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Setting children free: children's independent movement in the local environment

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Setting children free: children's independent movement in the local environment

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Parental concerns about children's safety and security are restricting children's independent exploration of the local environment. Children are being denied important opportunities to exercise, to acquire decision-making skills, such as crossing the road safely, and to develop social skills through interaction with their peers. This paper presents findings from the project CAPABLE (Children's Activities, Perceptions And Behaviour in the Local Environment) being carried out at University College London. Based on findings from fieldwork carried out with children aged 8-11 in Cheshunt, Hertfordshire, the paper shows the effect of factors such as the number of adults at home, having an older sibling, having a car or garden at home and living near to a park on the propensity to be allowed out alone. Then it considers how being allowed out alone affects the amount of time children spend outdoors, playing with friends and watching television. The paper then uses data from children who have been fitted with physical activity monitors and GPS (Global Positioning Satellite) monitors and asked to keep diaries, to show how children's travel behaviour differs when they are with adults from when they are not.

Introduction

In Great Britain, children have suffered a loss of freedom in terms of being allowed to go out of the home alone in recent years. For example, in 1985/86, 21% of children aged 5-10 travelled alone to school. By 2005 this had dropped to 6% (Department of Transport, 2002, 2006). Pooley et al (2005) found similar evidence over a longer period from interviews carried out in Manchester and Lancaster. They found that about 40% of people born in 1932-41 travelled to school alone at the age of 10-11, whereas about 9% of those born in 1990-91 travelled alone at that age.

Hillman et al (1990) looked more broadly at the issue of children being allowed out unaccompanied by an adult. They found that in England, 80% of 7-8 year olds were allowed to go to school alone in 1971. By 1990 this had dropped to 9%. They also looked at various other measures of the freedom allowed to children by letting them undertake various activities unaccompanied: for example, crossing the road, using buses, cycling on roads and going out after dark. In all cases where the equivalent data were collected in 1971 and 1990, the children had less freedom to go out alone in 1990. They carried out comparable surveys in Germany in 1990, and found that German children were allowed much greater freedom to go out alone than their English counterparts.

Hillman et al (1990) attribute this trend in the loss of freedom by children to the growth in car ownership, noting the paradox that the freedom that increasing car ownership has offered parents has been offset by constraints imposed on them by the perceived need to escort children more because of the increase in traffic danger.

Pooley et al (2005) identify four factors that have affected the journey to school since the 1940s: first, availability of transport technologies in the form of cars; second, an increase in parental choice in education which has led to longer journeys to school on average; third,

increasing pace of life, which has led to people attempting to cram more activities into a limited amount of time; and fourth, perceptions of risk, for example the perceived risks from strangers to children out alone. When the discussion is extended from the journey to school to children going out of the house more generally without an adult, the list of factors can be expanded. For example, home entertainment technology has expanded rapidly so that children now have a range of opportunities at home to listen to music, play electronic games, and watch multichannel television that may have reduced the relative attractiveness of going out to play. The changing perceptions of risk have partly led to the move from free play to organised activities for children: in the past children would play out on the streets or walk to the local park, now they have to be taken to their football lessons, dancing classes, and so on, and usually this involves a car journey (Mackett et al, 2005). This need to escort children by car has greatly added to the complexity of life for parents, particularly mothers, many more of whom are employed, often part-time, than previously. There is almost an element of competition between parents to encourage children to go to as many of these activities as possible, in order to be seen to be 'a good parent'. Many children have their out-of-school lives filled by attending these various activities, leaving little time for free play or going out gaining experience from making decisions about where to go and whether it is safe to cross the road, and from social interaction with other children.

Some of the benefits from allowing children out alone have been shown by Van Vliet (1983) who found, from a weekend diary kept by children in Toronto, Canada, that children who usually travelled without adults on the bus, streetcar and metro went out on more trips from home and did so for a greater range of activities.

In Britain, there is evidence that some children are being forced indoors by intolerant adults who claim that the children cause noise or a nuisance according to a survey carried out by The Children's Society (Children's Play Council, 2003). There are many examples of bans on playing in many areas, including refusal to allow the erection of a netball hoop on a village green in Oxfordshire, and a skateboard park in Cumbria and signs forbidding ball games in many urban areas.

