

**CHILDREN’S ACTIVE COMMUTING TO
SCHOOLS IN DIFFERENT NEIGHBOURHOODS:
DESIGN OF STREETS AS CHILD FRIENDLY
ENVIRONMENTS**

**A Thesis Submitted to
the Graduate School of Engineering and Sciences of
İzmir Institute of Technology
in Partial Fulfillment of the Requirements for the Degree of**

MASTER OF SCIENCE

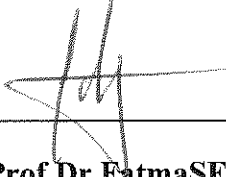
in Urban Design

**by
Gülce ABATAY**

**July 2019
İZMİR**

We approve the thesis of **Gülce ABATAY**

Examining Committee Members:



Assoc. Prof. Dr. Fatma ŞENOL

Department of City and Regional Planning, İzmir Institute of Technology



Assoc. Prof. Dr. H. Engin DURAN

Department of City and Regional Planning, İzmir Institute of Technology



Asst. Prof. Dr. Ayşe GÖNÜLLÜ ATAKAN

Department of Sociology, Manisa Celal Bayar University

18 July 2019



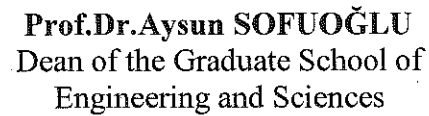
Assoc. Prof. Dr. Fatma ŞENOL

Supervisor, Department of
City and Regional Planning,
İzmir Institute of Technology



Assoc. Prof. Dr. A. Can DEMİRKESEN

Head of the Department of
City and Regional Planning



Prof. Dr. Aysun SOFUOĞLU
Dean of the Graduate School of
Engineering and Sciences

ACKNOWLEDGMENTS

I would like to express my deepest gratitude to my supervisor Assoc. Prof. Dr. Fatma Şenol for her constant support, excellent guidance, critical feedbacks, encouragement and patience throughout my study. Without her precious support it would not be possible to conduct this research. I would also like to thank my committee member Assoc. Prof. Dr. Hasan Engin Duran for his guidance and support for this study and Asst. Prof. Dr. Ayşe Gönüllü Atakan for her contribution to final version of the thesis.

Nevertheless, I am grateful to all children and parents who participated in questionnaire studies in Doktor Cavit Özyeğin Primary School and Kars Halil Atila Primary School. Also, I would offer my special thanks to all teachers and administrative staffs in Doktor Cavit Özyeğin Primary School and Kars Halil Atila Primary School for their help and patience during my questionnaire study.

I wish to express my special thanks to my dear friends Seda Atak and Elifcan Özyıldırım for their emotional companion and love. Also, I would like to offer my special thanks to my dear friend and home mate Gökce Gökçen for her motivation and encouragement since the beginning of my study. Besides, I would like to offer my special thanks to Barış Utku Şentürk for his valuable technical help and endless support.

Last but not least, I offer my deepest thanks to my dear family Caner Abatay, Yurdağül Abatay, Selin Abatay, Ezgi Abatay Kartav and Osman Kartav for their existence, endless love and support.

ABSTRACT

CHILDREN'S ACTIVE COMMUTING TO SCHOOLS IN DIFFERENT NEIGHBOURHOODS: DESIGN OF STREETS AS CHILD FRIENDLY ENVIRONMENTS

The study examines the factors that affect the 8-11 years old primary school students' commute to school by using active transportation modes (i.e., walking and bicycling). Active commuting to school is promoted for children as the main opportunity for children's physical activity for their physical and even mental health. However, in recent years there has been a significant decrease in the number of children who engage in physical activity in many parts of the world including Turkey. As a result of rapid urbanization, decreasing number of open spaces in urban areas and also increasing level of car ownership are seen as the main reasons for children's passive lifestyles. One of the easiest and most practical ways to adopt physical activity in children's daily life is to enable children to commute to their school by walking or bicycling. On the other hand, although there are increasing number of studies abroad, there is an important literature gap about the factors affecting children's active commuting to school in Turkey. Besides multiple social factors (such as parents' concerns about the safety of their children) children's perceptions about physical characteristics of the built environment (such as land use and vehicular traffic) are some of the significant factors shaping travel mode of children to school. The aim of this study is to identify the social and physical factors that affect mode choice of children's commuting to their school while examining children's and their parents' experiences and expectations about the built environment. Developing as a study about 8-11 years old primary school students in two schools of two neighbourhoods in Bornova/Izmir, this thesis deploys fields observations and majorly user surveys with these children and their parents about their experiences of commuting to school. Finally, it develops recommendations and strategies for the physical design of the streets for children to use active transportation opportunities.

ÖZET

ÇOCUKLARIN FARKLI MAHALLELERDEKİ OKULLARA AKTİF GİDİŞ-GELİŞİ: SOKAKLARIN ÇOCUK DOSTU ÇEVRELER OLARAK TASARIMI

Araştırma 8-11 yaşındaki ilk öğretim öğrencilerinin okula aktif bir şekilde (yürüyerek veya bisikletle) gidip gelmesini etkileyen faktörleri incelemektedir. Çocukların fiziksel ve zihinsel sağlıkları için okula aktif bir şekilde gidip gelmeleri fiziksel aktivitelerinin temel fırsatı olarak teşvik edilmektedir. Fakat, son yıllarda Türkiye dahil olmak üzere dünyanın pek çok yerinde fiziksel aktivite yapan çocuk sayısında önemli bir düşüş gözlemlenmektedir. Hızlı kentleşmenin bir sonucu olarak, kentsel mekanlardaki açık alanların azalması ve araç sahipliğindeki artış, çocukların pasif yaşam tarzlarını sürdürmelerinin nedenleri olarak görülmektedir. Çocukların hayatında fiziksel aktivitenin bir günlük yaşam aktivitesi olarak benimsenmesinin en kolay ve uygulanabilir yolu çocukların okula gidip gelmelerinde aktif olmalarıdır. Öte yandan, bu konuda yurtdışında bir çok sayıda çalışma olmasına rağmen, Türkiye'de çocukların okula aktif bir şekilde gidip gelmelerini etkileyen faktörler hakkında önemli bir literatür açığı bulunmaktadır. Bir çok sosyal faktörün yanı sıra (ebeveynlerin çocuklarının güvenlikleri ile ilgili endişeleri gibi) çocukların yapıları çevrenin fiziksel özelliklerine ilişkin algıları (arazi kullanımı ve araç trafiği gibi) çocukların okula gidip gelirken kullandığı seyahat modlarını şekillendiren önemli faktörlerden bazılarıdır. Bu çalışmanın amacı, çocukların ve ebeveynlerinin yapıları çevreye ilişkin deneyimlerini ve beklentilerini incelerken, çocukların okula gidip gelirken kullandığı ulaşım modlarını etkileyen sosyal ve fiziksel faktörleri belirlemektir. Bornova / İzmir'de iki mahallenin iki ilkokulunda 8-11 yaşındaki ilk öğretim öğrencileri hakkında bir araştırma olarak geliştirilen bu tez, alan gözlemleri ve büyük ölçüde çocuklar ve ebeveynlerinin okula gidip gelme deneyimleri hakkında kullanıcı anketleri sunmaktadır. Son olarak, çocukların aktif ulaşım fırsatlarını kullanmaları için sokakların fiziksel tasarımına dair öneriler ve stratejiler geliştirmektedir.

“If we want children to flourish, to become truly empowered, then let us allow them to love the earth before we ask them to save it.”

David Sobel

TABLE OF CONTENTS

LIST OF FIGURES	x
LIST OF TABLES	xiii
CHAPTER 1. INTRODUCTION	1
1.1. Problem Definition.....	1
1.2. Aim of the Study	3
1.3. Methodology and Study Site.....	5
1.4. Structure of Study	5
CHAPTER 2. CHILDREN AND BUILT ENVIRONMENT	7
2.1. Definitions of Childhood	7
2.3. Children in Built Environment	12
2.3.1. Children’s Independent Mobility in Built Environment.....	14
2.4. Summary	17
CHAPTER 3. FACTORS AFFECTING CHILDREN’S ACTIVE COMMUTING TO SCHOOL.....	18
3.1. Social Factors.....	19
3.1.1. Parental Features	19
3.1.3. Children Related Features.....	21
3.2. Built Environment Related Factors.....	21
3.2.1. Distance Between Home and School.....	22
3.2.2. Vehicular Traffic.....	23
3.2.3. Sidewalks and Bikeways	23
3.2.4. Aesthetical Features	24
3.2.5. Sense of Safety.....	24
3.2.6. Land Use and Population Density	25

