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Children's Independent Trips on Weekdays and Weekends: Case Study of Québec City

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Abstract

Children's independent mobility (CIM) on school days (weekdays) and on the weekend are examined in this study. Previous studies have focused primarily on weekday trips, with a vast majority only examining trips to school. However, the types of trips and the available time differ between weekdays and weekends. Weekday trips are more regular and possibly more local, whereas on the weekend the children may have more free time (i.e., no school) to engage in activities. Parents (as a group) are also less likely to have work obligations, and thus potentially more time, on the weekend. Theoretically, each context for the weekend could facilitate more independent or active mode trips. Nonetheless, this may be linked to whether destinations are local, which is linked to the built environment. Using origin–destination data (2011) for the City of Québec, this paper will expand knowledge in the field of children's travel by examining all trips during a weekday (n = 979) and weekend (n = 315) for children aged 9 to 11 across five built environment types. The findings show that weekend trips are rarely independent, and that the key explanatory factors for greater CIM are shorter distances, having an older sibling, and more urban environments. Other sociodemographic variables were not significant or were inconsistent between the two types of weekday.

During the past few years, a notable decrease in children's active and independent travel (or mobility) has been observed (e.g., *1–4*), and terms such as "immobility" and "inactivity" are more and more present when children's travel is discussed (*5*, *6*). Children's travel is markedly different from that of their parents, in part because of the differences in autonomy (e.g., *7*). Children's independent mobility (CIM) is important because of how it affects children's well-being, whether that be the physical, psychological, economic, cognitive, or social domains (*8*). As a result of this importance, many studies can be found on children's independent travel (see *9*), but most studies have focused on weekday trips to school. Some previous studies have asked parents about their children's CIM for weekday and weekend (*10*), but few studies have directly examined CIM for these two parts of the week in the same context (*11*). In this study, independent trips by children aged 9 to 11 are estimated for weekday and for weekend travel.

Previous literature has highlighted numerous factors that influence CIM, including individual, household, and built environment contexts (i.e., *9*). Individual characteristics of children could play a role such as their age or their sex. Household characteristics of the children may also have an influence such as the level of income, the number of cars, and family composition. As well, the built environment is often found to affect CIM. Therefore, for this study CIM is examined with respect to variables related to the child, the household, and the built environment of their residence.

CIM: Trends and Influences on Lived Experiences

In this study, CIM has been defined as "the freedom of children to travel around their own neighbourhood or city without adult supervision" (*12*). Thus, for this study CIM comprises trips without adults who are responsible for the child arriving at their destination. As such, a public bus trip is considered independent (the child is responsible for getting off at the correct location), but a trip in a school bus is not as it is the responsibility of the bus driver to drop the children off. Children traveling with

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other children, including siblings, are considered to be conducting independent trips here, so the term could be refined to "independent from adults," which is similar to other previous work (*13*). In other words, it is the child who is free to walk and cycle without the supervision of an adult. In such a trip, children are more responsible for their own mobility, which requires numerous decisions (see *14*).

One framework for understanding CIM is the socioecological model, which has been used in public health for several years (e.g., *15*). In that framework, CIM is understood to be influenced by factors ranging from individual and family characteristics, through to neighborhood built environment, policy, and cultural influences. A good review of these different influences for children's active and independent travel can be seen in Mitra, who proposes a behavioral model of school transportation that reflects these influences (*9*). Generally, with age, children's independence increases, and often boys are more independent (*9*). However, for the right to go alone, gender may play less of a role (*16*). Increasing income and increasing car ownership are often found to decrease independence (*9*), though this may be linked to the built environment (*17*). Finally, culture will likely be a factor, as different expectations exist for independent travel (*18*). This section focuses primarily on how independent travel relates to children's lives and current trends. In the discussion section, the findings are discussed with respect to related research outcomes.