The trends of increasing car ownership, decentralisation of urban activities, more structured leisure activities for children and greater complexity of family life have interacted to reduce the opportunities for children to walk about alone and with their friends. These tend to be exacerbated by parental perceptions about the risks to children out alone.

The purpose of this paper is to present findings from a project that brings these ideas together. The project, entitled CAPABLE (Children's Activities, Perceptions And Behaviour in the Local Environment) is being carried out at University College London (see http://www.casa.ucl.ac.uk/capableproject/). CAPABLE followed on from a project to investigate the effects of the car on children's volume of physical activity and long-term car dependency (see http://www.cts.ucl.ac.uk/research/chcaruse/). The most innovative part of that was to fit about 200 children with activity monitors and asking them to keep diaries from which it was possible to establish the relative contribution of various activities, including walking, to children's energy consumption (Mackett et al, 2005).

CAPABLE involves staff from the Centre for Transport Studies, the Centre for Advanced Spatial Analysis, the Bartlett School of Planning and the Department of Psychology all at UCL. In this work, children are being fitted with GPS (global positioning system) monitors

as well as using the activity monitors and diaries, so that it is possible to establish where children go for various activities. Another aspect of interest is whether or not children are allowed out without an adult. Questionnaire surveys have been conducted of children and their parents, and various drawing and mapping exercises carried out with the children (Mackett et al, 2006). The fieldwork was carried out in Lewisham in south-east London, and in Hertfordshire, the area immediately north of London.

Methodology

In this paper results are presented from fieldwork carried in two schools in Cheshunt in Hertfordshire, using four research instruments: questionnaires, activity monitors, GPS monitors and diaries.

The questionnaires contain questions about the child's personal details and household, their journey to and from school in terms of length, mode of travel and whom they travel with, their frequency of use of various modes for other journeys, whether they are allowed to travel without an adult, and about going to organized activities, visiting friends and playing. The questionnaires were completed in class, under the supervision of one of the research team.

Figure 1 The RT3 activity monitor

The activity monitors are RT3 tri-axial accelerometers, manufactured by Stayhealthy, USA, which measures movements in three directions, as shown in Figure 1. The RT3s combine all three acceleration vectors to produce an overall vector magnitude (VM) expressed in terms of activity counts. These can be converted into activity calories using formulae programmed into the equipment using data on the age, gender, weight and height of the child. Activity calories are calories used in undertaking physical activity. The RT3s can also convert activity calories to total calories, that is, including the calories that are used by the body to function and develop even when the person is passive, by adding on a constant

based on the physical characteristics of the person. Activity calories are used in this work in order to facilitate comparison of the results of this work with other research (it is recognised that the formulae for converting the RT3 outputs to activity calories have not been fully validated for such young children). They were set to record movements on a minute-by-minute basis.

The GPS is a satellite-based positioning system. Twenty four GPS satellites are orbiting the earth at a very high altitude. By picking up signals from these satellites, a GPS receiver can locate the user's position on the ground with a relatively high accuracy of several metres. Several types of GPS equipment were tested, in order to decide the best in terms of precision, battery life and acceptability to the children. The GPS equipment used in the CAPABLE project is the Garmin Foretrex 201 which is small and light-weight so that children can easily wear it on their wrists all day long, as shown in Figure 2. It monitors children's locations at set intervals and records them in its memory in chronological order. These data can be superimposed subsequently on a map or input into a GIS (geographic information system) so that they can be linked with other spatial data and analysed.

Figure 2 The Garmin Foretrex 201 GPS monitor

Trost et al (2000) have shown that four days of monitoring of physical activity in children are required. In this study, the volunteers were asked to wear the monitors from a Wednesday to a Monday, with data being collected for the four days Thursday, Friday, Saturday and Sunday. These days were chosen so that both school days and weekend days were included.

The children were asked to complete a travel and activity diary for the four days. An example extract from the diary is shown in Figure 3. The RT3 output was used as a visual aid by the child and a researcher to identify high-activity events shown in the trace which had not been previously mentioned in the diary.