3.3. Summary	26
CHAPTER 4. URBAN DESIGN CASE STUDIES TO IMPROVE CHILDREN'S ACTIVE COMMUTING TO SCHOOLS	29
4.1. Streets Ahead Project.....	30
4.2. Kindlint	32
4.3. Safe Routes to School Programme	33
4.4. Hackney Play Streets Project.....	35
4.5. Holland's Woonerf	35
4.6. London Play's Home Zone	38
4.7. Summary.....	40
CHAPTER 5. METHODOLOGY AND STUDY SITES	41
5.1. Study Methods for Data Collection	41
5.1.1. Built Environment Data	42
5.1.2. Social Environment Data	42
5.2. Data Analysis.....	45
5.3. The Study Site.....	48
5.3.1. Doktor Cavit Özyeğin Primary School	55
5.3.2. Kars Halil Atila Primary School	57
CHAPTER 6. CHILDREN'S COMMUTING PATTERNS TO SCHOOLS IN BORNOVA: NEIGHBOURHOODS' AND RESPONDENTS' CHARACTERISTICS	61
6.1. Neighbourhood Characteristics of Two Schools	61
6.2. Study Respondents' Characteristics and Children's Commuting Patterns to School.....	65
6.4. Summary.....	82
CHAPTER 7. PERCEIVED RISK FACTORS AND EXPECTATIONS ABOUT SCHOOL SURROUNDINGS IN BORNOVA	84

7.1. Children’s and Their Parents’ Perceived Risk Factors About School Surroundings	84
7.2. Children’s and Their Parents’ Expectations from the Immediate Built Environment of Schools.....	92
7.3. Summary.....	98
CHAPTER 8. CONCLUSION AND RECOMMENDATIONS	100
REFERENCES	106
APPENDICES	
APPENDIX A. SURVEY QUESTIONS FOR CHILDREN	114
APPENDIX B. “DRAW-AND-WRITE” SURVEY FOR CHILDREN	117
APPENDIX C. SURVEY QUESTIONS FOR PARENTS	119
APPENDIX D. PHYSICAL ENVIRONMENT OBSERVATION CHECKLIST.....	125

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
Figure 1. 1. Conceptual Model of Study Approach About the Factors for Children's Active School Travel	3
Figure 4. 1. Pedestrian Crossing Improvements in the Street.....	31
Figure 4. 2. Children and Parents in a Shared Street	31
Figure 4. 3. A Kindly (Child Route) Plan.....	32
Figure 4. 4. Children Painting the Stones on the Child Route.....	33
Figure 4. 5. A Crossing Implementation to Slow Traffic	34
Figure 4. 6. An Implementation to Buffer Bike Lane.....	34
Figure 4. 7. A Blocked Road Outside of School	36
Figure 4. 8. Children Playing in the Blocked Street	37
Figure 4. 9. An example of Woonerf Street.....	37
Figure 4. 10. An example of Woonerf Street.....	38
Figure 4. 11. An Example of "Home Zone"	39
Figure 4. 12. An Example of "Home Zone"	39
Figure 5. 1. Location of Bornova in Izmir Province.....	49
Figure 5. 2. Boundaries of Erzene and Evka-3 Neighbourhoods and Selected Schools	49
Figure 5. 3. Education and Neighbourhood Park Areas in Erzene and Evka-3 Neighbourhood	50
Figure 5. 4. Slope Analysis Around the Selected Schools.....	51
Figure 5. 5. Land Use Analysis Around the Selected Schools	52
Figure 5. 6. Cengizhan Street and Parking Lot Near the School	55
Figure 5. 7. Land use analysis of Doktor Cavit Özyeğin Primary School.....	56
Figure 5. 8. Playground Area Near Doktor Cavit Özyeğin Primary School	57
Figure 5. 9. Park Area Near Kars Halil Atilla Primary School.....	58
Figure 5. 10. Land use analysis of Kars Halil Atilla Primary School.....	59
Figure 5. 11. Cumhuriyet Square.....	60
Figure 5. 12. "I Love Bornova" Sculpture	60
Figure 6. 1. Streets That Are Scored According to Built Environment Characteristics Around DCÖ	62

<u>Figure</u>	<u>Page</u>
Figure 6. 2. Streets That Are Scored According to Built Environment Characteristics Around KHA	62
Figure 6. 3. Most Used Streets Around Schools by Children.....	63
Figure 6. 4. Gender of the Children in DCÖ and KHA	67
Figure 6. 5. Age of the Children in DCÖ and KHA	68
Figure 6. 6. Distances Between Children’s Home and School.....	69
Figure 6. 7. Children’s Mode of School Travel According to School Among All Respondents.....	70
Figure 6. 8. Children’s Mode of School Travel According to Gender Among All Respondents.....	70
Figure 6. 9. Children’s Mode of School Travel According to Age	71
Figure 6. 10. Children’s Independent School Travel in DCÖ and KHA.....	72
Figure 6. 11. Children’s Independent School Travel According to Gender	72
Figure 6. 12. Children’s Independent School Travel According to Age	73
Figure 6. 13. Car Ownership in DCÖ and KHA.....	74
Figure 6. 14. Parent’s Outdoor Public Space Use Behaviour.....	76
Figure 6. 15. Parents Who Say "Absolutely I Agree" to the Statements	77
Figure 6. 16. Parents’ Answers to the Statement "My child is big enough to go to school by walking or cycling" According to Their Children’s Age	77
Figure 6. 17. Parents’ Answers to the Statement "My child is big enough to go to school by walking or cycling" According to Their Children’s Gender.....	78
Figure 6. 18. Places in Which Children Have Permission to Go Alone.....	79
Figure 6. 19. Places in Which Children Have Permission to Go Alone According to Children’s School	80
Figure 6. 20. Places in Which Children Have Permission to Go Alone According to Children’s Gender	81
Figure 6. 21. Places in Which Children Have Permission to Go Alone According to Children’s Age.....	81
Figure 7. 1. Parents’ Answers to the Statement "I think my neighbourhood is safe enough for my child to go to school by bicycling or walking alone" According to Their Children’s School	85

<u>Figure</u>	<u>Page</u>
Figure 7. 2. Parents' Answers to the Statement "I think my neighbourhood is safe enough for my child to go to school by bicycling or walking alone" According to Their Children's Age	85
Figure 7. 3. Parents' Answers to the Statement "I think my neighbourhood is safe enough for my child to go to school by bicycling or walking alone" According to Their Children's Gender	86
Figure 7. 4. Perceived Risk Factors for Parents and Children in DCÖ	87
Figure 7. 5. Perceived Risk Factors for Parents and Children in KHA	87
Figure 7. 6. Parent's Concerns About Their Children's Active School Travel in DCÖ and KHA.....	88
Figure 7. 7. Parent's Concerns About Their Children's Active School Travel According to Children's Age.....	89
Figure 7. 8. Parent's Concerns About Their Children's Active School Travel According to Children's Gender.....	89
Figure 7. 9. Children's Fears About Active Travel to School in DCÖ and KHA	91
Figure 7. 10. Children's Fears About Active Travel to School According to Age	91
Figure 7. 11. Children's Fears About Active Travel to School According to Gender ...	92
Figure 7. 12. Parent's Expectations on Safe School Environments.....	93
Figure 7. 13. Parent's Expectations on Safe School Environments in DCÖ and KHA	94
Figure 7. 14. Children's Expectations on Safe School Environments.....	95
Figure 7. 15. Children's Expectations on Safe School Environments in DCÖ and KHA	96
Figure 7. 16. Children's Expectations on Safe School Environments According to Age	97
Figure 7. 17. Children's Expectations on Safe School Environments According to Gender	98
Figure B. 1. Sketch for Students in Doktor Cavit Özyeğin Primary School	118
Figure B. 2. Sketch for Students in Kars Halil Atıla Primary School	118
Figure C. 1. Map for Parents of Students in Doktor Cavit Özyeğin Primary School...	123
Figure C. 2. Map for Parents of Students in Kars Halil Atıla Primary School.....	124

LIST OF TABLES

<u>Table</u>	<u>Page</u>
Table 3. 1. Influential Social Factors For Children’s Travel Mode To School And Expected Influence On Walking To School	27
Table 3. 2. Influential Physical Factors For Children’s Travel Mode To School And Expected Influence On Walking To School	28
Table 5. 1. Variables used for regression analysis at this study	46
Table 5. 2. Variables collected at site observations for the analysis of built environment	47
Table 6. 1. Scores of Built Environment Features Around DCÖ and KHA.....	64
Table 6. 2. Results of the Regression Model	66
Table 6. 3. Characteristics of the Children	67
Table 6. 4. Expected Influential Factors Which Affect Children’s Commuting Patterns to School and Findings of This Study	83
Table D. 1. Physical Environment Observation Checklist.....	125

CHAPTER 1

INTRODUCTION

1.1. Problem Definition

This thesis examines the factors that affect primary school student's active commuting to school in the case of two schools of two neighbourhoods in Bornova/Izmir. Active commuting to school is promoted for children to be physically and mentally healthy. This thesis assumes that the promotion of physical activity in childhood is essential. Physical activity provides a number of significant benefits for children, including improved physical and mental health. Risk factors for cardiovascular problems and obesity begin in childhood and last to adolescence (McGill, 2000; Boreham and Riddoch, 2001). Children who regularly engage in physical activity have less chronic diseases (Boreham and Riddoch, 2001; Biddle et al., 2004), have more psychological health (Biddle et al., 2004) and be more active in their adolescence and adulthood periods (Malina, 1996). This study argues that policies related to the built environment especially urban design implementations that encourage more active lifestyles can enable children to reach a healthy life.

