them with few opportunities to practise outside activities in parks and playgrounds, and also to go to cinemas, leisure facilities or attractive shopping centres.

It is worthwhile noting that the families of children in Cluster #C1 are mostly bi-parental families characterized by a higher rate of two working parents. Finally, children of this cluster appeared somewhat less secure than the average (secure-unsecure score 2.67 vs. 3.77).

Cluster #C2: High dependent mobility with a slight local autonomy.

This cluster is made up of 188 children (19.8%). The intra-cluster inertia is average (0.089). The distance to the origin (1.13) is one of the highest indicating that this group tends to be slightly apart from the rest of the sample.

The percentages of children of Cluster #C2 who declare to have the licences to use buses (2.7% vs. 31.4%), go out after dark (6.4% vs. 18%), and go to school on their own (9.4% vs. 28%) are quite low. In this respect, their profile is similar to that of children in Cluster #C1, but three distinctive traits can be noted. None of the children of Cluster #C2 is allowed to cross main roads and the percentage of them allowed to cycle on main roads is the lowest of our sample (6.4% vs. 31.4%). On the reverse, contrarily to the children of Cluster #C1 more than one third of them declared that they went to other places than school with friends or on their own (36.2% vs. 66.7%). Thus, children of cluster #C2 are warned to cross or cycle on main roads but enjoy some independence to move in their local neighbourhood.

Children in Cluster #C2 massively attend primary school (91%), and on an average they are the youngest children of our sample (mean age 8.5 vs. 10.8). These younger children fell the most insecure in their local area (secure-unsecure score 1.56 vs. 3.77). They mentioned fewer activities than the average (3.46 vs. 4.36), but more than children of cluster #C1.

No specific area is associated to Cluster #C2, but the area amenities are presented in negative terms by the parents of children of Cluster #C2. Higher percentages of them mentioned that there are: (a) no park reachable without crossing a main road (62.8% vs. 42.5%), (b) no shared communal space (53.7% vs. 40.6%) and (c) no quiet residential road (58.5% vs. 48.3%). On the other hand, these children live more frequently in a house (62.2% vs. 53.4%) with a garden (63.8% vs. 54.3%). It is noteworthy that the parents of children of Cluster #C2 grant few licences and appear to be the most anxious ones about the children's safety in the local area (parental secure-unsecure score -0.37 vs. 0.0).

Cluster #C3: Emerging independent mobility with a large local autonomy.

This cluster is the largest with 268 children (28.3%); due to its large size it is also the less homogenous (intra-cluster inertia = 0.094). The distance to the origin is the shortest (0.30), this means that Cluster #C3 is most central and the closest to the average profile of the whole set of children participating in the French survey.

None of the children of Cluster #C3 are going to school on their own, similarly none of them are going outside after dark. On the opposite, as compared to the whole sample, markedly higher percentages of these children have the licences to cross main roads (81.3% vs. 62.2%), cycle on main roads (60.8% vs. 45.4%), and use buses (40.7% vs. 31.4%). Furthermore nearly all these children have the licence to go to other places than school on their own or with friends (95.9% vs. 66.7%). A detailed examination of the types of activities where these children went on their own suggests that the activities are likely to take place in the neighbourhood: walked or cycled around, went to sport or art club, visited friends and went to playground. On the other hand, it appears that the distance from home to school is longer than the average: 46.3% of their parents estimate that the school is more than 2 km away, against 28.9% for the whole population.

This may explain why the children of Cluster #C3 present a large independent mobility in the local neighbourhood while none of them goes to school independently.

Most of these children attend secondary school (70.9% vs. 48.9%); their mean age (11.7) is higher than the general mean age for the whole sample (10.8). No significant differences can be detected regarding their gender, their number of activities or their feeling of safety, but some differences emerge regarding the areas. A lower percentage of the children of Cluster #C3 lives in *Rennes*—the major city—(13.1% vs. 20.4%), and higher percentages of them are found in the secondary schools of: (a) the suburban new town, (b) the small town and (c) the market town. Interestingly, both children and parents seem to perceive their local area as relatively safe: secure-insecure scores 4.6 vs. 3.8 for children, and 0.3 vs. 0.0 for their parents.

Cluster #C4: Large independent mobility restricted to daylight hours

This cluster regroups 175 children (18.5%). The intra-cluster inertia (0.072) and the distance to the origin (0.072) are average.