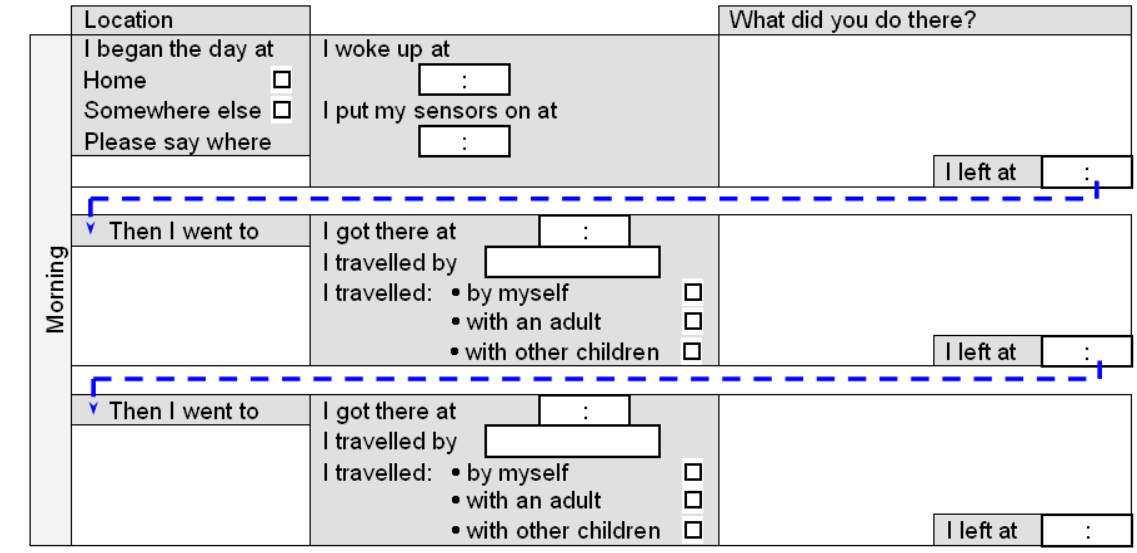

Figure 3 The activity and travel diary

The data were initially entered into Excel spreadsheets. Programs written in Visual Basic were used to integrate the data from the GPS and RT3 monitors into an Access database to give greater flexibility for analysis. The data from the three sources had to be reconciled using the times given. The GPS monitors were regarded as accurate. The RT3s were set to collect activity data in minute intervals using times set from a computer, and so it was straightforward to integrate these two data sets. It was much more complex to reconcile these two data sets with the children's diaries. Travel diaries have long been suspected of under-recording trips: this is one of the first opportunities to demonstrate explicitly that trips are missed out from diaries. There were cases when the GPS trace made it clear that the child had gone out and the diary showed no such entry. Considerable effort was put into adjusting the times in the diaries to be consistent with the GPS monitors where this could be done unambiguously. In order to maximize the data collected from the GPS monitors they were set to obtain a reading for the current location at every possible opportunity. Occasionally this meant a large number of points within a very short space of time. It was decided to simplify the analysis by averaging the data in two dimensions to give the location every minute. This simplified reconciliation with the data from the RT3s which were set to collect data in one minute intervals. Because of difficulties with the GPS equipment, for example, significant loss of points or failure of the battery charger, and children forgetting to complete their diaries, not every child provided a complete set of data. The events recorded in the children's activity and travel diaries were classified, using a typology shown in Mackett et al (2005).

The results presented in this paper explore the issue of children being allowed out without an adult, in terms the effects on children's travel behaviour. The focus is on walking trips, because that is the main form of transport used by children aged 8-11 when they go out without an adult.

Results

As shown in Table 1, 330 children at two schools in Cheshunt, Hertfordshire, completed questionnaires. Of these, 162 children wore the GPS and RT3 monitors and completed diaries and provided some data. The latter is not a large number, but it should be borne in

mind that the children were being asked to wear two pieces of equipment, one of which required charging every night, and keep a diary of their activities and travel, for four days. This was demanding of both child and researcher time. Relatively few of the children provided comprehensive data because of practical problems such as difficulties recharging the batteries in the GPS monitors and forgetting to complete their diaries or to wear the monitors. Also, the data were collected in the period from October 2005 to March 2006, which includes winter in Britain and therefore not an ideal time to collect data on outdoor activities. The children were in the top three years of primary school, that is, aged 8 to 11.