Accordingly, over the years, the number of children who regularly engage in physical activity is decreasing rapidly (National Physical Activity Plan Alliance, 2016; Cavill et al., 2006; Republic of Turkey Ministry of Health, 2014). Only 21.6% of 6 to 19-year-old children and adolescents in the United States attain 60 or more minutes of physical activity on at least 5 days per week (National Physical Activity Plan Alliance, 2016). In Europe, in 2006, only one-third of school children are reported to comply with recommended physical activity duration which is 60 or more minutes per day (Cavill et al., 2006). In addition, According to the report titled "Turkey Nutrition and Health Survey 2010" 65.8% of 6-8 years old children, 52.7% of 9-11 years old children, 56.2% of 12-14 years old adolescents and 57.8% of 15-18 years old adolescents do not have any physical activity regularly in Turkey (Republic of Turkey Ministry of Health, 2014).

Active commuting to school is one of the affordable and applicable way for children to achieve being physically active. In this way, children can participate in physical activity as a part of their daily lives. Although there are a few of studies that have not found a correlation between physical activity level and active commuting to the school (Metcalf et al., 2004), a large number of studies show that children who commute to school by walking or bicycling tend to be more active in their daily life than those who do not (Cooper et al., 2003; Lee et al., 2008; Ozdemir and Yilmaz, 2008; Rosenberg et al., 2006). For example, according to Cooper's study (2003), children who walk to school (65%) are significantly more active than those who travel by car. Likewise, Rosenberg (2006) tells that students who actively commute to school have a lower body mass index than non-active commuters to school. Supportively, Lee (2008) examines the results of 18 different studies about active commuting to school and levels of physical activity, weight, and obesity in children and it tells that 15 of 18 studies have a positive relationship between active commuting to school and total physical activity degrees.

Although nowadays benefits of active commuting to school is a popular subject, especially in studies abroad, the percentage of children who commute to school by walking and bicycling decline (McDonald, 2006; Salmon et al., 2005; Sturm, 2005). Salmon's (2005) study indicates that the frequency of walking and cycling to school and from school has declined steadily from 1985 to 2001 in Melbourne, Australia. Also Sturm (2005) points out that the percentage of walking to school among the U.S. children aged 5 to 15 years has declined between 1977 and 1990. Therefore, the low amount of this sustainable and affordable model of physical activity at a period of non-active childhood is an important health issue that has to be solved. On the other hand, there is an important literature gap about the factors affecting children's active commuting to school in Turkish cities. Factors that influence walking to and from school among children in Turkey require further investigation. Also, there is limited evidence to guide policy and urban design interventions in Turkey to encourage children walking to and from school among children in Turkey.

Among the major factors shaping the conditions for children's active commuting to school, many studies emphasize parental attitudes and their influence on children's travel behaviour (Salmon et al., 2007; Timperio et al., 2004). On the other hand, children's perception of their environment is studied less and mostly not seen as

important as much as parents' perception of the built environment. Banerjee et al. (2014) point out that while parents' perception of their built environment is highly negative, children's view about their environment is not. In other word, children and their parents mostly have not a similar view about their environment, whereas the perception of children about the environment needs to be investigated more. Accordingly, this study makes an important contribution to the literature in terms of referring to children's perceptions and expectations about physical environment design.

1.2. Aim of the Study

The aim of this study is to identify the social and physical factors that affect travel mode choice of children's commuting to their school while examining children's and their parents' experiences and expectations about the built environment. Figure 1.1 shows the main approach of this study about the factors affecting children's tendency to walk to school.

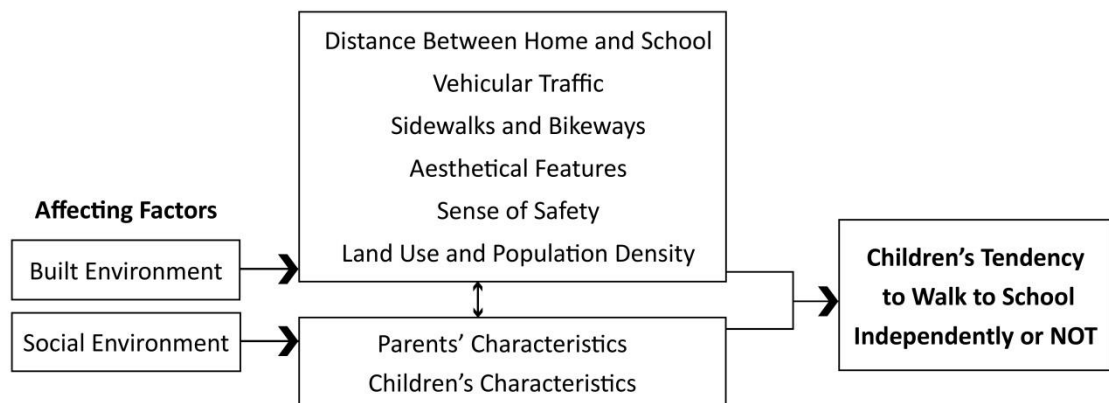


Figure 1. 1. Conceptual Model of Study Approach About the Factors for Children's Active School Travel

As urban designers, if we consider developing policies for children's active use of the environment, first we need to know affecting factors of it and children's perceptions

about their environment as individuals. In accordance with this purpose, the following questions will guide this research about the factors shaping children's active commuting to school:

- What kind of physical and social environment characteristics affect children's active travel to school?
 - Physical environment factors
 - Shorter distance between home and school may increase children's tendency to walk to school.
 - Improvements in vehicular traffic such as traffic calming measures and safe crossings may increase children's tendency to walk to school.
 - Improvements in the quality and width of sidewalks and bikeways may increase children's tendency to walk to school.
 - Improvements in aesthetical features such as well-maintained buildings, trees and plants, cleanness of the built environment may increase children's tendency to walk to school.
 - Children's and parents' safety perceptions about the built environment may affect children's tendency to walk to school.
 - Land use and population density of the environment may affect children's tendency to walk to school.
 - Social environment factors
 - Parental features such as socio-economic characteristics of the household may affect children's tendency to walk to school.
 - Children features such as children's gender and age may affect children's tendency to walk to school.
- What are the differences between children's and parents' perceptions and expectations about about the built environment?
 - Parents' and children's perceptions about the built environment are different. Because, physically and socially, children and adults have different needs and expectations about the built environment.
- How to improve children's active mobility to schools by urban design implementations?

- Improvements in the built environment such as sidewalks and bikeways, vehicular traffic and aesthetical improvements may increase children's tendency to walk to school.

Through these questions my hypotheses are; a) As well as socio-demographic characteristics of the household and children's characteristics, physical characteristics of the built environment affect children's active commuting to school. b) Moreover, physical and social factors interrelate to each other in children's active commuting to school. They both affect the children's and parents' perceptions about the built environment interrelatedly. c) Children's and parent's perception about the built environment are different and it is clear that the associations between the physical environment and physical activity among adults are not feasible to children.

1.3. Methodology and Study Site

With this study, children who are in primary school around 8-11 ages in Doktor Cavit Özyeğin Primary School in Evka-3 neighbourhood and Kars Halil Atilla Primary School in Erzene neighbourhood in Bornova / Izmir are examined to investigate the factors that affect those children's active and independent commuting to school. Within this context, three methods employed to examine these factors. First, to examine the immediate built environment of the schools, site observations are employed. Then, to examine children's and parents' experiences and expectations about the immediate environment of schools, questionnaire studies with children and parents are employed.

1.4. Structure of Study

This thesis examines the factors that affect primary school student's active commuting to school in the case of two schools of two neighbourhoods in Bornova/Izmir. Chapter 2 details the definitions of childhood in terms of biological, psychological, sociological and legal aspects. After that, it explains the concept of children, especially in Turkey. It also studies the association between children and the

built environment and finally children's independent mobility without the supervision of adults (especially parents) in the built environment.

Chapter 3 details the extensive literature about the factors affect children's active commuting to school under the titles of physical and social environment factors.

Chapter 4 discusses a number of urban design implementations in order to encourage children to be active especially in their travel to school. After that, it evaluates successful implementations of each project according to built environment features such as vehicular traffic, sidewalks and bikeways, aesthetical features, sense of safety and land use features.

Chapter 5 shows the methods that are used to collect the data for this research and the general context of the study site in respects to its location, geography and physical structure.

Chapter 6 deals the results of the site observation about the immediate surroundings of schools and results of parents' and children's questionnaire studies. It discusses children's features, socio-economic features of the household and neighbourhood features and their associations between children's tendency to active commuting to school.

Chapter 7 compares children's and parents' perceptions and expectations about the immediate environment of schools according to answers of questionnaire studies. After that, it discusses actual and perceived risk factors for children's active commuting to school according to field observation and results of questionnaire studies.

Chapter 8 is the last chapter. This chapter includes recommendations about encouraging children to walk to school with several urban design implementations. It presents these recommendations by taking into account children's own expectations and physical characteristics of the built environment and taking inspiration from the successful urban design implementations.

CHAPTER 2

CHILDREN AND BUILT ENVIRONMENT

To understand the association between children and the built environment, we need to examine the concept of childhood and children's needs. The quality of the physical environment can affect children's health both negatively or positively (Cummins and Jackson, 2001). Children need to be active in the built environment in order to be healthy in terms of physical and mental. Therefore the relation between children and built environment is quite significant and need to be examined.

This chapter focuses on biological, psychological, sociological and legal definitions of childhood as well as the concepts and the stages of childhood. After that, it aims to discuss children's mobility in the built environment and their limitations.

