

## Improving Sustainability Concept in Developing Countries

# Where do Cairene Children Walk to Primary School?

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### Abstract

Considering the Cairene context and its urban extensions, this paper hypothesizes that planned urban districts are becoming less suitable for children to walk to school. A questionnaire was sent to parents of children in grades 4, 5 and 6 of 3 schools; one in each of Dokki/Mohandeseen (n=406), Madinet Nasr (n=124) and 6<sup>th</sup> of October City (n=98) to explore the mode by which students travel to school and the different variables affecting the parental perception and decision. Results showed that active school travel is much less practiced in new cities than in the inner city districts with percentages 35.3% in Dokki, 40.9% in Madinet Nasr and 12.5% in October.

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**Keywords:** Children walkability; active school travel; cities extensions

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## 1. Introduction

Many upcoming physical, social and mental problems were observed recently to be common among new generations. Inter-generational equity posits that placing children at the center is crucial for a society to be sustainable<sup>1</sup>. The rationale is that a city that works for children is said to work better for everyone<sup>2</sup>. Studies were carried out hypothesizing the significance of active school travel (AST) as a key stone in solving many of these problems, being an ‘everyday activity’ passing by ‘everyday spaces’ that contribute to developing the child’s social and environmental well-being<sup>3</sup>. Previous studies showed that parents’ perceptions are the main barrier to children AST, especially when associated with independent mobility. This paper examines this in different city extensions in

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the Greater Cairo Region (GCR) and unveils the factors that contribute to those parental perceptions. The results presented are part of on going empirical work conducted towards a Master Degree.

## 2. Literature review

While it was observed that the rates of overweight among children and teenagers are increasing in an obvious way between the years 1980 and 2002<sup>4,1</sup>, it was proposed that the growth usage of motorized transportation since the beginning of the fifties of the twentieth century encouraged using cars for travelling distances that were walked previously<sup>5</sup>. At the same time, it was shown, in an analysis of the National Personal Transportation Survey (NPTS) of the U.S. -no similar surveying is available for Egypt-, that active travel to school witnessed a decline between 2001 and 1969 that was reflected by an increase in being chauffeured to school<sup>4</sup>. Despite recording the highest rates of AST in most of the survey period years, primary students walking and biking witnessed the sharpest decline in that period. Important factors affecting this specific daily physical activity were uncovered in previous studies.

### 2.1. Influential factors and barriers

Parents' mental process while choosing the travelling mode of their children to school can be explained through the contribution of factors related to the physical and social environment, besides individual factors and the child characteristics.

*Physical factors* can be classified into Macro level environmental factors, such as density, diversity and pedestrian friendly design<sup>6</sup> and Micro level environmental factors; such as accessibility, pleasurability, diverse destinations, density of housing, perceived safety of traffic and crime, which are considered to be main scales of this level<sup>7</sup>. Residential population densities were observed to be the most related component of the walkability index to AST<sup>8</sup>, where the higher degree of urbanization seems to limit children's mobility licenses. On the other hand, urban intensification is thought to have the potential to reduce the dependency upon automobile, through increasing the probability of more people living within a walkable distance to various destinations<sup>9</sup>, such as schools<sup>7,10</sup>. Unless it is accompanied by less passive commuting behaviour, traffic congestion is argued to increase<sup>11</sup>, contributing to 'a city that is increasingly hostile to children's needs'<sup>9</sup>.

The choice of travel mode is significantly affected by travel distance. For Kerr et al. (2006)<sup>8</sup>, schools within 20-minute walk represents one of the main associated factors to active travelling behavior, and there is nothing to do, if proximity to school is not available. Attending schools based on choice rather than geography, due to difference in schools levels and programs, may be a contributor to these unwalkable distances<sup>12</sup>. In addition to that, it was argued that mixed use contributes to walking as it concentrates many destinations within a walkable area<sup>13</sup>. The concentration of destinations may be supporting adult walking, but does not seem to be that influential in the case of children<sup>7</sup>. However, in urban settings where mixed use results in an increase of 'natural surveillance' with the presence of other favourable factors, it has contributed to children's AST<sup>14</sup>. Besides, "Pedestrian friendly-designed streets" represented in a well-connected street network, contributes to short, convenient and direct walks<sup>15,7</sup>. In another study, facing several roads (vehicular dominant streets) to cross was associated with fewer active travelling to local destinations among children aging 10-12 year old<sup>16</sup>. Moreover, it was argued that traffic congestion, which contributes to parental concerns about their children safety leading to chauffeuring them, is actually one of the consequences of the undeveloped public transportation networks<sup>9</sup>.