As compared to the whole survey sample, larger percentages of children in Cluster #C4 declare to have the licences to go to other places than school (88% vs. 66.7%), cross main roads (84% vs. 62.2%), use buses (50.9% vs. 31.4%), and cycle on main roads (61.1% vs. 45.4%). Nevertheless, the main characteristic of Cluster #C4 is that all the children went to school on their own. In contrast, none of them declared going out after dark.

These children are mostly but not exclusively attending secondary school (66.3% vs. 48.9%). Their mean age (11.9) is significantly higher than that of the whole sample (10.8). Lower percentages of children in Cluster #C4 are found in the rural market town—*Combours*—or the rural area—*Pleine Fougères*, whereas a higher percentage of them live in the major city—*Rennes* 41.7% vs. 20.4%. Moreover, it came out that Ssc of the major city but also of the small city—

Fougères—are over-represented in this cluster. It also emerges from the parents' questionnaire that a higher proportion of children in Cluster #C4 live not far from the schools, i.e. less than 0.5 Km (36.1% vs. 20%). On the contrary, proportionally fewer of them live more than 2 Km away from school. One can also note that a larger percentage of the children's households in Cluster #C4 have only one car (33.1% vs. 21.5%), and a lower percentage have 2 or more cars (24.6% vs. 43.2%). These contextual factors may explain why the main characteristic of this cluster is that all the children go to school on their own.

Moreover, if we keep in mind that the secondary school catchment areas can be quite extended—which is the case in Rennes and particularly in *Fougères*—the short distances from home to school indicate that children of Cluster #C4 are more likely to live in the city centres themselves rather than on their fringes. This also transpires when we examine the activities where these children go alone or with friends. As for Cluster #C3, children in Cluster #C4 declared numerous activities likely to take place in the neighbourhood (e.g. visited friends' homes or went to playground), but others suppose an easy access to local shopping malls, city centre or leisure facilities likely to be found in the bigger cities (went to shops, amusement parks or leisure facilities). The urban status of the children in Cluster #C4 is further supported by the fact that they are proportionally more numerous than in the whole sample to live in a flat (28.6% vs. 15.1%), and conversely less numerous to live in a house (35.4% vs. 53.4%). Finally, the families of these children are more frequently single parent households (13.7% vs. 8.1%).

Cluster #C5: Largest independent mobility including going outside after dark.

Cluster #C5 is the smallest; it is made up of 153 children (16.2%). The intra-cluster inertia (0.085) suggests a slight heterogeneity among the children's profiles, but the specificity of the

cluster is that the distance to the origin is the largest one (1.29). This indicates that in Cluster #C3 the children exhibit in some way atypical licence profiles.

Children of Cluster #C5 show the highest degree of independent mobility. All of them declared going out after dark, which is the most discriminative specificity of this cluster. All of them also go to places other than school on their own or with friends. In Cluster #C5, higher percentages of children than in the whole population went on their own to a very wide range of activities, including: friends' homes, shops, playgrounds, walking or cycling around, leisure facilities, concert, sport or art clubs, cinema, relatives, place of worship and library—by decreasing order of differentiation. Moreover, Cluster #C5 presents the highest percentages of children who are granted the licences to cycle on main roads, use buses and cross road. The only licence for which they are not first ranked is going to school on their own; but this licence is contingent to the distance from home to school, particularly Ssc.

These children are mostly attending secondary school, and their mean age is higher: 11.8 vs. 10.8. Nevertheless, Cluster #C5 is also made up of Psc, 38% of the cluster—i.e., 59 children! It must be emphasized that Cluster #C5 is the only cluster for which gender significantly intervenes in the group constitution: boys in a majority make up Cluster #C5, 61.4% vs. 50.8%. This is even more obvious if we consider separately the Psc, the percentage of boys is up to 67.8% against 32.2% of girls. Other noticeable attributes of the children making up Cluster #C5 are that they markedly practice a greater number of activities and feel more secure than children of the whole sample, respectively mean number of activities = 6.71 vs. 4.36, and mean secure-insecure score = 5.6 vs. 3.8.

As regard to the area, the children of the major city—*Rennes*—are over-represented in Cluster #C5 (28.1% vs. 20.4%). One can also note a lower percentage of households with 2 or more cars. This maybe related either to the fact that a higher proportion of Cluster #C5 families

live in a big town or to the fact that a lower percentage of these families are bi-parental families, 45.7% vs. 56.3%.