2.1. Definitions of Childhood

Biologically, a child is a person between infancy and adolescence, or the period of human development from infancy to adolescence (Rathus, 2013). The physical development characteristics of the child vary according to the age groups (Fişek and Yıldırım, 1983).

- Children from birth to 1-year-old: They spend most of their time with orientation. They can stand up by themselves and walk when held by both hands. They could imitate a sound, learn to say two or three words, understand a short command or prohibition. They explore the world; start to look at and touch everything. They participate fully in playing games with adults (Fişek and Yıldırım, 1983).
- Children from 1 to 2 years old: They walk by themselves and discover their surroundings. They can bring two words together and enrich their vocabulary. They show interest in the movement and behaviour of adults and try to imitate

them. They start to show interest in other children and want to play with them, but this play is very personal (Fişek and Yıldırım, 1983).

- Children from 2 to 3 years old: They can jump and climb. They develop their language, start to ask questions, understand most words and sentences. They start playing with other children and realize that a world exists outside his family (Fişek and Yıldırım, 1983).
- Children from 3 to 4 years of age: They can wander on their own and visit neighbours. They can tell their name, sex and age. They play with the other children and start sharing the objects (Fişek and Yıldırım, 1983).
- Children from 4 to 5 years old: They can bounce, ride on a swing and use the types of equipment in playgrounds on their own. They start to show interest in the activities of adults (Fişek and Yıldırım, 1983).
- Children from 5 to 6 years old: They know climbing the tree and dancing according to music. They start to be interested in activities in and around the house. They can create games and change rules when playing (Fişek and Yıldırım, 1983).
- Children from 6 years to 12 years old: They have a continuous change in the body, and therefore, the progression of motor skills are the most prominent features of this age group. Children's controls on their bodies increase, and they can sit for a long time, focus and maintain their attention. Regular exercise is essential at this age. Motor movements of these children are more regular and have coordination. Running, climbing, swimming, cycling, slipping are just a few of the physical skills that primary school children can do (Fişek and Yıldırım, 1983).
- Children from 12 to 18 years old: In adolescence, increase in height and weight are significant at this age group. Growth for boys and girls starts at different times. On average, girls start to grow two years ago and complete the growth process earlier than the boys (Fişek and Yıldırım, 1983).

On the other hand, children's psychological development is explained by Jean Piaget who is a psychologist. Piaget states that children's cognitive development is completed during the period of childhood (Çanakçıoğlu, 2012). This theory is accepted as the predominant understanding of children and a universal idea which assumes a biological and social stage of children from infancy to adolescent (Çanakçıoğlu, 2012).

Before Piaget's theory, children are often considered as adults. Instead, Piaget implied that the way of children thinking is substantially different from the way that adults thinking. According to theory of cognitive development by Piaget, childhood includes four stages: sensorimotor stage which include birth to 2 years, preoperational stage which include ages 2 to 7, concrete operational stage which include ages 7 to 11, formal operational stage which include age 12 or more (Piaget, 1954).

Sensorimotor stage is a process that continues to evolve with the participation of perception and dynamic activities for a new-born child and continues until the appearance of speech and symbolic images. The child cannot grasp the perceptual continuity of the objects due to the lack of coordination between the spaces and the comprehension. Preoperational stage is a process that a large amount of children perceive the environment in general and try to integrate objects and concepts that are not related to each other without considering the details. Concrete operational stage constitutes a turning point in terms of the child's cognitive development; children start to think logically, and establish a more holistic relationship with their environment. According to Piaget, children at this stage are capable of processing the information they schematized in their mind depending on the action, sensation and movement. On average, 12-year-old children enter the formal operational stage. At this stage, they have been able to understand personal and abstract interpretations expressed by concrete concepts. Beginning from the age of 7-8 years, with increasing socialization, they start to enter into debates at the level of expressing their own perceptions and they have a more critical attitude towards the social environment and standards in which they are involved (Çanakçıoğlu, 2012).

Moreover, children's social and legal status has changed by time. According to O'Brien (2000), children's place in society is acknowledged towards the end of the 20th century both socially and legally. In the book "The State Of The World's Children " (2005) UNICEF explains changing images about childhood by time. Accordingly, in 1919 thanks to the "Save the Children Fund", thoughts about children have begun. This fund concern about the post-war poverty of a large number of children around Europe. Later the name of the fund change and become the International Union for Child Welfare. In 1924, the Union initiated children's rights in terms of physical and social development and they helped children when they have a sickness, disables or hungry; also when they have economic exploitation or freedom problems or they need

upbringing as a social agent in the society. In 1989, The UN General Assembly approved the Convention on the Rights of the Child. The United Nations Convention on the Rights of the Child, in 1989, characterised a 'child' as an individual beneath the age of 18, except if the laws of a specific country determine the legal age for adulthood youthful (United Nations General Assembly, 1989). The Convention is the leading worldwide human rights agreement to unite all worldwide standards of arrangements concerning kids under the same roof, and the first to introduce child rights as a legal obligation. The World Summit for Children was arranged in New York in 1990 and delegates from several states and governments participated. The leaders signed the "World Declaration on the Survival, Protection and Development of Children" along with an action plan for implementing the declaration by the year 2000. By the 2000's The UN General Assembly arranged a special session for children, and met for the first time to specifically discuss children's problems. Over a hundred children participated in the session as delegate members. Finally, with the "Convention on the Rights of the Child ", all countries of the world have recognized the existence of economic, civil, political and social rights of the children and have promised to fulfil their requirements at the national level (Kirazoğlu, 2012). After these developments about children rights, at present, children start to be seen as an individual agent of the society.

In parallel with the western world, the start of the developments related to child law in Turkey is the 20th century (Kirazoğlu, 2012). At that time, regulations concerning children is published, and children in challenging conditions are helped with services through charitable foundations. Significant developments in children's rights, especially place in the Republic period. Unlike other legal systems, the rules for the protection of children in the Turkish Legal System are supported directly by laws (Kirazoğlu, 2012). Turkey signs the UN Convention on the Rights of the Child in 1990, and then it is approved in 1995 (UNICEF, 2011). Parallel to the UN Convention on the Rights of the Child, all boys and girls up to 18 years old are regarded as a child in Turkey (UNICEF, 2011). According to the rights of children in Turkey, every child has the right to protection and care and to have a personal and direct relationship with his / her parents. Besides, the State has been obliged to take preventive measures against children against all forms of abuse and violence. (UNICEF, 2011).

The Convention identifies "childhood" as separated from adulthood and legitimised that what is suitable for adults may not be convenient for children. After

that, the Convention ask for governments to supply substantive assistance for children and promote families to protect children from being separated from their parents. The Convention recognises that children have their rights, and they are not passive agents of charities but authorised actors in their development (United Nations General Assembly, 1989). In the report named "The State of the World's Children: Childhood Under Treat", UNICEF (2005) defines childhood as the period for a child to be in school and in play, to grow self-sufficient with the support of their family and the community consisting of adults. It is a valuable period in which a child should live away from fear and severity, and they have to be preserved from harassment and exploitation. Childhood does not mean just the period between birth and maturity; it means to the situation of the child's life and the quality of this period. Although intellectual discussions about the description of childhood and cultural differences of states about what to hope from childhood period, there has always been a significantly shared consciousness that childhood refers an individual and safe period (UNICEF, 2005). Childhood is one of the immutable and natural rings of our life process and it is a socio-cultural concept. For this reason, it is determined according to norms and values like other social concepts. Both experiences of children and the concept of childhood have changed for centuries. Changes in childhood due to economic and environmental conditions affect the social conditions of children.

Accordingly, children's spatial mobility is a concept that changes according to time, culture as well as social norms and it has to be examined regarding these variables. For example, At the beginning of the 19th century, with the industrial revolution and economic changes, especially in the western world, perception of childhood has changed (Kirazoğlu, 2012). With the increase in welfare level in the society, children have experienced the transition from working life to school life. Within this process, new concepts like security needs, future concerns, education and development of the child have been revealed and the new role of the child in the urban environment has shaped. Accordingly children begin to be conceived as dependent on their parents.

2.3. Children in Built Environment

Towards the end of the 20th century, with the globalization of children's rights, the status of children's right to have a separate life from adults became to spread in social and legal environment. Similarly, researches on childhood sociology emphasized the importance of children's positions as social actors and as creative and inventive users of the space (James and Prout, 1997). Together with all these researches and developments on the children's right, the traditional concept of childhood as vulnerable and in need of protection suggested by developmental psychology and socialization theories are in the centre of focus of researches in recent years (Valentine, 2004; Mayall, 2009). Unaccompanied children conceived as a worrisome and undesirable individual on "adult spaces" if they appear in areas which have not been particularly identified as "childhood spaces" such as playgrounds or schools (Jenks, 2005). Children are considered as vulnerable to unknown risk factors of daily life. Urban public space is perceived as a zone where children are spatially restrained according to age. Therefore despite an increasing number of children living in cities, today it is not common to see an unaccompanied child in public spaces (O'Brien, 2000). The perception that public space is not safe for children results in an increase in adult-oriented investments in public space. Accordingly, supplying child-friendly facilities such as traffic calming diminishes. As a result, children's loss of outdoor freedom has become a vicious cycle.

Cunningham (2005), advocates that childhood should be thought with the society and physical environment. Although the social environment is very important, the physical environment is also crucial (Freeman and Tranter, 2011). Children are shaped by their social world and also their physical world in which places they grow up.