Few children have unrestricted mobility in their urban environment, which limits their exploration of their local living environment, and their ability to meet and play with other children in open spaces without the constant supervision of adults (*19*). A lack of mobility may be seen as a stigma of always being and remaining within the same territory. From a cognitive point of view, it may represent for children a notion of "routine," to be locked in a known, marked-out space. If children's mobility is too restrained, they could lose out on experiences, have reduced neighborhood knowledge, and have a smaller range of activities (spatial and variety) (e.g., *20*). This limitation can be seen in children's spatial maps of their neighborhoods (*21*). Further to exploration, independent travel is linked with seeing known people while traveling (*22*). Also, when children do not travel by active modes, their overall physical activity is lower, because trips by active mode could represent one of the principal sources of physical activity for some children (*23*, *24*).

For some years now, studies have shown that children's active and independent travel is decreasing in many developed countries. In Île-de-France (the greater metropolitan area of Paris), almost 40% of the weekly mobility for 11-year-old children was accompanied (*25*). In Japan, for all children under 18 years old, walking and cycling on weekdays can nationally be seen to have decreased from 78% of all trips in 1989 to 69% in 2010 (*26*). For the national data in Japan, weekend trips by active modes are shown to be lower, with 60% in 1989 and 30% in 2010 (*26*). This would suggest that perhaps independent travel on weekends is lower, though it was not clear from that study.

In London, England, over a 19-year period (1971 to 1990), the percentage of independent trips decreased considerably. Larger decreases were observed for 9-year-olds than for children slightly older (*1*). In the United States, McDonald reported a significant reduction in active transport to school between 1969 and 2001 (*27*). In Canada, Buliung et al. reported that for Toronto there was a reduction of over 10% of walking trips to school for children aged 11 to 13 between 1986 and 2006 (*3*). Few studies apart from Hillman et al.'s work have quantified CIM (as opposed to walking or active trips to school) over a long period of time and most studies have focused on trips to school (as such data are more abundant) (*1*). Thus, the state of knowledge suggests that it is not known how children's independent travel differs between weekend and weekday travel, nor whether the other factors would consistently influence such trips.

Why Encourage Independent Trips?

Active and independent travel relates to numerous benefits for children. From a sustainability perspective, children's mobility is important because it influences social, environmental, and economic components of their lives. The autonomous mobility of children relates to the sustainable development of the city by reducing vehicle traffic, but also to well-being (*8*). Finally, being allowed to travel independently is linked directly to children's travel satisfaction, and through that to their life satisfaction (*28*).

CIM relates to overall physical activity, but it probably influences several aspects of children's cognitive development and social interactions (*29*). If a child is not able to benefit from opportunities of independence, their horizons may be reduced and they may find themselves in difficulties when they are no longer protected (*1*). Independent children experience and manage danger, which allows for their cognitive development (*14*). Restricting the child's autonomy could negatively influence their development with reference to their local connections (*22*, *30*), and reduce their social interactions (*1*, *19*). Moreover, independent travel allows children to develop their environmental intelligence (through urban exploring [*21*, *31*, *32*]). Through such exploration, children will have a greater knowledge of their urban environment than children transported by cars (*33*).

Therefore, CIM is reducing, which may have negative consequences on children's health and well-being. For

active travel and other physical health activities, researchers from public health have often used the socioecological framework (e.g., *15*). Such a framework suggests CIM must not only be understood as related to the child and his or her family, but also to the built environment and culture within which he or she exists. Mitra proposes a behavioral model for school transportation that incorporates those different influences of individual, household, and the built environment (*9*). Here, the concept is applied to all trips by children. However, the context of such travel will also vary from weekdays to weekends, but this has not been well studied. Thus, the objective of this study is to understand how, in the same cultural context (Québec, Canada), CIM might vary from weekdays to weekends.

Methodology

Study Area

The area of this study is the metropolitan community of Québec. Children in the Québec City area are highly dependent on motorized transport, particularly motor vehicles (*34*). Québec City contains an older center with "rings" of development that are progressively less urbanized. The center was mostly developed before the invention of cars, and the streets are relatively narrow and the land use is mixed. The first "ring" (or "crown" in the local terminology) is mixed residential development, followed by suburban development with an urban design that changes from linear blocks to curvy roads in more recent residential areas. The city also contains the largest number of inner-city highways in Canada, although at the same time having a bus system that (at the time of the study) included three high-frequency bus lines with designated lanes (during peak hour). The city has a low density, as can be seen in Table 1, but there is variation in the built environment (Table 2). For clarity, "School Day" will be used in place of weekday.