Discussion

The first set of analyses focused on the development of children's independent mobility in French Brittany. The comparison in the licence holding of six form of independent movements of primary and secondary school children put forward that independent mobility develop markedly after 11 years when children are in secondary school. Specifically, four of the six licences are held by a large majority of the secondary school children: to go to other places than school on their own, to cross main roads, to use public transport, and to cycle on main roads. However, only one third of these older children declared to go to and from school on their own. This result is probably due to the size of the secondary school catchment areas which were particularly large in four of the five survey areas. Therefore, the distances from the children's homes to secondary school constrained the children to use the school bus or to be driven by their parents.

The less granted licence to both secondary and primary school children is the licence to go out after dark. The percentages of the French children allowed doing so either in primary or in secondary school were lower than those observed in England and Germany (see Shaw et al., 2013). it was impossible to literally translate the expression “after dark” in French. We used the expression “*quand il fait nuit*”, that does not mean “*at night*”, but could be more ambiguous for a clear distinction between “*after dark*” and “*at night*”. Thus, many children may have understood the question “*do you spend time with friends outside after dark*” as “*Do you spend time with friends outside at night*”, which means after 8:30 p.m. In France, the evening meal is a family event that generally takes place around 8 p.m. ant that represents a psychological and social

frontier separating late afternoon from night. These linguistic and cultural elements may partly account for the lower score observed in France regarding the licence to go out after dark.

The first set of results puts forward that primary school children's independent mobility is particularly restricted; four of the six licences examined were held by less than one third of these children. The licence to go to other places than school is the most frequently mentioned by the 7- to-11-year olds. As a matter of fact, going on their own to other places of the surrounding signifies the opportunity to go to play areas, parks, sport clubs or shops without depending on parental accompaniment, besides it also means the possibility to freely visit friends in the neighbourhood without adult supervision. But one can note that only half of primary school children can benefit from such a basic and critical licence that can be seen as a prerequisite to the development of activities independently from adults in the dwelling area. For the other half of the primary school children, this result supports the idea that out of school activities are likely to take place in adult-controlled settings such as sport or art clubs, activity centres, adventure parks etc., where children must be accompanied by their parents (Bachiri, Després and Vachon, 2008; Witlox and Tindemans, 2006).

On the whole, these results make clear substantial changes in children's independent mobility from primary to secondary school. However additional analyses must be carried out to accurately establish how these licenses evolve depending on age⁴. Such analyses will help to disentangle the effects related to the child development from those related to the shift from primary to secondary school.

⁴ Detailed analyses related to the development of each of the six licenses as a function of the age can be found in the complete report of the survey conducted in French Brittany. Retrievable at <http://www.sites.univ-rennes2.fr/reso/espenf/>.

The second set of analyses permitted to isolate five contrasted types of independent mobility defined by various combinations of licences. These five profiles of independent mobility are mainly depending on the number of licences gained—i.e., they appear ordered from a first profile with quasi no licences gained to a fifth profile with all licences gained. The fact that the licences profiles seem mainly defined by the number of licences gained and that age appears positively associated to an increasing number of licences can speak in favor of a unique pattern of development organised in a predictable succession of stages.

However, if the age emerges as the principal factor significantly associated with each of the five profiles, an accurate examination reveals that the link between age and a given profile nonetheless presents some flexibility—i.e., the age range of the children making up a cluster is relatively extended. Moreover, the profiles are not only determined by the number of licences gained but also by the type of the licences gained. For instance, children making up cluster #C1 have the same or a slightly lower number of licences gained than children making up cluster #C2, but what distinguishes them is that none of the former gained the licences to cross main roads and to go to other places than school, whereas more than one third of the latter declared to go to other places than school on their own. Furthermore, one can note that children in cluster #C1 are on average older than children in cluster #C2. Similarly, for the groups of children making up clusters #C4 and #C5, we observe that their mean number of licences is alike and that their mean age is the same, but the difference between the two groups relies on the fact that none of the children in cluster #C4 is going out after dark without an adult supervision, whereas children in cluster #C5 pretend to do so.