"Built environment" is a term that refers to places such as buildings and streets which are created by human activities on purpose and it refers fundamentally to outdoor spaces (Roof and Oleru, 2008). The built environment in which children live has a substantial impact on children's life. Health and the built environment features such as quality of air, water, and food are interrelated to each other. The physical environments of the home and school also have an impact on health regarding to exposures to lead, dirt, noise, and the light of environment. According to Committee on Environmental

Health (2009), the general structure of the physical environment of a child's community have also an impact on health in a number of ways. As cities have spread over rural areas, urban development has been frequently transformed into low density settlements in rural areas. As a result of urban sprawl, automobile travel has become widespread and it causes both air pollution and traffic problems. As another result of urban sprawl, some urban areas have a lack of opportunities such as few supermarkets and community gardens, and it can cause an obstacle to access to vital productions such as foods. On the other hand, the physical environment of a settlement can provide possibilities for play which is a fundamental notion for the development of children, and for physical activity which helps to achieve overall well-being for children (Committee on Environmental Health, 2009).

To explain the effects of the built environment on child Freeman and Tranter (2011) gave an example that two children have a similar family structure but live in quite different environments. For example one of them lives in a deprived and demolished building estate in a central area, other lives in a government housing estate with low residential density in a suburban area. In comparison, the experiences of the environment of the child who grows up in an apartment building above a commercial place in a central district would be quite different from a child who grows up in a suburban area isolated from traffic and crowded. Although the suburb is physically quite close to the centre, the lifestyles and influences associated with the environment would be quite distinctive (Freeman and Tranter, 2011).

On the other hand, in Bishop and Foulsham's (1973) study with a mapping method, children and adults have different images of their neighbourhood. This study found that when adults' maps mostly show a lighthouse in the neighbourhood as a significant landmark, children's maps do not show the lighthouse, but show kiosks, telephone booths and some vacant lots as their favourite places. In other words, children mark smaller scale parts of the neighbourhood (Bishop and Foulsham, 1973). Children unlike adults, spend extensively their time at school, have substantial time for recreation, carry out their daily physical activity through play, might not drive, and they must comply with the restrictions imposed by adults (Krizek et al., 2004). With all these differences, children behave differently than adults in the built environment. Therefore, standing on only researches of community design and physical activity of adults will be incompetent research for children.

Besides, children's environment need to have more attention in childhood literature. Although there are several studies that investigate parent's influence on their children's mobility in the built environment (Salmon et al., 2007; Timperio et al., 2004) children's perception about their environment is studied by a few literature (e.g. Banerjee et al., 2014; Krizek et al., 2004). Children are usually do not have a chance to identify their needs and expectations about the public spaces (Spencer and Woolley, 2000). When thinking about children's active commuting to the school, it is always conceived as parent's perceptions about their children's mobility in the built environment and children are not conceived as an independent agent in the society (Banerjee et al., 2014). However they should be considered as an indispensable and independent part of the built environment. Researches illustrate that children's experiences and participation of the planning process is quite significant in order to bring children in the physical environments, thus urban planning and policy makers should work with real researches and children (Malone, 2013). Therefore children's needs and perceptions about their environment should be known in order to develop policies about children's mobility in the built environment (Banerjee et al., 2014).

2.3.1. Children's Independent Mobility in Built Environment

Independent mobility of children refers to the movement of children aged under 18 years without accompanied by adults (Hillman et al., 1990; Whitzman and Mizrachi, 2009). Children's independent mobility in the built environment usually contains active transportation modes such as walking and cycling, and sometimes public transportation vehicles (Fyhri et al., 2011). Independent mobility usually depends on the parental licence (that is parental permission) for unaccompanied mobility around built environment. Children's independent mobility is usually seen as more appropriate when children are at the age of between 8 and 13 years. The reason for this, parents confirm that their children can have more capabilities to understand and perceive the physical environment and defend themselves (Whitzman and Mizrachi 2009; Carver et al., 2010). According to researches, boys likely to be more independent in the built environment than girls. This shows boys can have more licenses for travelling to places

without adult supervision and also take public transport without their parents (Mackett et al. 2007; Brown et al. 2008; Carver et al. 2010).

Over the last decades, the possibility of children's independent mobility around the neighbourhood has decreased dramatically in different parts of the world (Hillman et al., 1990; Schoeppe et al., 2014; Björklid, 2002). For instance, according to the study titled "One False Move" by Hillman et al. (1990), between 1971 and 1990 there was a quite significant decrease in children's independent mobility in England. Also Schoeppe et al. (2014) found that Australian children's independent mobility levels declined between 1991 and 2012. Prezza et al. (2001) found that in Italy, 71% of 7 to 12 year-old children are going to and from school with their parents. This means these children are lacking in the chance of independent mobility and to meeting other people and to practice the environment on their own. Likewise, in Sweden according to Björklid's (2002) research children's independent mobility has diminished because parents are worried about traffic.

While the importance of children's independent mobility in the built environment is acclaimed, there are concerning reports about decline in children's independent mobility due to rising vehicular traffic. Parents' fear of traffic forces them to escort their children to school or to friends and consequently restricts the children's freedom (Heurlin-Norinder, 1996). According to Hillman et al. (1990), declining trend of independence mobility of children arises due to parents' restrictions on their children's independent mobility because of a fear of danger from vehicular traffic. In addition O'Brien et al. (2000) express that there is a decline in the number of children who have independent travel to school without accompanied by an adult because there is an increase in parental anxiety about children's safety in built environment especially public spaces. In other words, children's mobility in the built environment is mostly shaped by their parents' perception and mobility in the built environment.

"Parent's licences" concept is firstly mentioned in Hillman et al.'s (1990) study. Parent's licences refers that which kind of mobility permissions do children have in their environment without their parents. O'Brien et al. (2000) use this concept to examine children's spatial mobility in different characterized parts of London. He found that early children and girls have less licences in urban settings than the others. Besides there are a number of literature about how children's independent mobility change

according to size and the density of the city which they live (e.g. Heurlin-Norinder, 1996; Jones, 2000; Kytta, 2004; O'Brien et al., 2000). These studies explored that children who live in lower density environments have more licenses than the others. According to the result of O'Brien et al.'s (2000) study, the reason of declining trend on children's independent mobility in higher density environments is not only because of parent's licenses but also children's negative perceptions of their built environments. Children who live in the inner city describes their environment as chaotic and stressful while children who live in outer of the city describes their environment as quiet and peaceful (O'Brien et al., 2000).

Children's development is both physical and psychological process as well as a social process. International studies have found that as children's independent mobility has decreased sharply, also their play areas are shrinking (Heurlin-Norinder, 1996). However, children's development is undoubtedly connected with play, which is precisely on the immediate environment of children in which children closely associated with their surroundings. Children play continuously, around their school, home and even en route from home to school and through play, children train their cognitive, mental, social and physical abilities. The outdoor environment is an essential balancing factor for children because the indoor environment is mostly for adult-dominated regarding sizes and functions (Moore and Young, 1978). Because of this for growing children their local and proximate environment are most important environments. For children in order to become independent and functioning agents of society, they need to spend time in their proximate outdoor environment without being accompanied by adults (Heurlin-Norinder, 1996). Children's environments expand outside of the home especially by the ages of 8-9 and parental restrictions diminish (O'Brien et al., 2000). Backyards of home, school gardens, streets and playgrounds are accessible public spaces for children to spend time and be active. For example, while children travel to school or a friend's home, streets are one of the most used public spaces by children. Also, backyards are essential for children to play with their peers and also develop their cognitive developments. For this reason, public spaces in which children can be active and independent are quite significant for children's developments and these spaces should be designed not only for adults but also for children.

2.4. Summary

This chapter details the definitions of childhood in terms of biological, psychological, sociological and legal aspects. The concept of childhood has shaped according to economic and social conditions of the time and the geography. At contemporary times, children are dependent on their parents at their mobility in the environment, whereas their movement in the environment is bounded to the immediate environment of their school, home and route to school (if the distance is walkable). On the other hand, the outdoor environment that children spend time is a substantial factor for their psychological and physical development. Accordingly, the physical design of the children's environment is quite significant to achieve for children being healthy mentally and physically.

Studies that aimed to create and develop child-friendly environments gain value nowadays. Researches show that children's perceptions and needs should be known in order to create these child-friendly environments. Therefore studies that investigated the relationship between the child and the environment are crucial.

CHAPTER 3

FACTORS AFFECTING CHILDREN'S ACTIVE COMMUTING TO SCHOOL

Walking and cycling to school is recommended for children to be mentally and physically healthy, whether with the supervision of an adult or not. One of the easiest and most practical ways to adopt physical activity in children's daily life is to enable children to commute to their school by walking or bicycling. According to recent researches about the relationship between cycling and walking to and from school and being physically and mentally healthy, there are several reasons for the decreased trend of walking and cycling to and from school. They are social and physical environment factors. Therefore, to encourage children to walk and bike to school, these affecting factors should be investigated.

While some researchers emphasize physical factors as the most important factors to explain walking as a mode choice by children for commuting to school, others underline social factors as more important. This study considers that children's travel mode choice to school is affected by both physical (home-school proximity, vehicular traffic conditions on the path to and from school, neighbourhood built environment characteristics) and social (household socio-economic attributes, and parental or caregiver perceptions of neighbourhood safety) factors by their interrelation to each other.