New urbanists advocated more walkability features than standard suburban designs<sup>17</sup>, represented in fewer vehicle lanes, more traffic calming devices; such as traffic circles and bulb outs as well as lower speed limits, besides shorter block length and narrower streets<sup>18</sup>. In addition, absence of painted crosswalks is perceived by parents as a barrier to let their children walk to school<sup>18</sup>. Also, mixed use and pedestrian friendly design features like increasing continuous sidewalks<sup>19</sup>, were suggested to contribute to walking to school. Clear vision obstacles; such as wastebaskets or untrimmed vegetation, early morning darkness on certain day intervals of the year, were mentioned by parents to be barriers to walking to school<sup>19</sup>.

*Social factors* are related to the parental perceptions, stranger danger, geographical perspectives and school aspects. The factor of how parents perceive the environment was considered as a main predictor of active school travel than physical environmental variables<sup>20</sup>, as children are argued to be five times more likely to commute

actively if their parents concerns are fewer<sup>8</sup>. In general, parent and child factors may be categorized into personal safety, sibling, time management and motivation barriers and facilitators.

Personal safety barriers, that were the most significant barrier to active travel identified by parents, were significantly represented by fear of child kidnappings while walking to school<sup>19</sup>. As perceived by both parents of AST and non-AST students, parents' responses were different. While the parents of non-AST students chauffeur their children to school, parents of AST children escort them while walking to school, or determine certain routes obligating their children to take to school<sup>19</sup>. Some studies<sup>19,21</sup> conducted the parents feeling of uncomfortability while their children walk on their own to school having no information if their child arrived safely to school or not. Regarding this concern, "Early notification" system of child arrival or not to school was suggested so that parents could be unworried about their children<sup>19</sup>. Other parents claimed that their child may be in an accident in case of active travel to school. Besides, both parents of AST and non-AST students suspected their kids mature judgment and ability to thoroughly follow the rules of traffic and to make "good split-second decisions"<sup>19</sup>.

In a previous study<sup>19</sup> as well, parents claimed that having children in the same household attending various schools make chauffeuring them to their schools more convenient and sometimes a must. Also *younger siblings*, who are in need for sleeping at times of commuting elder children or who do not bear walking on their own for this distance but also too old for strollers, may force their parents to chauffeur their elder siblings instead of walking with them to school<sup>19</sup>. Interestingly, older siblings are considered personal safety facilitator, where they are considered as someone to escort their younger siblings<sup>19</sup>.

In Ahlport et al.'s (2008) study<sup>19</sup>, parents identified *time barriers* to be the inflexibility of their work schedules, especially when both parents work outside the home, besides the tight time of the morning, and the fact that walking or bicycling to school takes more time than being driven instead, which requires earlier wake up of both parents and children. Thus, some parents chauffeur their children to school having the goal of only "getting to school", as they don't consider travelling to school as an activity at the destination<sup>19</sup>. Parents described concerns to walk to school within five items; too distant, too difficult, unsafe from traffic, unsafe to cross streets and unsafe from crime<sup>7</sup>. Some other practical reasons such as appropriateness, weather conditions<sup>19</sup> and some times restrictions imposed by school<sup>19</sup> might influence walking to school. It was argued that parents are mainly concerned about strangers and teenagers besides traffic<sup>22</sup> and about their children being exposed to negative cultures<sup>23</sup>. It was argued that 'long haired layabouts, teds, mods, and rockers, yobbo's' young people 'hanging about on street corners' are usually put at odds with older generations<sup>2</sup>.

From the geographical perspective, the protective parenting culture results in children developing an "island geography" in which they compromise their destinations, but preventing effectively first hand experience of their 'local sphere' between locations they are chauffeured to and from, as they, as a passive passengers, are seeing more but learning less<sup>24</sup>. Interestingly, local 'norms' determining the distance and time allowed for children to far away from home were found to be established through an important role played by the social interaction between mothers<sup>23</sup>. This is to cope up with the local 'common sense' of the meaning of being a 'good mother'. This was what Tranter (2006)<sup>25</sup> named as 'Social traps' where uncertainty about other parents' decision about how they will let their children travel to school by, the thing that makes them feel obligated to chauffeur their children to school. Another noticeable aspect, about the geographical perspectives, is the normal patterns of travelling in the society, as the general bicycling and public transport uses patterns were found to be parallel to that patterns of commuting to school<sup>5</sup>.

School aspects related to students' active travel to school were classified in one study<sup>19</sup> into school-related barriers and facilitators. School-related barriers were determined by school policies; such as the early school day start time in the morning and the load of school bags carried by the children<sup>19</sup>. School-related facilitators mentioned by parents were crossing guards who are, in some schools, favorite safety personnel, besides its heavy traffic, where the too elongated wait in the drop-off/pick-up car queue can raise children spirits to active commuting to school<sup>19</sup>.