Table 1. The children in the survey

	Boys		*Girls*		*Total*	
	Question-naire	*GPS etc*	*Question-naire*	*GPS etc*	*Question-naire*	*GPS etc*
Year 4 (age 8-9)	63	25	48	32	111	57
Year 5 (age 9-10)	54	33	63	36	117	69
Year 6 (age 10-11)	57	16	45	20	102	36
Total	174	74	156	88	330	162

Before examining the travel data from the diaries, the effects of allowing children to go out without an adult, using data from the questionnaires, will be considered.

As Table 2 shows, 56 % of the children were allowed out without an adult. The proportion increases with age, in general, with slightly fewer of the Year 4 boys allowed out than the Year 5. The proportion of boys allowed out is higher than that for girls.

Table 2. Percentage of children allowed out without an adult.

	Boys	*Girls*	*All*
Year 4 (age 8-9)	52	33	44
Year 5 (age 9-10)	50	44	47
Year 6 (age 10-11)	86	69	78
Total	63	48	56

The next issue to be considered is the types of travel that they are allowed to do without an adult, since there is a major difference between being allowed to walk a short distance along the child's own road to a friend's house and being allowed out to wander freely and use public transport. Table 3 shows the percentage of children allowed to travel without an adult in various ways. The highest proportion is for travelling to friends' homes, which, as implied above, may just be along the road. The second highest proportion is for going out on a bicycle. This may seem surprising, but many children see cycling as an activity that they perform on local residential roads rather than as a journey. This is confirmed by the much lower proportion allowed to cycle on major roads. A high proportion, 63%, is allowed to cross main roads, which is rather higher than the proportion allowed to go out for a walk. It may be the case that some of the children walk to school and have been trained to cross one or more main road on the way, but are not allowed to walk freely. The travel activity that the lowest proportion of children is allowed to do without an adult is travel by bus. This partly reflects the fact that bus journeys, by definition, imply travelling considerable

distance by home. Boys are allowed to participate more than girls for all the travel activities except going to organised activities.

Table 3. Percentage of children allowed out without an adult to travel in various ways

	Boys	*Girls*	*All*
Visit friends' homes	82	65	74
Go out on a bicycle	71	65	68
Cross main roads	69	56	63
Go out for a walk	55	42	49
Travel to organised activities	45	53	49
Cycle on main roads	42	24	33
Go on buses	35	28	32

An interesting issue is whether being allowed out alone encourages children to go to more places, thereby providing them with a richer life. Table 4 shows the proportion of children visiting various types of places, disaggregated by whether or not they allowed out without an adult. Looking first at the places the children visit, it can be seen that local shops is the most popular place, followed by the park, with sports facilities at the bottom, but still with a high percentage. The ranking is the same for the two genders, with slightly more girls going to the park, cinema and shopping centres and more boys going to sports facilities.

Table 4. Proportion of children visiting various places

	Boys			*Girls*			*All*		
	Allowed out without an adult?		*All*	*Allowed out without an adult?*		*All*	*Allowed out without an adult?*		*All*
	Yes	*No*		*Yes*	*No*		*Yes*	*No*	
Local shops	95	92	94	97	91	94	96	92	94
Park	92	89	91	91	95	93	91	93	92
Cinema	90	89	90	91	91	91	90	90	90
Shopping centres	91	86	89	97	85	91	94	86	90
Sports facilities	87	80	84	84	80	82	86	80	83

It can be seen that that in almost all cases, more of the children who are allowed out without an adult visit more of the places than those who are not. This suggests that being allowed out without an adult can offer the opportunity to visit more places. Children who are allowed out without an adult tend to go to the shops, especially girls, and to sports facilities, especially boys. More of the children who are not allowed out without an adult go out to the park. This suggests that children prefer to go around the shops rather than to the park given a choice. The same proportions of those allowed out with or without an adult go to the cinema.

The next aspect of being allowed out without an adult to be considered is the impact it has on other aspects of their lives, as shown in Table 5. In terms of being outdoors, about two-thirds of the children spend more than three hours outdoors at the weekend, and slightly under half of them spend this amount of time outdoors during the week. More of the boys spend time outside than the girls. For both boys and girls, more of those who are allowed out without an adult, spend these amounts of time outdoors. Given that children are more active when they are out of the home than when they are in it (Mackett, et al, 2005), this

suggests that allowing children out without an adult allows them to be more active. It also allows them to travel more locally and interact more with the local area.

Table 5. The implications for various aspects of children's lives of being allowed out without an adult.