This chapter details these factors under the titles of social and physical factors. Social factors examine parental and child related features. Physical factors examine distance between home and school, vehicular traffic, sidewalks and bikeways, aesthetical features, sense of safety and land use and population density.

3.1. Social Factors

Socio-cultural factors are one of the most investigated factors in children's active commuting to school. To give examples, Yarlagadda and Srinivasan (2008) found substantial impacts of socio-economic features of the household, but report that the effects of distance between home and school and built environment features are statistically insignificant. Similarly, McMillan (2007) reports that built environment characteristics have fewer effects on children's travel mode to the school than the socio-economic features of the family.

Social factors can be examined under the title of parental and children related features. Parental features are socio-economic features of the family such as income of the household, car ownership and education level of the parents. Children related features are gender and the age of the child.

3.1.1. Parental Features

According to Banerjee et al.'s (2014) study, parents' own walking behaviours is associated with how their child travel to or from school. A higher proportion of children whose parents walk more than a few times a week walked to and from school (%63) than those whose parents do not regularly walk (%26). On the other hand, according to Sidharthan's (2010) research, in the context of children's mode preference to go and from school, children's travel mode preference to school are effected by the behaviours and preferences of other households and people in the same neighbourhood. For example, if parents observe that many children in the neighbourhood walk to school, they feel comfortable sending their children by walk as well. Likewise, according to Hume et al. (2009), children whose parents have good relationships with their neighbours are more likely to have active commuting in the neighbourhood compared with other children.

On the other hand, according to Sidhartan's (2010) study, household demographics such as more household income and car ownership is associated with

higher tendency to use the car and lower tendency to use alternative modes such as school bus and walking. Sidharthan (2010) indicates that previous researches also demonstrate this tendency. Similarly, according to Mitra et al.'s (2010) study, walking is less common among children whose household have high-income. Similarly, McDonald (2008) examines the results of 2001 US National Household Travel Survey and states children who live in low-income neighbourhoods are more likely to walk to school. Also, Banerjee et al. (2014) found that children who live with a single parent and in a household with annual income less than \$35,000 tend to significantly walk more to and from school more than children who live with both parents and in a household with annual income more than \$35,000. Besides Banerjee et al. (2014) found that children with no or one car in their household and children whose parents receive a high school degree or less are also significantly associated with active travel for the trip from school.

Sidharthan's (2010) research shows that the existence of adult non-workers in the household positively effects children's tendency to walk to school, it is because the adult nonworker can escort the children on the way to school by walking.

Moreover, parental work status and availability affect children's travel behaviour to and from school. For example, in McDonald's (2008) study, mothers have more tendency to travel with their children to the school. Also according to Hensher and Reyes's (2000) study, in Sydney, Australia, %60 of parents drop children to the school while they commute to work. Also, parents' tendency to drop children to school can increase when the number of children in the household is increasing. These findings show that maternal work status and automobile usage behaviour and the condition of the household have a significant effect on children's trip behaviour to school.

Besides, there is evidence that the existence of single parents in the household affects children's travel choice to school (Rosenbloom, 1989). Children's of single mothers are more likely to have independent mobility around the environment, it may because of that single mothers have more challenges with fewer opportunities.

3.1.3. Children Related Features

Age factor plays one of the most important roles in the rate of walking or cycling to go to school. According to previous researches, older children tend to walk more than younger children for the school trip (Ewing et al., 2004; McDonald, 2008; Mitra et al., 2010; Easton and Ferrari, 2015).

Gender is one of the most influential factor for children's choice to go to school. According to previous researches, boys walk or cycle to school more than girls (Easton, and Ferrari, 2015; Steward, 2011; Banerjee et al., 2014). Especially, girls appear to be more influenced by safety perception in walking than boys, accordingly girls are more being driven to the school by cars (Banerjee et al., 2014). Banerjee et al. (2014) found that significantly more girls (%56) who perceive walking as safe walk to school than those who perceive unsafe (%23).

3.2. Built Environment Related Factors

There have been studies on the effects of the design of streets on people's behaviour in the environment (Appleyard et al., 1981). Appleyard et al. (1981) indicate that a livable community have a secure territory, livable and healthy environment, places for play and learn and greenery. Besides, Jacobs (1961) researched the relationships between physical design of the streets and safety perception on people with the concept of "eyes on the street". According to this concept, more people and activity on the street make the street safer. Within the light of these examples, physical factors in the built environment can be significantly influential factors for both adults and children's travel behaviour.

According to research that carried out by Churchman et al. (1991), we can see that the physical design of the neighbourhood can make a difference in the ability of children to play outside and use public space alone at an early age. This research shows that how the physical and structural change between three different neighbourhood characteristics effect on mother's decision to allow their children to go out alone.

According to the results of this study, mothers allow their children to go out alone in the neighbourhood which is placed around a courtyard without car traffic because it is suitable for play and have an opportunity to enter to the buildings through this courtyard (Churchman et al., 1991).

Therefore, among the other factors, the physical factors, the design and planning of the built environment are one of the essential factors of children's and parent's choice of walking and bicycling to school (Saelens et al., 2003). Transportation and land use policies and urban development policy could have an impact on children's active mobility. Accordingly, physical factors can be examined under the title of distance between home and school, vehicular traffic, sidewalks and bikeways, aesthetical features, sense of safety and land use and population density.

3.2.1. Distance Between Home and School

The excess of geographical distance between the home and school location plays the most important role in the decreasing rate of walking and bicycling to school (Mitra et al., 2010; McMillan, 2007). Decrease in travel distance may increase the propensity to walking substantially. Urban design studies accept that the ideal walking distance is 400 meters for children to walk to school. This distance can be defined as the distance taken within 10-15 minutes.

Mitra et al., (2010) indicates that in the City of Toronto, many public schools are affected by province-wide restructuring policy, because of this policy children started to locate far away from schools. Also, in the US, a similar trend has been observed during the past decades (Schlossberg, 2006). Centralization of the schools and its result, tendency to send children to private schools, are one of the most important reasons for the car-dependent school journey. As parents have several choices for private school, travel to the school may have increased (Fyhri et al., 2011). Private schools draw students from the neighbourhood schools, reducing the proximity between a child's home and school location, and likely discouraging walking. However, changes in applied policies in this issue can help to increase the number of children who can walk to school.

3.2.2. Vehicular Traffic

According to Davison and Lawson (2006)'s literature review about the relationship between physical environment and children's physical activity, the presence of crosswalks, traffic lights and street connectivity end up with higher rates of walking and bicycling to school . On the contrary, the high level of vehicular traffic result in fewer rates of walking and bicycling to school (McMillan, 2007). Besides, Boarnet et al.'s (2005) study about the effects of Safe Routes to School program, crossing and traffic control improvements have a substantial impact on the possibility of children deciding to walk and cycle to and from school. In parallel with this, environmental alterations that address risk factors related to automobile traffic is likely to be encourage children to more walking and biking and urban design implementations that aimed at decrease parental perception and fear of crime may promote outdoor physical activity among children (Committee on Environmental Health, 2009). According to researches, the maximum speed on the streets should be 30 hours/km in order to ensure that children can safely travel to school by walking or cycling with a sufficient pedestrian pavement and safe access (Tandoğan, 2014).

3.2.3. Sidewalks and Bikeways

According to Davison and Lawson (2006)'s literature review about the relationship between the physical environment and children's physical activity, the presence of sidewalks on the way to school end up with higher rates of walking and bicycling to school. Also, Boarnet et al. (2005) state that improvements in quality and width of pedestrian ways increase the possibility of children's choice to go to school by walking. Besides, Ewing et al. (2004) noticed that street density and connectivity among pedestrian ways have an important effect on walk and cycle to and from school. Therefore in accordance with all the literature, it is clear that sidewalk and bikeway features have a significant effect on children's choice to travel to school. Indeed, various sidewalk improvements that seem simple to regulate can increase the tendency of children to walk to school.

3.2.4. Aesthetical Features

According to Davison and Lawson (2006), features such as graffiti and empty beer bottles in the immediate environment of schools have a negative effect on walking and bicycling to school for children. Besides, Ewing et al. (2004) explain that convenient pedestrian-friendly design implementations such as trees and plants along the streets around the school increase children's tendency to walk or bike to school. Similarly, Banerjee et al. (2014) state that aesthetical features such as street cleanness around the school, the existence of abandoned or vacant lots on the way to school and building maintenance on the way to school have a quite significant impact on children's travel mode to school. For example, while existence of a lot of litter and abandoned or vacant lots on the street have a negative impact for walking to school, well-maintained buildings on the way to school and street cleanness have a positive effect on walking to school.

3.2.5. Sense of Safety

As we understand from previous researches parents anxiety of safety on their children have a great impact on children's use of open public spaces (Oğuz, 2011). In many countries, the amount of crime and the perceived and actual risks in the built environment for children have increased, and as a consequence, there are changes in the level of independence associated with children (Carbonara-Moscatti, 1985). That is why parents tend to restrict their children's mobility in public spaces. These mobility restrictions are mostly because of increases in the level of traffic and parents' conceptions of social dangers (Hillman et al., 1990). When thinking about road safety for the way to and from school, extra consideration about children and the risk of injury or death should not be seen as the only problem, but other factors such as perceived risks and insecurity, parents' and children's anxiety, and limitations on children's mobility should also be considered seriously (Heurlin-Norinder, 1996).