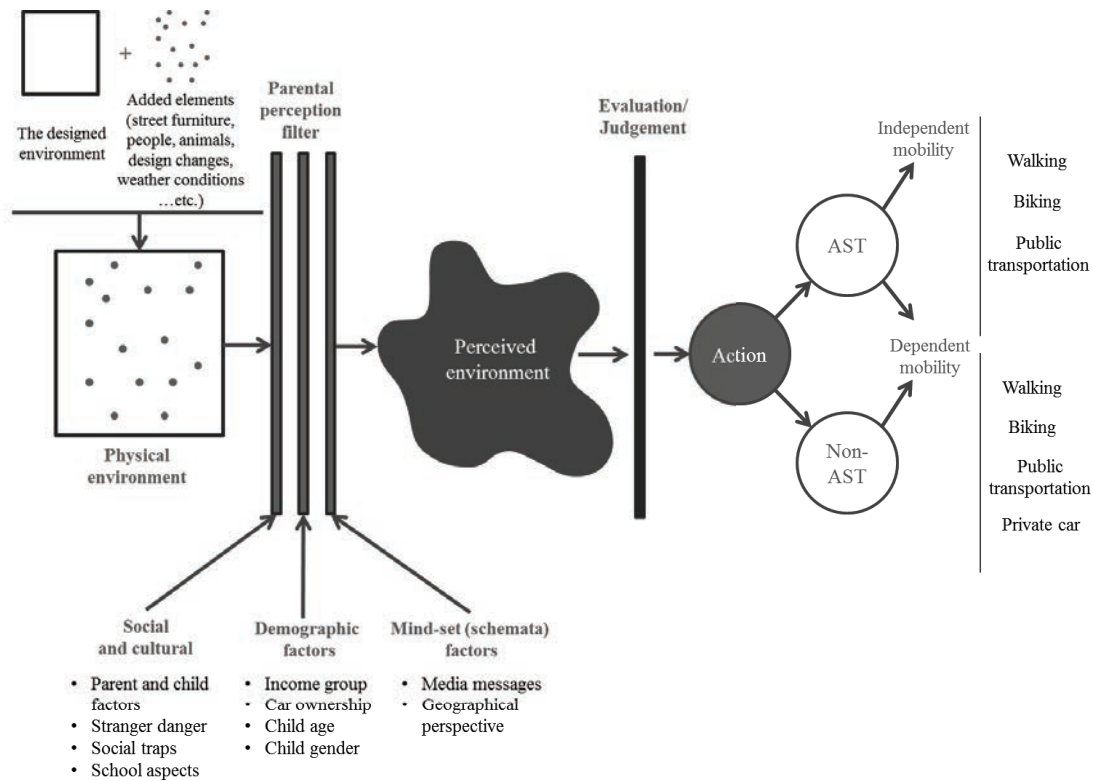


Fig. 1 Model showing the mediating factors between the built environment and AST (adapted from Shehayeb et al 2003<sup>14</sup>).

*Individual factors*, related to socio-economic levels, demographic factors and child own perceptions, were found to have their influence as well. Walkability to school rates varied in many studies among different socio-economic levels. Many studies<sup>18,24,8,26,27</sup> ended up that higher walkability rates are found with lower income levels, while children in higher income levels are more likely to be chauffeured with their parents to school. This may be justified through many reasons; such as higher income association to greater access to cars<sup>24,8,26,5</sup>, the difference between infrastructure and street layouts resulted in difference parental perceptions about traffic safety<sup>18</sup>, average of household monthly income and number of cars per household<sup>8,26,5</sup> and the development of protective parenting culture<sup>24</sup> considering chauffeuring provides a greater tendency that reduces opportunities of exploring their neighborhood.

The variance in independent mobility was claimed to be mostly explained by factors such as *child age*<sup>28</sup>, where independent mobility is naturally less restricted with older children<sup>8</sup>. Living in proximity to schools, and being escorted by parents, siblings or a guardian adult were suggested to raise the rate of younger students walking to school<sup>29</sup>. While some studies<sup>28,30,31</sup> observed that boys are less restricted than girls, a direct relationship between active commuting to school and the physical activity only for girls was validated in one study<sup>32</sup>. It was also revealed that when the route to school is perceived by parents as unsafe for AST, girls are the first to suffer dropping out of school in one study in the 6<sup>th</sup> district of the 6<sup>th</sup> of October city<sup>14</sup>. These clashing results draw attention to the conflict in literature regarding the demographic factors of sex type and its influence upon active travelling to school and physical activity.

Although influential factors are classified into types, they are more interrelated and affecting each other. Figure.1 is a proposed model showing the relation between the various factors and the way they mediate whether directly or indirectly the relation between the physical environment and AST.

## 2.2. The significance and scope of the entire study

Although the influential factors are almost declared in many of the recent studies, to the authors' best knowledge, none has been carried in the Egyptian context with its political, economic and social aspects that all together create its urban environment. In addition, the study provides a comparative analysis of the influence of the urban environment of different districts of one city 'Cairo' showing how it is varying throughout its development stages. From these two perspectives, the study should contribute to the walkability research.

The scope of the study is limited to studying the effect of the physical urban 'planned' environment upon the behavior of active travelling to primary school for children between 9 and 12 years old. The study has a historical and geographical scopes; beginning from the expansions in the post-war period in the Greater Cairo Region (GCR) respectively. This is when Cairo began to be Greater Cairo as the expansions crossed the Nile for the first time<sup>33</sup>.