	Boys			*Girls*			*All*		
	Allowed out without an adult?		*All*	*Allowed out without an adult?*		*All*	*Allowed out without an adult?*		*All*
	Yes	*No*		*Yes*	*No*		*Yes*	*No*	
% spending more than 3 hours outdoors at the weekend	80	51	69	64	62	63	73	57	66
% spending more than 3 hours outdoors during the week	57	38	49	44	35	39	51	36	46
% going to a friend's house at least once a week	77	58	70	76	73	74	77	66	72
% spending more than 16 hours a week watching TV etc	25	18	22	19	19	19	22	18	21

The next aspect being considered here is the proportion that goes to a friend's house at least once a week. More of the girls do this than the boys, which may be partly a corollary of more of the boys spending time outdoors. Once again, being allowed out without an adult is associated with a greater probability of going to a friend's house. It was shown in Table 3 that this is the form of trip that the greatest proportion of the children were allowed to do without an adult.

It might be thought that being allowed out without an adult, which, as it has just been shown, is associated with a greater likelihood of spending more times outdoors, would be associated with spending less time watching television and DVDs, and playing on the computer. As Table 5 shows this is not the case, particularly for boys. More of the boys who are allowed out without an adult watch a lot of television and similar activities. This may be associated with parental attitudes, with some parents being more relaxed about allowing children freedom to choose what they do in terms of going out and watching television, while other parents exert more control over their children's lives.

Overall it seems that being allowed out without an adult is associated with being outdoors and being able to visit friends. This suggests that the greater reluctance of parents to allow children to go out without an adults than in the past, may be leading to them spending less time outdoors, and so being active, fewer opportunities to be with friends, and fewer opportunities to visit various places.

Having examined the places that children say they go to in general and the sort of trips they make locally from the questionnaires, attention will now be focused on the actual

travel behaviour of the subset of them that wore the monitors and completed the diaries over the period of four days.

These results are only for the children from one school who provided information from both monitors about walking trips and gave sufficient information in their diaries to facilitate matching of the trips described in the diaries with the times that they were out of the house according to the GPS monitors. They are only from one school because, at the time of writing, the reconciliation between the three research instruments had only been completed for that school. This all means that data are only available for 38 children, 15 boys and 23 girls. This is not a huge number and the results should be regarded as illustrative rather than definitive. However, it should be noted, that it is unusual, if not unique, to have this type of micro-level data on children's behaviour.

Table 6 shows the speed at which the children moved. This shows speeds for all walking, and for walking to and from school, broken down by whether or not the child was accompanied by an adult and by gender. Looking at all walking trips together it can be seen that children walk much faster when they are with an adult than when not. It is worth noting that the speed when walking with an adult is about 1 meter per second which is 3.6 km per hour or 2.25 miles an hour, which is a reasonable walking speed which gives some credence to the results. However, when the children are without an adult they walk at less than half this speed. The speeds for walking to and from school are broadly similar, but there are some interesting differences. The children walking to and from school with an adult walk at the same speed in each direction, whereas the unaccompanied children (only girls because no boys gave valid data for this trip), walk much faster home than they do to school. The girls seem to walk slightly faster than the boys.

Table 6. Speed in metres per second

	Boys			*Girls*			*All*		
	Accompanied by an adult?		*All*	*Accompanied by an adult?*		*All*	*Accompanied by an adult?*		*All*
	No	*Yes*		*No*	*Yes*		*No*	*Yes*	
All walking	0.4	1.0	0.8	0.4	1.1	1.0	0.4	1.0	0.9
Walking to school	-	1.0	1.0	0.3	1.1	1.0	0.3	1.1	1.0
Walking from school	0.4	1.0	0.8	0.6	1.1	1.0	0.5	1.1	0.9

Note: averages over whether or not the child was accompanied include cases where the accompaniment was not specified.