3.2.6. Land Use and Population Density

Some studies (e.g., Larsen et al., 2009; McMillan, 2007) show that there are positive interrelation between land use mix around the school location and walking among children. Also, there are several studies about land use and preference of travel mode which state that the built environment characteristics such as well-connected streets, small city blocks and mixed land uses inspire nonmotorized transport (Cervero and Duncan, 2003; Greenwald and Boarnet, 2001). On the other hand, Ewing et al. (2004) explain that short blocks and mixed land uses had negative influences on walking and biking to the school. Besides Mitra et al. (2010) emphasize that there is a negative relationship between land use mix near the home or around the school location and mode choice for school transportation. Mitra et al. (2010) emphasize that although land use mix improves access and pedestrian comfort for adults, it have a negative impact on children's choice to walk to school. Because of concerns about traffic in mixed land use areas and children's negative perceptions about these areas, children feel unsafe in mixed land use areas.

According to Davison and Lawson's (2006) literature review about the relationship between physical environment and children's physical activity, availability of parks and playgrounds encourage higher rates of walking and bicycling to school among children.

On the other hand, the urbanism of the inner city no doubt provides to the greater level of competency and proficiency in dealing with dangers, threats and difficulties of city life (Banerjee et al., 2014). According to Banerjee et al.'s (2014) study children prefer busy commercial areas as their favourite places than isolated and quiet residential areas. He says that it results from most likely that children feel more safe thanks to lively streets and "eyes on the street" and they like high opportunities for bumping into their friends. However according to Banerjee et al.'s (2014) research, land use factor is not associated with children's active commuting to school.

Besides, there some studies about the relationship between children's mobility around the neighbourhood and the neighbourhood characteristic such as land use. For example, Prezza et al. (2001) states that the most independent children who live in Rome, are those children who live in apartment buildings with courtyards near the parks

and in new neighbourhoods. Besides, according to Loukaitou-Sideris (2002) research, inner city children relied more heavily on the neighbourhood park for open space recreation and play than suburban neighbourhood children. It is most likely arising from their crowded houses and accordingly lack of space for play and that they live in gardenless houses. The vast majority of Inner city children (%95) live within a ten minute walk from their neighbourhood park. As a result, most of them (%69) walk, bike or use skateboards to access the park, while the suburban neighbourhood children mostly by car (%74) and a higher number of them are accompanied by an adult (%83). In other words, land use and urban developmental policies have a strong impact on family policies about children's daily mobility.

3.3. Summary

In light of the literature mentioned above, children's travel mode to school is affected by various features from the social environment to the physical environment. As can be seen from the literature, the physical design of the immediate school environment and the school route have a significant effect on walking to school. Almost all literature points out that shorter distance between home and school is the most important affecting factor on children's walking to school. Moreover, the socio-economic factors such as household income, the composition of the household and parents' perception on children's active commuting to school are some of the remarkable factors that affect to children's walking to school. On the other hand, children's features such as age and gender are the most investigated factors related to children's active and independent commuting to school. It seems that children's travel to school is highly affected by their parents' perception of their children's age and gender. Consequently, Table 3.1 and Table 3.2 show that affecting factors on children's travel mode to school and what is the expected influences according to literature.

Table 3. 1. Influential Social Factors For Children’s Travel Mode To School And Expected Influence On Walking To School

Social Factors	Children’s Characteristics	Increase in Age	+
		Gender (boy)	+
		Children have friends in neighbourhood	+
	Parents’ Characteristics	Increase in years live in neighbourhood	+
		Increase in neighbourhood relations	+
		Parents walking habit	+
		Increase in household size	unclear
		Living with both parents	+
		Number of children in the house	-
		Increase in income	-
		Number of working people in the house	-
		Car ownership	-
		Mothers car using habit	-
		Child bicycle ownership	+
		Child phone ownership	+
Increase in parental education	-		
Parents outdoor space use habit	+		
Parent’s supportive perception about active commuting to school	+		

Table 3. 2. Influential Physical Factors For Children’s Travel Mode To School And Expected Influence On Walking To School

Physical factors	Distance	Distance between home and school	-
	Sidewalk and Bike Way features	Wide sidewalks	+
		Quality of sidewalk (material)	+
		Obstacles on the sidewalk	-
		Sidewalk amenities	+
		Signs for pedestrians	+
		Existence of bike way	+
		Increase in slope	-
		Traffic Environment features	Existence of bus stop on the street
	Wide car roads		-
	Increase in traffic speed		-
	Existence of crosswalk		+
	Existence of traffic lights		+
	Increase in traffic density		-
	Existence of traffic calming		+
	Aesthetic features	Existence of trees and flowers along the street	+
		Well maintained buildings	+
		Quantity of abandoned areas	-
		Environmental pollution (bottles, trashes)	-
	Sense of Safety features	Mixed-use buildings along the street	unclear
“Eyes on the street”		unclear	
Security measures along the street		+	
Street lightning		+	
Landuse And Population Density	Existence of parks	unclear	
	Existence of commercial and mixed use areas	unclear	
	Existence of residential areas	unclear	
	Population density of the area	unclear	

CHAPTER 4

URBAN DESIGN CASE STUDIES TO IMPROVE CHILDREN'S ACTIVE COMMUTING TO SCHOOLS

This chapter examines a number of examples related to child-friendly street implementations which encourage children to be active and independent in the built environment, especially the immediate environment of the school. In this direction, this chapter examines Streets Ahead Project, Kindlindt Project, Safe Routes to School Programme, Hackney Play Streets Project, Holland Woonerf Project and London Play's Home Zone Project according to these project's successful implementations related to vehicular traffic, sidewalks and bikeways, aesthetical features, sense of safety and land use characteristics of the environment.

In today's industrialized and developed cities, children live in insecure, polluted and crowded cities and cannot find a place for themselves (Sivri Gökmen, 2013). Whereas the city should be able to supply that children feel safe in the physical environment, and it should be able to make children feel as an equal part of society with other individuals through the design, planning and behaviour of adult individuals (Churchman, 2003). Attitudes and behaviours towards children's needs and rights are rapidly changing. In 1989, many countries signed the Convention on the Rights of the Child, which was adopted at the United Nations General Assembly. Within the Convention, the Child-Friendly City (CFC) is accepted as an implementation which aimed at developing children's lives and fulfilling their rights at the city and community level. According to UNICEF's report (2018), the Child-Friendly Cities Initiative (CFCI) determined some strategies to develop the concept of CFC for local governments:

- Children themselves should participate in the processes
- Child-friendly policies and legal frameworks should be adopted to protect the child's rights.
- Awareness of child rights should be understood by society.
- The CFCI action plan should be prepared for each goal area.
- A budget should be allocated for children

- Cross-departmental coordination and partnerships should be adopted in local governments.
- The capacity in local governments should be developed.
- Data and evidence should be collected before and after the project in order to evaluate.

CFCI have launched in 2014 in Turkey after many European country and it is aimed at helping children who have challenges in urban areas (UNICEF, 2019). In the beginning, it launched as a project within the context of 10 municipalities including Bornova-Izmir in Turkey. According to CFC approach:

A CFC is where children are protected from exploitation, violence and abuse; have a good start in life and grow up healthy and cared for; have access to quality social services; experience quality, inclusive and participatory education and skills development; express their opinions and influence decisions that affect them; participate in family, cultural, community and social life; live in a safe secure and clean environment with access to green spaces; meet friends and have places to play and enjoy themselves; have a fair chance in life regardless of their ethnic origin, religion, income, gender or ability (UNICEF, 2018, p. 10).

Within the concept of CFC, in order to make the physical environment more livable for the child, a number of projects are carried out about children's places in the built environment. Children's places in the physical environment are mostly home, school and play environments and the streets between them. Therefore, a CFC should serve children safe school, home and play environments and provide safe streets between children's places.

4.1. Streets Ahead Project

According to VicHealth's (2011) report, "Streets Ahead" is a program to improve physical activity in 4 to 12 years old children by encouraging them to walk and cycle independently around their neighbourhoods in Australia. Implementations of the project are both infrastructural improvements and social improvements in society. Improvements in the social environment consist of informing children about drivers and informing drivers about children and consequently, it aims to raise awareness in society.

Importantly it includes some infrastructural applications such as traffic calming measures that reduce car volume and speed around schools, street closures around the school and home zones, better walking and cycling infrastructure and shared streets in the neighbourhood (Figure 4.1 and Figure 4.2).



Figure 4. 1. Pedestrian Crossing Improvements in the Street
(Source: VicHealth, 2011)



Figure 4. 2. Children and Parents in a Shared Street
(Source: VicHealth, 2011)

4.2. Kindlint

"Kindlint" which means "child route" is a project that was first implemented in 2007 in Amsterdam. Reframing Studio which implement the project explain the project in their official website (<https://www.reframingstudio.com/projects/kindlint>). Accordingly, the main motivation for the project is to provide children routes which they can walk and bicycle independently. The project advocate that the age of the children which allowed to have independent mobility has increased day by day and this cause a number of health problems for children. Therefore, this project aims to connect children's places such as school, home and playgrounds and create a child-friendly route by fun and safe streets. 4 stages are presented for the project to create safe and fun routes for children. The first stage is to determine a child route in the neighbourhood, second is to create safe traffic environment by safe crossings and traffic calming measures on the route (Figure 4.3), third is to create play points on the route and finally to implement more colour and art on the route (Figure 4.4). The project adopts a participatory process in order to create child routes with children themselves.