Data Used in the Study

This study uses the 2011 Québec Metropolitan Community (*CMQ* in French; for more detail on the data visit: www.transports.gouv.qc.ca/fr/salle-de-presse/nouvelles/Pages/enquete-origine-destination.aspx) (*35*) Origin–Destination data, which are administered by the provincial Ministry of Transport. These data aim to capture all household trips made on the previous day. The 2011 survey included 26,441 households (roughly 7.2% of all households) and was administered by telephone. Trips by children are typically reported by an adult, so there exists the possibility that independent trips are underreported. The data are weighted based on census data to accurately represent the population of neighborhoods. Trips with a distance greater than the 95 percentile were removed.

Table 1. Comparison of Independent Trips by Children Aged 9 to 11 During School Day versus During Weekend

Factors/week period	School day (SD)	Weekend (SD)
Number of children	2,635	666
Female (%)	51	48
Age	10 (0.82)	10 (0.82)
Number of cars (statistically different)	1.7 (0.67)	2 (0.74)
Number of persons (statistically different)	4 (0.97)	4.2 (1.09)
Number of siblings (statistically different)	0.62 (0.78)	0.54 (0.82)
Household income (average $Canadian)	80,570 (1.76)	87,524 (1.73)
○ 0–29,999*	7%	5%
○ 30,000–59,999	20%	15%
○ 60,000–89,999	25%	25%
○ 90,000–119,999	20%	23%
○ 120,000–149,999	8%	10%
○ Over 150,000	7%	7%
○ Not given	13%	14%
Independent trips (%)	48	13

*Income totals may not sum to 100% due to rounding.
Source: Québec Metropolitan Community Origin–Destination data, 2011 (*35*).

The purpose of this study is to better understand the mobility behavior of 9- to 11-year-old children, as this is commonly the age range when children in Anglo-Saxon countries begin to have greater independent travel. This research improves on current knowledge by exploring the question of autonomy for trips made on both weekdays and the weekend.

Study Sample

General statistics of the sample for this study are shown in Table 1. Statistical differences for the two samples of weekday and weekend trips are the number of people residing in the household and household car ownership. There are differences with respect to income ranges, although the averages are not statistically different. The weekday sample has a higher percentage of the richest group, but the weekend sample has a greater percentage of the mid-to-high groups.

There is no "independent" trip variable in the data set. As such, an algorithm was created for identifying such trips. Any trip in which an adult is not responsible for the child arriving or getting off at the stop is considered to be an independent trip. Thus, a school bus trip, although not "escorted," does not require the student to pay attention and get off at the correct stop as the driver takes responsibility. Although a teenager (16 years or older)

Table 2. Decomposition of the Built Environment's Distribution

Districts	Mixed land use*	Household density (n/Km^2)	Density of favorable roads** (Km/Km)	Intersection density (n/Km^2)	Bike path density (Km/Km^2)	Density of bus stop (n/Km^2)	Walkscore®***
Center	0.38	4,619.3	491.2	88.0	1.98	27.2	80
Old suburbs	0.15	2,350.0	1,715.6	55.2	2.18	19.6	59
New suburbs	0.24	902.2	5,257.4	31.5	1.55	15.0	43
Periphery	0.12	353.6	1,113.7	14.0	0.61	5.7	35
Outlying rural	Unknown	128.0	1,066.1	10.4	0.78	3.5	30

Note:
*Mixed land use corresponds to the diversification of land use and is based on the entropy method (e.g., Cervero and Kockelman [*36*]). Values are included between 0 (single use) and 1 (balanced land use). However, in this case, five land use types were used: residential; commercial; industrial; recreational; and institutional.
**Favorable roads have speeds of 30 Km/h or less.
***Walkscore is based on the average for those areas using the online tool Walkscore.com.

could drive a child somewhere, and therefore it is "adult free," it is not possible for the child to independently use this mode (though they could use a ride hail or taxi, but these trips were not evident in the data set). Finally, a trip by an active mode could still be escorted, so any trip in which the child and adult left at the same time by the same mode was considered an escorted mode.