## 3. Methodology

This study provides descriptive information about the mode by which primary school children travel to and from school. Besides, it tries to unveil the relationship between the physical environment and children's walking by testing an explanatory model that examines factors hypothesized to be influencing parental decision-making about the trip to school, comprising key features of the physical environment in different districts of Cairo representing different stages of its urban extension and development.

### 3.1. Study districts selection

The selection criteria of the study districts was based on:

- Each of the districts represents a stage of the urban growth of Greater Cairo.
- Each of the districts should have lasted for more than 30 years; so that a complete generation is supposed to have been raised there to control the factor of being still under development or establishment.
- Similar level of income of the population in all the districts, mainly of the middle and upper middle class; so that the chosen sample would have both choices of active or passive travelling.

As a result, Dokki, Madinet Nasr and October districts were chosen as case study districts representing the formal core, the 1970s extension and the 1980s extensions into desert cities respectively.

### 3.2. Criteria of schools selection

In each of the selected districts, all primary, private, mixed schools were surveyed. Targeting these types of schools was for the following reasons:

- *Primary schools*: were the center of the study for the fact of their neighborhood orientation and the more noticeable controlling role of the parent in travel decisions for children in this age; from 8 to 12 years old, when parents usually start to give their children many 'green cards' of independent mobility<sup>10</sup>.
- *Private schools*: so as to control the factor of the level of income that may affect the results, as parents of middle and middle high income were observed to be usually sending their children to private schools. These income categories were chosen for the reason that they have both chances to commute passively; by private car, or actively; through walking or biking.
- *Mixed schools*: so as to examine the factors effect on both sexes travelling to the same destination, ignoring the fact that some schools are attended by both sexes but the classes are not mixed.

Among this list of schools, three schools were chosen and approached to participate in the study in each district, so that they represent the different urban environments within the same district. Upon the completion of designing the questionnaire, a series of permissions prior to contacting schools were essential; an approval from the Department of Architecture and Faculty of Engineering of Cairo University; a consent letter from the post graduate studies administration directed to each of the authorities concerned afterwards.

Each of the schools was then visited in person by the researcher to present the study and deliver a package of material that included a descriptive letter of the study defining the role of the school and the steps to be taken, a

copy of all series of permissions granted, a consent letter directed from Cairo University and a copy of the approved questionnaire.

Only one school in Madinet Nasr and one school in October, expressed interest in participating in the study. In Dokki district, two out of the three schools accepted participating in the study, but one of them was later excluded because of the very low response rate of parents (7%). To sum up, of the 9 previously selected schools, only three (one in each district) were included in the study.

### 3.3. Data collection instrument

While the larger empirical study, still on-going, is based on both a questionnaire for parents and an urban survey of the physical environment, this paper presents the empirical part related to the questionnaire for parents, as the main data gathering tool. The questionnaire design was based mainly on two sources; first, few validated survey questions from existing instruments<sup>34</sup> and second, factors related to the person (perception, social and culture) and the environment (physical, social and economic) drawn from the literature review, which were used to change or add some questions to those from validated existing instruments. The survey language was in Arabic and was designed to be answered in about 20 minutes.

*Participants' recruitment:* In each school, the sample included all the parents whose children are in the 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> grades. The aim of including the parents of students from all classrooms into the sample is to control the effect of the social interaction between mothers, which is usually stronger between mothers of students of the same classroom, resulting in a common local norms defining allowed distance and time for children to far away from home.

*Sample size:* The sample size was 406 parents in the school in Dokki, 179 parents in the school in Madinet Nasr and 90 in the school of October.

The questionnaire was sent via the school with the students in grades 4, 5 and 6 to their parents for completion. Parents were asked to fill the questionnaire and send it back with their child the day after. Along with the questionnaire, a cover letter was attached declaring the purpose of the study, informing that all permissions was granted from the concerned authorities and asking for the parent's participation in completing the survey. No follow-up was conducted to capture non-respondents, however schools were asked to accept the returned questionnaire for a week long, so as to give more chance for larger number of respondents.

*Response rates:* The total number of the distributed questionnaires was 675 across the three schools, of which 253 questionnaires were returned of an overall responding rate 37.5%. Out of 406 questionnaires distributed in Dokki, 131 questionnaires were returned with responding rate 32.27%. In Madinet Nasr, 73 out of 179 questionnaires were returned with 40.8% responding rate. On the other hand, 49 questionnaires out of 90 distributed in the 6<sup>th</sup> of October city were returned with 54.4% responding rate.

### 3.4. Data analysis

The study mainly compares the factors affecting the parental perception in the three districts, classifying parents into two groups; parents of children walk to school and parents of other children. For the purpose of this paper, the analysis excluded those children reported by their parents in the survey to be living beyond 15-minute walk by an adult from school, unless they do walk to school. That is for the fact that long distances were found to be a main barrier for children to walk to school; a factor that cannot be overcome by enhancing other factors.