The discussion above implies that the children move much more slowly when not accompanied by an adult. However, when the intensities (activity calories of energy consumed per minute) are examined, as shown in Table 7, a slightly different picture emerges, particularly for boys. Even though boys have a lower speed when walking without an adult, they use more calories. This is because speed is measured as units of horizontal displacement per unit time. It looks as if the boys are moving laterally to the main direction of movement much more when not accompanied by an adult. In fact, parents can observe this type of behaviour in children when the children are given the opportunity to do so on recreational trips rather than being strongly encouraged to walk directly to or from school. The girls use considerably fewer activity calories per minute when not accompanied by an adult than when they are, but the difference is less than the

equivalent difference for speeds, where unaccompanied girls walk at less than half the speed they use when walking with an adult. This suggests that girls make fewer of these lateral movements than boys, preferring a more leisurely form of movement. The slowest walking recorded was for girls walking with other children and without an adult.

Table 7. Intensity of energy consumption in 10^{-2} activity calories per kilogramme of body weight per minute

	Boys			*Girls*			*All*		
	Accompanied by an adult?		*All*	*Accompanied by an adult?*		*All*	*Accompanied by an adult?*		*All*
	No	*Yes*		*No*	*Yes*		*No*	*Yes*	
All walking	7.4	6.7	6.3	3.7	6.7	6.3	5.2	6.7	6.3
Walking to school	-	6.0	4.8	3.6	6.7	6.0	3.6	6.4	5.9
Walking from school	8.0	7.9	7.0	4.0	6.4	6.2	6.0	7.0	6.6

Note: averages over whether or not the child was accompanied include cases where the accompaniment was not specified.

Another way to examine how children move about is to look at the sinuosity of the children's movement by considering the angles that they turn through as they walk along, as shown in Table 8. Two points need to be borne in mind here: first, the GPS points have been averaged to give a point every minute, so much of the lateral movement will have been lost, and second, by recording locations every minute, the slower a person moves, the move the lateral movement will be picked up. Notwithstanding these issues, it is interesting to note the differences in the angularity of the children's movement when they are with and without an adult. There is much more turning, particularly by the boys, when they are not accompanied by an adult, as implied in the discussion above on the speeds. There is also more turning on the way to school than on the way home, whereas one might expect children to stop to play and run around more on the way home because of the slacker time constraints.

Table 8. Mean angles turned each minute in degrees

	Boys			*Girls*			*All*		
	Accompanied by an adult?		*All*	*Accompanied by an adult?*		*All*	*Accompanied by an adult?*		*All*
	No	*Yes*		*No*	*Yes*		*No*	*Yes*	
All walking	74	43	44	63	35	39	68	38	41
Walking to school	-	51	50	67	37	43	67	42	44
Walking from school	78	24	35	55	26	29	67	25	31

Note: averages over whether or not the child was accompanied include cases where the accompaniment was not specified.

This all suggests that children do behave differently at a microscale when they are allowed out without an adult.

Conclusions

This paper has presented some results from an ambitious project to understand how children interact with the local environment. The focus in this paper has been on whether the children are allowed out without an adult and the implications of this for where they go, and then the nature of their walking behaviour and how this is influenced by whether or not they are accompanied by an adult.

About 56% of the children are allowed out on their own, with more boys being allowed out than girls. There is a wide range in the proportion of the children who are allowed to undertake various types of local travel, ranging from making very local trips to friends or recreational cycling near home, to going out on longer trips involving using buses or cycling on main roads. Children who are allowed out alone are able to visit a greater range of places, particularly to shops and sports facilities. Children who are allowed out without an adult are more likely to spend time outdoors than other children, and to visit a friend's house frequently. They also appear to more likely to spend a large amount of time watching television and DVDs and playing computer games. This may be due to them being allowed greater freedom by their parents than other children.

The nature of children's walking behaviour has been considered, in terms of their speed of travel, their energy consumption and their angular movement. It was found that the children appear to walk more slowly when they are not with an adult, but this is, partly, because they tend to move about laterally to the main direction of movement, particularly boys. This much more sinuous type of walking may well be associated with exploring the environment and socialising, both of which are very important aspects of children's development which are facilitated by allowing children to go out without an adult.

From the literature it is clear that children are allowed out without an adult much less than they used to be. This paper has shown that more of those who are allowed out without an adult go to various places, and that when children are out alone or just with their friends they behave rather differently. Rather than walking along at an adult pace to reach the destination as quickly as possible they move around in the environment much more. It will take further research to establish exactly what they gain from this more exploratory type of movement, but it is based on them deciding where to go and what to do, and that is an important part of growing up. It is being lost to children who are not allowed out without an adult, and that may be a very great loss with all sorts of implications.

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