Autonomous trip rates are quite different between the weekday (48%) and the weekend (13%) (Table 1). Consequently, children are found to be less independent during the weekend despite the likelihood of more "free" time (i.e., no school or work obligations).

Built Environment Aspect. The built environment (Table 2) is added to the data according to a neighborhood classification developed previously. This classification is based on 17 different measures of the built environment related to transport (*37*). Most of the children live in the least urban areas of "periphery" and "outlying rural." They represent 76% (weekday) and 73% (weekend) of the children in the sample.

Analysis and Results

The focus of this study is independent trips for young children. Potential influences that are possible to analyze with this data include age, gender, household income, number of persons in the household, and household car ownership. As the home location is also known, the data were matched with the built environment types (Table 2). As the dependent variable is a binary (i.e., an independent trip or not), binary logistic regression was conducted with the statistical program Stata 14.2.

Variables Created

Several variables were created to improve the analysis. The total number of adults in the household was estimated by summing all individuals over the age of 18. The total number of older siblings was added by summing the number of individuals between the ages of 12 and 25 (the assumption here is that it is unlikely that a parent would be 16 years older than a 9-year-old child, though possible). The total number of siblings of the same age range (9- to 11-year-olds) was added by summing all children of that age minus one (i.e., if there are two children aged 9 to 11, then there is only one sibling to each child in that age range).

The Euclidian distance was included for all trips. The distance was calculated with the geographical coordinates of the start and end points of the trip. The role of "reasonable" walking and cycling distances was also examined. This is estimated by taking the 80% threshold of all walking or cycling trips by the target group (i.e., 9- to 11-year-olds; see *38*). During the weekday, this distance is about 0.64 Km (walk) and 0.83 Km (bike) for 9- to 11-year-old children. Then for the weekend, it seems that children are making longer trips in which the reasonable distance thresholds are 1.71 Km (on foot) and 1.83 Km (by bike).

Results

The results of the two binary regressions can be seen in Table 3. Each group of influences (i.e., child, household, built environment) is discussed in turn. Household income and the number of adults could be removed from these analyses without affecting the results; they were retained as they were found to be significant in previous studies.

Table 3. Binary Logistic Regression Analysis of the Likelihood of CIM in Québec for Children Aged 9 to 11 During School Day versus Weekend

		School Day (n = 2,550)		Weekend (n = 629)	
		Odds ratios			
Children	Age	9 (reference)	1.0	9 (reference)	1.0
		10	1.39**	10	0.21**
		11	2.83****	11	0.47
	Gender	Girls	0.98	Girls	2.41**
Household	Household income ($Canadian)	0–29,999 (reference)		0–29,999 (reference)	
		30,000–59 999	0.72	30,000–59 999	3.46
		60,000–89,999	0.79	60,000–89 999	0.28
		90,000–119,999	0.77	90,000–119,999	0.44
		120,000–149,999	0.84	120,000–149,999	0.49
		Over 150,000	0.96	Over 150,000	0.19
		Unknown	0.71	Unknown	1.10
	Number of cars	0 (reference)		0 (reference)	
		1	0.86	1	0.44
		2	0.68	2	1.89
		3 or more	0.38**	3 or more	0.19
	Number of persons	Number of persons	0.77**	Number of persons	0.89
		Older sibling	2.52****	Older sibling	2.32***
		Sibling of 9 to 11	2.02***	Sibling of 9 to 11	0.85
	Number of adults	1 (reference)		1 (reference)	
		2	1.39	2	1.03
		3	0.84	3 or more	0.23
		4	0.82	NA	NA
External	Built Environment	Center (reference)	1.0	Center (reference)	1.0
		Old suburbs	1.34	Old suburbs	1.23
		New suburbs	0.56**	New suburbs	0.23
		Periphery	0.58**	Periphery	0.16**
		Outlying, rural	0.87	Outlying, rural	0.19*
	Distance of trip (Km)	0/0.49 (reference)	1.0	0/0.49 (reference)	1.0
		0.5/0.64	0.60***	0.5/0.99	0.07****
		0.65/0.82	0.23****	1.0/1.49	0.01***
		0.83/0.99	0.15****	1.5/2.49	0.02****
		1.0/1.99	0.03****	2.5 and over	0.003****
		2.0/3.0	0.01****	NA	NA
		Over 3 Km	0.01****	NA	NA
Constant			3.53***		11.51*
Likelihood ratio χ^2			(30) = 607.22		(25) = 156.5
Probability $>\chi^2$			0		0
Log likelihood			–12,151.7		–6,894.6
Pseudo-R^2			0.400		0.571

Note: NA = not applicable. ****$p \leq 0.001$; ***$p \leq 0.01$; **$p \leq 0.05$; *$p \leq 0.1$.