Table 1: Demographics of students included in the analysis (excluding students living beyond 15-minute walk by an adult from school)\*\*\*

District	Age distribution (years old)***				Grade distribution (primary)			Sex distribution		Total
	9	10	11	12	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	Male	Female	
Dokki- total	1	5	3	7	6	6	5	7	10	17
AST	0	0	2	3	1	2	3	5	1	6 (35.3)
Madinet Nasr- total	4	5	5	2	9	7	6	10	9	22
AST	2	4	1	1	6	1	2	5	4	9 (40.9)
October- total	5	4	1	4	7	2	6	2	12	16
AST	0	0	1	1	0	0	2	0	2	2 (12.5)



\* Table shows AST frequencies and their percentages in brackets (%)

\*\*Percentages are calculated out of the number of respondents to that question s. N(%)

\*\*\*Cases of ages beyond the scope of the study (9-12 years old) were excluded from the analysis.

The entire sample included 55 students in total (21.7% of 253 respondents); 17 students (13% of 131 respondents) in Dokki district, 22 students (30.1% of 73 respondents) in Madinet Nasr and 16 students (32.7% of 49 respondents) in 6<sup>th</sup> of October city. From the sample, 30.9% reported that walking is their main mode of travelling to school; percentages of 35.3% in Dokki, 40.9% in Madinet Nasr and 12.5% in October stated walking as their main travelling mode to school. All students who were reported by their parents to travel to (or/and) from school on foot were considered active school travellers (AST) in this study.

Inferential statistics were adopted to seek correlations between different variables and walking to school. Data was analyzed using the Statistical Package for the Social Sciences (SPSS), version 22.0 and the level of significance was set at  $p < 0.05$ . The independent variables were selected from the parent survey that aimed to measure the factors found in the literature to be affecting parental perception and hence walking decision. Variables were examined for the significance of their bivariate correlation with the dependent variable (walking to school). The dependent variable was converted into a dichotomous one; where walking to school has the 1 value and every mode else has a 0 value. Although biking is an active travel mode, one case that was found to bike to school in Dokki district was previously excluded as it was reported to be living beyond the 15-minute walk by adult.

Variables were considered to be significantly correlated walking to school in case of significant correlation to either 'Walking to school; reported by parents as main mode of traveling to/from school' or 'Frequency of walking to school in the last two weeks prior to answering the survey' or 'Likelihood of future walking to school in the next two months past to answering the survey'. Pearson correlations were applied to scale/interval variables, whereas Spearman correlations were applied to Likert-scale or categorical variables.

#### 4. Results

The factors found to be significantly correlated to "walking to school" were tabulated twice. Once, as in Table 2 showing the questions used in the survey to measure each factor. Table 3 shows the resulting correlation coefficients for the significantly correlated factors for each district and the whole sample. In case of being correlated to more than one question measuring the dependent variable or to more than one question defining the independent variable, values with least p-values are indicated.

Table 2: Independent factors significantly correlated to walking to school.

Independent factors	Survey questions
<b>Child factors</b>	
SEX	What is the sex of your child? (0=male, 1=female)
AGE	What is your child age?
ACTIVITY	The likelihood of allowing your child to walk to school if s/he were older (5-scale likert)
	Does your child participate in any activities after school?
KIDPERCP	Where do these activities take place?
	'My child doesn't like to walk to school' (5-scale likert).
<b>Parents/home factors</b>	
DISTANCE	How long does it take you child in his way from school?
	'The distance between our home and the school is short that my child can walk' (5-scale likert)
	It is important 'To my child to live near to his school' (5-scale likert)
PROTECT	Does anyone escort your child to school?
TIMEHH	To where does the adult go after escorting/picking up your child?
	'Commuting my child to/from the school is more comfortable for me/suitable with my schedule' (5-scale likert)
	The likelihood of allowing your child to walk to school if 'it were easy for you to walk your child on your way to work or other places'. (5-scale likert)
KIDMATURE	'I'm worried about my child to have an accident if he is alone' (5-scale likert)
	'I am not sure if my child can make the correct decision in the right timing' (5-scale likert)
SIBLING	It is important 'To my child to learn how to walk or bike to his school'(5-scale likert)
	Number of household members in each of (0-4), (5-8) years old.
	Number of household members in each of (12-17) years old.
GEOPERCEPTION	Number of household members older than 60 years old.
	To what extend do you think that your 'family' will agree with you if you allowed your child to walk to school. (5-scale likert)