Therefore, these results suggest that the development of independent mobility is to a large extent—but not exclusively—defined by an increased number of licences gained depending on age. This means that there is not a unique pattern of development but several pathways leading

from a full dependent mobility to a large independent mobility. Such a conclusion draws our attention to the factors likely to modulate the development of independent mobility through various combinations of licences.

The cluster analysis permitted to identify several factors associated to the different types of independent mobility. Among them, the type of area stands as an important one associated significantly to the definition of four clusters. For instance, children making up the cluster #C4 defined by a large independent mobility restricted to daylight hours are over-represented in the major city and under-represented in the rural area. Conversely, children from the major city are under-represented in the cluster of the children showing an emerging independent mobility with a large local autonomy, whereas those living in the suburban new town offering a lot of pathways, parks and play areas are over-represented in that cluster (see Annex 1). Such findings strengthen the idea that environmental attributes such as city-size, density and outdoor urban facilities can either hinder or support the development of particular aspects of children's independent mobility.

Finally, it seems worthwhile mentioning that children's safety feeling in the neighbourhood emerges from the cluster analysis as a factor tangibly associated to the nature and degree of independent mobility. On the other hand, gender is only associated to one cluster—i.e., boys are overrepresented in the cluster of children declaring the largest independent mobility, that includes the license to go out after dark.

Overall, this empirical study supports the view that a complex array of factors—including environmental attributes of the living area—intervenes in the development of children independent mobility.

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Figure 1 *Progression of the Six Licences from Primary to Secondary School: Children's statements*

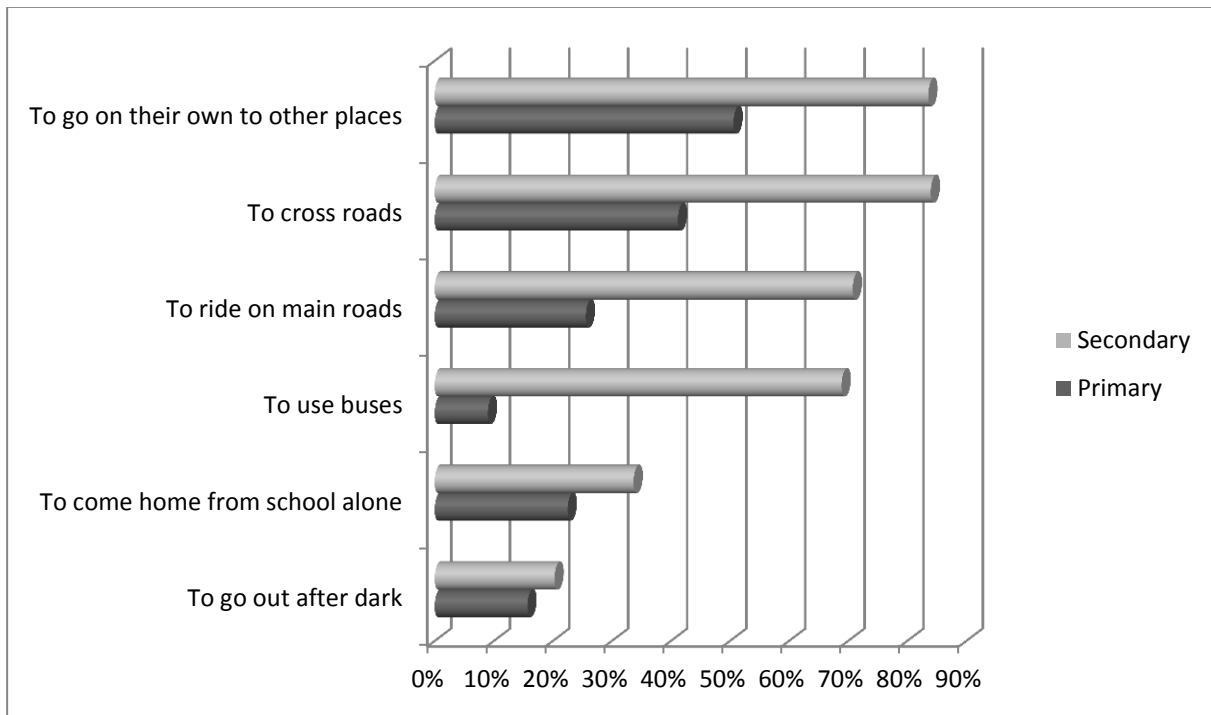


Figure 2 Cluster tree and partition issued from children's declarations on their licences