Influence of the Child's Demographic Characteristics. For age, on weekdays, children aged 10 are 1.39 times (or 39%) more likely to travel independently than 9-year-olds. Eleven-year-olds are almost three times (2.83) more likely to make independent trips than 9-year-olds on weekdays. Thus, for this context, the older the child is, the more independent they become for their trips.

On the weekend, results are the inverse. Here, it was found that the 10-year-old children were 4.8 (1/0.21) times less likely to be independent than 9-year-olds (Table 3). The result for 11-year-olds (two times less likely) was not significant. Therefore, it would seem that the younger children were more independent for the weekend.

No statistical difference was found for the role of gender for weekday trips. So, for this context, boys and girls had the same level of independence for trips. However, for the weekend, girls were more than twice as likely to travel independently (Table 3).

Consequently, for both age and gender, the results were not consistent, nor were they necessarily what was anticipated from other literature because on the weekend younger children were more independent and girls were more independent than boys.

Household Influences. Household factors have been found to play a role in children's travel. Several measures were tested: household income; household car ownership; the overall number of people in the household; the number of adults; the number of siblings over age 12; and the number of siblings aged between 9 and 11.

Household income was not statistically significant for either data set. Nevertheless, for the weekend, it might be the size of the data set that limits the statistical significance because large descriptive differences can be seen in Table 3.

The influence of the number of cars in the household is examined. Compared with a household without a car, children in households with three cars were nearly three times less likely (1/0.38) to travel independently on weekdays (Table 3). On the weekend, the number of cars did not have a statistical influence on the CIM. The general tendency would suggest that more cars resulted in fewer independent trips.

The number of people within the household and their role (parent, sibling) could have an impact on the level of independent travel. For weekday trips only, as the number of people within the household increases, children were 1.30 (1/0.77) times less autonomous. For the number of adults, no statistical difference was found. So, for the sample, no matter how many adults in the household, children were no more or less autonomous for their mobility.

The number of older siblings in the household had an impact on the autonomous traveling of the children. The influence was found to be positive, with trips on the weekday being 2.52 times more likely and on the weekend 2.32 times more likely to be independent (Table 3).

With regard to siblings of the same age, 9- to 11-year-olds, the results are not consistent. On weekdays it was a positive influence (2.02 times more autonomous). However, for the weekend, the influence might be the inverse, though there was no statistical difference.

Impact of External Factors on Children's Mobility. The local built environment of the child's residence was taken into account as this has been shown to influence independent travel. Five built environment types were previously identified and estimated for the study area (Table 2): the center; the old suburbs; the new suburbs; the periphery; and the outlying areas.

The influence of the built environment was clearer and larger on the weekend. On the weekend, only the old suburbs were not statistically different to the old center for children's independent travel. For the size of the influence, all measures relate to children living in the center: children in the new suburbs were four times less autonomous; in the periphery and outlying rural built environments, children were nearly six times less autonomous. Thus, in general, the less built-up the area, the less independent the child.

On weekdays, the new suburbs and the periphery were nearly two times less likely to result in independent trips. The non-significant result for the outlying rural area may be because of villages still having walkable distances to school.

The distance to a destination was found to be the strongest explanatory factor. If only the distance variable is used as an explanatory factor, the pseudo-R^2 is still 0.34 for the weekday and 0.45 for the weekend (analysis not shown here). The greater the distance, the less independent the trips. For the weekday, even for trips of 500 to 640 m, children are 1.67 times less independent than those who make journeys of under 500 m. Once the distance passes 1 Km, the proportion of autonomous trips decreases sharply. For trips between 1 and 1.99 Km, children are 33 times (1/.03) less independent than those who make journeys under 500 m. Moreover, for a distance over 2 Km, children were 100 times less independent.