FAMILYMODE	How much do you walk in your neighborhood?
LOCALSPACE	What is the maximum distance that you allow your child to walk alone? (in meters)
DRVLICENCE	How many of your household has a driving license?
HHCAROWN	How many cars does your household have?
LONGLIVENH	How long are you living here in your neighborhood?
School factors	
TRVLTIME	How long it takes your child in his way to school?
SCLCHOICE	'I choose for my child the best school regardless its proximity from our home' (5-scale likert)
SCLDAYSTRT	It is important to my child 'to sleep enough more than to walk to his school' (5-scale likert)
ARVREPORT	The likelihood of allowing your child to walk to school if 'there were an early notification of his arrival to school' (5-scale likert)
SCLBAG	The likelihood of allowing your child to walk to school if 'school bag were lighter' (5-scale likert)
Neighborhood factors	
STRANGER	'I'm worried that a stranger or a bully harm my child if he is alone' (5-scale likert) The likelihood of allowing your child to walk to school if 'You neighborhood were safer' (5-scale likert) To which extent do you think that you child is known in your neighborhood?
NEGCULTURE	'I feel worried about my child to pass by a street where young people and youth hang out' (5-scale likert)
TRAFFIC	The likelihood of allowing your child to walk to school if 'he weren't in need to cross crowd with high car speed streets' (5-scale likert)
DRVAWARE	My child has to 'Cross a street wider than 4 traffic lanes' (0=no, 1=yes) My child has to 'Cross/walk in a street with car speed exceeding 30 K/h' (0=no, 1=yes) The likelihood of allowing your child to walk to school if 'Drivers were caring and paying more attention' (5-scale likert)
INFRASTRUCTURE	The likelihood of allowing your child to walk to school if 'The streets were more shaded' (5-scale likert) My child has to 'Cross a street at an intersection with no traffic signs of car calming elements' (0=no, 1=yes) My child has to 'Cross a street at intersection with no white crossing lines' (0=no, 1=yes)
LUDESIRABLE	The likelihood of allowing your child to walk to school if 'Your child hasn't to pass by undesirable uses' (5-scale likert)
Community/city factors	
MEDIA	'I follow up what is said in media, but my decision is not affected by it positively or negatively' (5-scale likert)
SOCTRAP	To what extend do you think that your 'big family/friends' will agree with you if you allowed your child to walk to school. (5-scale likert)

Table 3: Bivariate correlation coefficient comparison of significant factors across the districts

Independent factors		All cases	Dokki	Madinet Nasr	October
Child factors	SEX	-0.308*	-0.633**	-0.056	0.167
	AGE	-0.159	0.360	-0.574**	0.447
	ACTIVITY	-0.444***	0.544		-0.535*
	KIDPERCP	-0.373**	-0.509*	-0.194	-0.248
Parents/home factors	DISTANCE	0.616***	0.393		0.635*
	SCLCHOICE	-0.388**	0.145		0.000
	PROTECT	-0.274*	-0.426	-0.441	
	TIMEHH	-0.494***	-0.692**	-0.676***	-0.455
	KIDMATURE	0.467***	-0.693**	-0.579**	0.417
	SIBLING	0.477***	-1.000***	0.441	0.491
	FAMILYMODE	-0.282*	0.254	-0.554*	-0.355
	LOCALSPACE	-0.143	0.349	0.978**	-0.160
	DRVLICENCE	-0.303*	-0.361	-0.466*	-0.235
	HHCAROWN	-0.308*	0.097	-0.441*	-0.255
	LONGLIVENH	-0.322*	-0.423	-0.563**	0.076
School factors	TRVLTIME	-0.302*	-0.510*	-0.466*	-0.574*
	SCLDAYSTRT	-0.360**	-0.487*	0.136	-0.560*
	ARVREPORT	0.232	0.525*	0.130	-0.242
	SCLBAG	0.352*	0.488*	0.344	0.161
Neighborhood factors	STRANGER	-0.468***		0.523*	0.358
	NEGCULTURE	-0.179		0.222	-0.300
	TRAFFIC	-0.489***	-0.508	0.578**	-1.000***
	DRVAWARE	0.477***	0.382	0.552*	0.452
	INFRASTRUCTURE	-0.656***	-0.484	-0.657**	-1.000***
	LUDESIRABLE	0.174	-0.381	0.511*	-0.171
Community/city factors	MEDIA	0.141	0.359	-0.449*	0.427
	SOCTRAP	0.590***	0.537*	0.513*	0.943***

\* p &lt; 0.05, \*\* p &lt; 0.01, \*\*\* p ≤ 0.001



## 5. Discussion

The analysis of the questionnaire data yielded significant results highlighting characteristics of the environment (both social and physical) over family social and cultural factors as the main factors affecting parents' decisions. The following discussion of the different factors shed light on why only 12.5% of students living within a walkable distance in 6<sup>th</sup> of October practice AST, which is less than half the percentage in Dokki (35.3%) and Madinet Nasr (40.9%). This supports the hypothesis that Cairo's new city extensions are less walkable than the inner districts. More elaboration of the neighborhood factors analyzed will be possible when related to the results of the urban survey that is currently being analyzed in the larger empirical study.

### 5.1. Child factors

Child factors that were found to be significantly related to walking to school were different across the three districts. Whereas Dokki parents allow their sons to walk more than they do for their daughters (SEX), and their decision was found to be related to their children desire whether to walk or not to school (KIDPERCP), the decision of the parents in Madinet Nasr and October was found to be related to the activities their children participate in after school. Parents in both districts were found to allow their children to walk to school more if they participate in an activity after the school time (ACTIVITY). In Madinet Nasr, parents were found to be also concerned about whether the activity takes place in the school, the same neighborhood or elsewhere. As the activities are farther from the school, active travelling to school decreases. (AGE) was not found to be significantly correlated to walking to school in Dokki or October. Surprisingly, older children were less likely to walk to school in the near future in Madinet Nasr. Bivariate correlations showed older children in Madinet Nasr to have siblings younger than 4 years old (coeff.= 1, p-value= 0); the fact that deter parents from accompany elder siblings in AST.

### 5.2. Parent/Home factors

Sibling barriers/facilitators factor (SIBLING) was the only factor found to be significantly associated to walking to school in all of the three districts among parent/home factors. On analyzing all cases, parents reported higher likelihood to allow their children to walk to school if all children in the household or other children in the neighborhood will walk with their child to the same school. However, the three districts were different in case of separate analysis. Younger siblings were barriers and elder siblings were facilitators with 1.000 coefficients (p-values= 0) in Dokki which corroborates the finding in the literature<sup>17</sup>, although this question had a low response rate (38.2%). Sibling barriers/facilitators factor did not show any significance in Madinet Nasr or October.

Parents of non-AST children in Madinet Nasr reported that commuting their children to school is more suitable to them, and parents of AST children reported that allowing their children to walk is more suitable for them. In Dokki, the likelihood of children to walk to school increases if parents could walk with them on their way to work (TIMEHH). However, no significant correlation was found between the parent's schedule and child walking to school in October.

Other than these two factors; sibling and parent schedule, none of the other social factors on the parent/home level were found to be significant except in Madinet Nasr. Children were found to walk more to school if their parents allow them to walk independently for longer distances from home (LOCALSPACE). Also, parents, who normally walk more on a daily base in their neighborhood, reported that their children are more likely to walk in the near future (FAMILYMODE). Madinet Nasr was the only district to show significant correlation between the length of residence in the neighborhood and AST, however this correlation was surprisingly negative, where parents of AST children were newer (LONGLIVENH) in the neighborhood. There was significant correlation between parents who live almost all their lives in the neighborhood and their feeling that their children are known in the street. However, in their notes, some of them explained that other barriers, such as heavy school bags and dangerous intersections, are reasons for non-AST.

Distance (DISTANCE) to school, in agreement with the literature, was found to be an important factor associated to AST in each of Madinet Nasr and October. While the perceived distance was the significant one in October, both perceived and real distances were significantly correlated (p-value<0.01, coeff.= -0.781, p-value= 0;

respectively) to AST in Madinet Nasr. Also, parents of AST children indicated the importance of living near to school more than parents of non-AST children. Interestingly, only in Madinet Nasr, parents of non-AST children reported that they choose for their child the better school regardless of its proximity (SCLCHOICE, coeff.= -0.706, p-value= 0), which indicates that the parents' choice of their children's school affects AST.

Moreover, Madinet Nasr was the only one among the three districts where walking to school increases significantly when car ownership (HHCAROWN) and number of members in the household holding driving licenses (DRVLICENCE) decrease, which supports the findings of previous studies. Also in Madinet Nasr, parents allow their children to walk to school independently when they are less worried about their child being in an traffic accident, whereas in Dokki children are less likely to walk to school when their parents are not sure of the capability of their children to make the correct decision in the right timing (KIDMATURE). In both districts, children are more likely to walk to school when their parents believe that it is important for them to learn how to walk to school. While (KIDMATURE) factor was not found to be significant in October, parental protective culture (PROTECT) was more influential to their decision, where parents feel more comfortable to allow their children to walk to school if they are escorting them; especially mothers, rather than anybody else.

### 5.3. School factors

One of the factors that was also found to be significantly affecting active travelling to school in the three districts is the duration of time a child takes in his/her way to school (TRVLTIME). The shorter the time a child takes in his/her way to school, the higher the frequency of walking to school. This applies in Dokki and Madinet Nasr, but was not significantly related in October. This supports the correlation between distance and AST mentioned in the literature. Although all the cases that were included in the analysis are living within 15-minute walk by an adult from school, 50% of non-AST children travel to school in more than 20 minutes, while only 11% of AST children take that long. In addition, Dokki parents are more likely to allow their children to walk to school in case that they are notified of their children arrival to school (ARVREPORT). Light school bag (SCLBAG) was an important factor reported by Dokki parents to increase the likelihood of allowing their children to walk to school. Although not being significant in Madinet Nasr, some parents highlighted it as a main barrier to walking to school.