Results are similar for weekend travel. For a distance of 500 to 990 m, children are 14.3 (1/.07) times more dependent for their trips than those who make journeys under 500 m. The highest level of dependence is for distances over 2.5 Km where children are over 300 times more likely to be accompanied for their trips. For 1 to 1.49 Km, children are 50 times less likely to be autonomous. Therefore, the greater the distance of the trip, the more likely the child will be accompanied. For the weekend, trips over 3 Km were not independent.

Discussion

This study examined independent mobility for children aged 9 to 11 for both weekday and weekend trips. The results show that independence significantly drops on the weekend, which is in line with other work in Québec (*39*) and in a different culture, Japan (*11*). This drop in independent trips could be related to several factors, including social practices such as families spending more time together on the weekend, children's free time being occupied by activities outside of their neighborhood, infrequent trips in which the child might not know how to get there, or numerous other possibilities. The topic requires more study, including qualitative research, to explore such potential causes.

Few explanatory variables were consistent across both data sets. Those that were included having an older sibling, the built environment, and distance. The results are first interpreted with respect to previous findings before a short discussion on the implications.

Age had a logical relationship for the weekday trips following previous research (e.g., *1* and *40*). However,

this was not the case for the weekend. Why this might be could relate to the older children being more involved in organized activities. Previous studies that looked at age typically focused on "licenses" for CIM (*1*, *40*, *41*), which would not determine whether they actually practiced an independent trip or not, or the studies only included school related trips (e.g., *42*).

Gender had no impact on the weekday, which mirrored previous research in Québec (*43*). For an international study, for most of the countries there was no difference between genders with reference to their licenses to travel independently (*16*). Nevertheless, this does differ from a UK study (*44*) and an Australian one (*45*). In our study, girls were found to be more independent on the weekend. This combination of results matches the only other previous study, in Japan, of all children's trips of the same age group for both weekday and weekend trips (*11*). For the studies that found a gender role different from this study, a few differences can be observed. First, those studies were only for weekday travel and were in northern Europe (*46*, *47*), though another was in Toronto, Canada (*48*). It is unknown what the case might be for weekend travel in those countries.

Household income was not found to be significant, which is in line with a previous study on parents accompanying children in Québec (*39*) but contrasted with several other studies on children's active travel from English-speaking countries (e.g., *49*), but also with a study on CIM from Belgium (*50*). However, the study on CIM was for children aged 10 to 13 years old and only during school trips (primary and secondary).

Car ownership was only loosely related to a decrease in independent travel, thus it supports some previous findings (*51*), but contrasted the association found in a similar study in Japan (*17*). It may be that overall car ownership levels in the Canadian context was higher. A review on children's active travel (not perfectly equivalent to CIM) also found mixed results for the influence of car ownership (*49*). Car ownership may act as a proxy for the need for higher mobility related to residential choice (e.g., *52*, *53*), but could also be related to cohort attitudes toward car use (e.g., *54*).

The number of people in the household reduced independent trips for the weekday, but this was not explained by the number of adults in the household. In fact, the number of adults did not influence independent trips, which contrasts with a study from Montreal (*55*). Considering that adults, older siblings, and same age-group siblings were controlled for, this may be the influence of younger siblings. In some cases in Québec, schools do not allow older siblings to escort siblings who are under 6 years old. Thus, a parent would need to escort at least the younger children, and the older ones may just leave at the same time.

As mentioned, older siblings were found to be consistently and positively associated with independent trips, which supports previous work (*56*, *57*). This might be because parents allow children to travel with older siblings because they have greater maturity and experience with respect to traffic, it could be a matter of learning how to get around from those older siblings, or it could be time limitations that require that some children travel independently (whereas others are escorted).