### 5.4. Neighborhood factors

Generally, these factors can be classified into two groups: traffic danger and stranger danger. The three districts were found to be different. While stranger danger was significantly affecting walking to school in Dokki, traffic danger was the influencing factor in October. On the other hand, Madinet Nasr child AST was affected significantly by both factors.

In Dokki, parents allow their children to walk to school when they are less concerned about their child to pass by a street where young people and youth hang out (NEGCULTURE). Also, strangers and hustlers who may harm the child (STRANGER) were considered by parents as barriers to allowing their children to walk to school. On the other hand, parents were found to be more likely to allow their children to walk to school if they thought that themselves and their child are known to people on the street and that people may notify him/her in case his/her child was harmed.

In October, strong correlation (coeff.= -1, p-value = 0) was found between AST and walking or crossing streets with speed limits above 30 km/h (TRAFFIC), and intersections with no white crossing lines (INFRASTRUCTURE). Children are non-AST if they have to pass by any of these street features.

In Madinet Nasr as previously mentioned, traffic danger and stranger danger are both important factors affecting parents' decision. Parents are more likely to allow their children to walk to school if they are less worried about a stranger or a hustler harming their child if s/he is alone (STRANGER). Besides, the frequency of children active travel to school increases if they do not have to pass by undesirable uses (LUDESIRABLE). In addition, perceived safe neighbourhood is positively associated to walking to school (STRANGER). On the other hand, walking to school was found to be negatively associated with the necessity to cross crowded high-speed streets, or streets wider than 4 traffic lanes (TRAFFIC), or intersections with no traffic signs or car calming elements or white crossing lines (INFRASTRUCTURE). Parents likelihood to allow their children to walk to school increases with more shaded

streets (INFRASTRUCTURE) and if drivers were more aware and paying more attention to children walking independently (DRVAWARE).

These findings highlight important issues that may deepen the understanding of Greater Cairo urban trends. First, residential activities in inner districts; represented here by Dokki, begin to be replaced by time by other activities that make it more visited by strangers and increasingly crowded. This resulted in less traffic danger as the highly crowded streets were enough to calm down speed. However, the presence of more strangers continuously in the area make parents more worried about their children independent mobility. On the other hand, the new cities; represented here by October, were planned to have wide streets with low residential density, the fact that leads to less cars on the streets, yet increasing the car speed. Its planning depends on the segregation between land uses, and the few ground floor commercial uses that have begun recently to appear, do not attract many visitors, yet it has the lowest rate of AST which may be attributed to its car-oriented planning. Between those two types, Madinet Nasr represents the peripheral extensions of the city that by time began to be an inner district. Although having the highest AST (40.9%) among the districts (Dokki= 35.3%, October= 12.5%), parents perceived both dangers of traffic and stranger.

### 5.5. Community factors

Social traps (SOCTRAP) and how family and friends would think about a parent if he allowed his/her child to walk to school were found to be positively associated with the likelihood that parents allow their children to walk to school. Where parents in Dokki and October were more affected by their friends' opinion, Madinet Nasr parents were more concerned by their families' opinion.

## 6. Limitations and suggestions

The results of this study, limited to questionnaire results, are indicative and require further work to verify their reliability. Although the study included a school in each of the three districts, results still cannot be generalized to the entire district. Each of the districts has areas that can be walkable and others that may not be so. Ideally, the study attempted to include three schools in each districts for more reliable sample, however many schools did not permit the researchers to carry out the study there in spite of having their names in the permissions. Thus, it is suggested that this research should be conducted at a wider scale in many other schools under the umbrella of the Ministry of Education as part of the quality program for the schools, and its results should then guide the development of new urban settlements.

## 7. Conclusion

Family demographics had some minor influences such as families with younger children seemed to practice less AST for their older children, and social and cultural influences did not seem to matter much. Type of school seemed to be an increasingly influential factor more than distance from home probably because of the increased diversity in school types. Social and physical characteristics related to possible dangers along the route to schools were found to be the most influential factors in all three districts despite the variations among the districts in the source of danger; traffic-related or crowding and stranger-related. Even in Madinet Nasr where walking to school percentages are highest, significant correlations exists between both dangers and walking to school. This suggests that actions towards enhancing AST lies within the design and planning of residential districts and should be addressed as one of the design objectives in both new developments as well as in the upgrading of existing districts.

## References

1. Gleeson B, Sipe N. Reinstating kids in the city. In Gleeson B, Sipe N. *Creating child friendly cities: Reinstating kids in the city*. Newyork: Routledge; 2006. p. 1-10.
2. Freeman C. Colliding worlds: planning with children and young people for better cities. In Gleeson B, Sipe N. *Creating child friendly cities: Reinstating kids in the city*. New York: Routledge; 2006. p. 69-85.
3. Holloway SL, Valentine G. Children's geographies: playing, living, learning. In Holloway SL, Valentine G. *Children's Geographies and the New Social Studies of Childhood*. New York: Routledge; 2000.