Finally, there is the influence of the built environment and distance, which plays a strong role. Those results are in line with results on children's active travel (*49*). In our sample, any trips over 1 Km (Euclidian distance) were very unlikely to be independent, suggesting that children of this age are relatively constrained to their immediate environments. It is not clear whether the slightly longer distances on the weekends are related to destinations being on average further than school trips. As for the built environment, the more urbanized the area, the more children were independent, which corresponds with results for other cultures (*11*). A special case was noted for the outlying rural areas. On the weekday, there was no difference from the urban core (statistically no difference and the odds ratio was essentially equivalent), but on the weekend, it was roughly five times less independent. The weekday trips in such areas are mostly related to school travel, which may still be local, whereas weekend trips may be to destinations that are too far, too dangerous (e.g., crossing highways or other high-speed roads), or where the parents prefer to drive (e.g., *58*).

Of course, not all factors that influence CIM were included in this study. For example, the parent's (or guardian's) beliefs with respect to danger (traffic, "stranger danger") could be a factor. A study in Sweden on children aged 8 to 11 years old aimed to determine which parental factors and environmental factors have an impact on the modal choice of children for their organized leisure activities (*59*). Parents referred to their trips as "cab trips." This behavior was linked with environmental factors (traffic, quality of sidewalks and bike lanes, number of cars in the household), but also parents' attitudes to independent mobility such as the maturity of their children and to parental factors (confidence in child, a desire to protect, or the presence of older children in the household). In English-speaking countries, results are mixed, but most findings are that concern over traffic safety does not play a significant role (*49*). In that review, ethnicity played a role, but not always (*49*).

A positive relationship between more urban (i.e., dense, mixed) built environments and independent mobility has been shown in this study, among others. This relationship could be explained by the design of new residential environments (here, new suburbs, periphery, and outlying area), whereas in comparison with the older

neighborhoods, they generally lack sidewalks and local amenities, have lower connectivity, and have higher traffic speeds (or roads that allow for such). All of these elements could reduce CIM for 9- to 11-year-old children, suggesting that such areas are not conducive to children's independence and the associated advantages for their well-being.

CIM is correlated positively with all domains of children's well-being, yet it is increasingly rare. Previous research mostly focused on weekday travel. On weekends, parents and children have fewer obligatory trips such as work (for most adults) or school, and here we find that independent trips diminish. The strongest explanatory variable is distance for both weekdays and weekends. A massive drop occurs at 1 Km, where trips are between 32 times (weekday) and 50 times (weekend) less likely to be independent. The large difference between the weekday and weekend for the overall percentage of independent trips may relate to where destinations for children (and their family) are located. If a policy approach increases the agglomeration of destinations into larger centers, then distances will increase, increasing dependence on parents and transferring the costs from the destinations to the individuals, creating more traffic at the same time (which is a public cost). Smaller and more local destinations may help protect or increase children's independence, and at the same time reduce time stress on parents, and reduce overall traffic. All these changes are associated with better health outcomes (e.g., *60*).

For future studies, it was found that the weekend differed considerably from the weekday, but the weekend trips are rarely studied. Are the low levels of autonomy related to cultural practice or a lack of local amenities for weekend activities? Previous research on children's active travel has found a positive correlation with local recreational destinations (*49*). The quality and quantity of independent trips should also be considered. Quality could be based on questions related to the child's well-being. It might relate to social well-being such as travel with friends or to friends. It could also be based on trip purpose or attributes of the destination. For the question of quantity, this could relate to frequency, but it could also examine what increases the range at which children are allowed to explore.

Conclusion

Children's independent travel was examined for both weekday (or school day) and weekend trips. The results demonstrate that there is a significant decrease in autonomy on the weekend compared with the weekday. Of the explanatory variables used, distance was the strongest factor and consistent over both sets of day. More urban areas were also more favorable to independent travel over the week. The only other consistent result was having an older sibling.

As with some previous studies on weekday travel, gender did not play a role, and independent trips increased with age. Nonetheless, these correlations did not hold for the weekend, which suggests that further study on the differences between these two parts of the week is needed.

For the weekend, being female played a positive role on the independent mobility of 9 to 11 year olds, and the younger children were found to make more independent trips. These individual influences changed direction, but the structural changes such as distance and the built environment only shifted in their strength of influence.

Author Contributions

The idea for the paper was developed through part of AC's master's thesis. AC wrote the original draft and conducted and interpreted the analysis under guidance from EODW. EODW conducted the final editing of the paper to meet TRB standards.

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