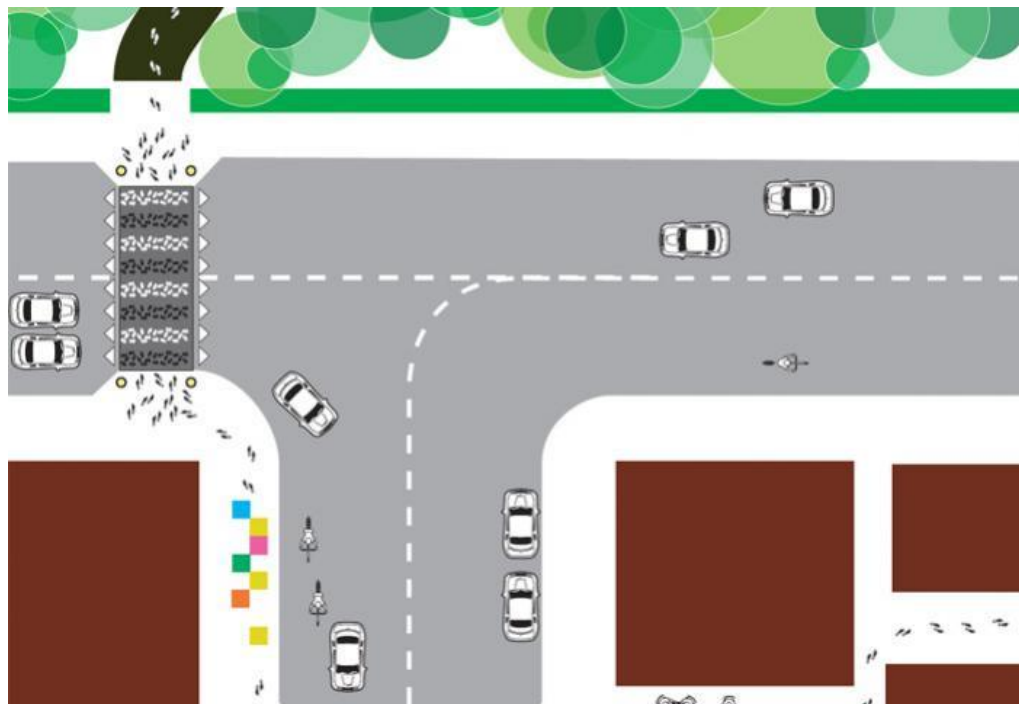


Figure 4. 3. A Kindlint (Child Route) Plan

(Source:Reframing Studio, 2012)



Figure 4. 4. Children Painting the Stones on the Child Route

(Source:Reframing Studio, 2012)

4.3. Safe Routes to School Programme

Safe Routes to School is a significant international movement to make streets on the way to and from school safe, accessible, and fun for children and it first starts in the US (<https://www.saferoutespartnership.org>). According to information on the official website of the programme, the aim of the programme is to create safe routes on the way to school and in this way encourage children to walk and bicycle to school. The programme has an action plan to achieve safe environments for children. It includes creating a list of obstacles that children face on the way to school and accordingly develop possible solutions for each challenge. These solutions consist of education enforcements such as raising awareness in society and engineering enforcements such as crossings, sidewalk and bikeway improvements (Figure 4.5 and Figure 4.6).



Figure 4. 5. A Crossing Implementation to Slow Traffic
(Source: Safe Routes Partnership, 2017)



Figure 4. 6. An Implementation to Buffer Bike Lane
(Source: Safe Routes Partnership, 2017)

4.4. Hackney Play Streets Project

Hackney Play Street is a project implemented in Hackney/UK to create streets which children can play in. According to Gill's (2015) report, the project's aim is to encourage children to play in outdoors (streets) that are close to home and school. Within the context of this project, three different models have been developed. These are the "residential street model", the "school model" and the "estate model". However, I will explain especially the school model in detail in the following part. The residential street model is basically street blocking in residential areas for children to play. The estate model is conducted for spending time in the amenity spaces among housing estates, where there is usually no traffic and thus there is no street blocking. The school model is basically conducted for once or twice in an education term. Streets outside of schools are closed to the traffic for a few hours, with the help of some warning signage and temporary barriers at the beginning and end of the streets (Figure 4.7 and Figure 4.8). Accordingly, it is aimed at children can spend time around the school environment by doing physical activities. According to data from Hackney Play Streets Evaluation Report (Gill, 2015), the programme has reached around 1600 children and nearly 800 families with 380 hours of sessions and the programme have been directly responsible for over 8100 hours of physical activity for children, on an equal with 14 additional classes of weekly time of physical education lessons.

4.5. Holland's Woonerf

"Woonerf" is a street system founded by an English architect and road engineer, Colin Buchanan, related to designing streets as children's playground (Tandoğan, 2014). Then the first woonerf applications were designed by Niek De Boer in Holland in the 1960s and his aim is to create roads which make feel people driving and walking in a garden. These streets are designed as places that take the street residents and pedestrians into account and forcing the drivers to go slowly. According to Tandoğan's (2014) study, "Woonerf" eliminates traffic problems, noise and safety problems by preventing excessive traffic speed and volume and it creates spaces that are used by the

society by creating front gardens in the street and accordingly provides the development of social relations among the residents. Tandoğan (2014) explains a number of applications of this system. The first application is to create a different entrance to emphasize the identity of the space where the Woonerf system is applied. In this way, it is ensured that vehicle drivers feel that they are a guest in that street. The second one is designing curves on the traffic lane in order to slow traffic and create pedestrian-friendly streets (Figure 4.9). The third is placing benches, border elements, playground equipment and plants to slow traffic and to create pedestrian-friendly streets (Figure 4.10). The fourth is to remove continuous pavement edges in order to make the drivers and pedestrians feel at the same level. The last one is providing discrete parking lots for vehicles in order to create functional spaces for pedestrians.



Figure 4. 7. A Blocked Road Outside of School

(Source: Hackney Play, 2019)



Figure 4. 8. Children Playing in the Blocked Street

(Source: Hackney Play, 2019)



Figure 4. 9. An example of Woonerf Street

(Source: Sustainable Design, 2011)



Figure 4. 10. An example of Woonerf Street

(Source: Courtyard Housing, 2007)

4.6. London Play’s Home Zone

“Home Zone” initiative was launched in the UK in 1998 by Children's Play Council, in order to raise awareness of the importance of the play in child development and the need to have adequate access for each child's better play opportunities and services (Bristol City Council, 2003). The aim of the “Home Zone” system is to change the way streets are generally used and to make the streets a place not only for vehicles but also for people, accordingly to improve the quality of life in that space. Main implementations in this system are creating parking spaces in the street, creating living spaces and play areas and reducing traffic speed in the street (Bristol City Council, 2003). Design components in this system are quite similar to “Woonerf”. For example, in order to slow traffic and create safe and fun spaces for children, traffic calming measures, curved vehicle routes, traps for vehicular traffic, restrictions in the street width, trees and plants, benches, bicycle parking areas, parking lots arranged at different levels and playgrounds for children are seen as different components of this system (Figure 4.11 and Figure 4.12) (Bristol City Council, 2003).



Figure 4. 11. An Example of “Home Zone”

(Source: Neighbourhoods, 2004)



Figure 4. 12. An Example of “Home Zone”

(Source: Metamorphosis, 2017)

4.7. Summary

Considering these practices which are made for designing streets livable for children, it is seen that the most important factor is designing the streets safe for children. As can be seen from the examples, the most important factor in making the streets safe for children is the arrangements in the traffic environment. As seen, traffic calming measures and sidewalk and bikeway improvements can positively affect children's active and independent travel to school. Besides that, in order to support children's quality of life and healthy development, the streets should be designed as fun areas where children can play with their peers in safe and contribute to their mental development.

CHAPTER 5

METHODOLOGY AND STUDY SITES

The aim of this study is to determine the factors affecting the 8 to 11-year-old children's active commuting to school and to develop urban design suggestions and strategies for integrating the active transportation systems of the children into their lives. For this purpose, three methods have been applied to determine the factors. These are questionnaire studies with children and parents and collecting physical environment data from Şenol's (2019) TUBITAK project, site observations and online sources (Yandex Maps).

Within the context of this aim two primary schools of two neighbourhood in Bornova is selected. These are Doktor Cavit Özyeğin Primary School in Evka-3 neighbourhood and Kars Halil Atila Primary School in Erzene neighbourhood. While Evka-3 neighbourhood is characterized mostly high-rise residential buildings, Erzene neighbourhood is characterized as the commercial centre of Bornova. These two primary schools of two neighbourhoods are examined in detail in the following part of the chapter.

5.1. Study Methods for Data Collection

This study focuses on children around 8-11 ages in primary school and examines the factors that affect children's active and independent commuting to school. After that, this study aims to develop urban design strategies for streets en route to school. In order to explore different urban environment impacts on children's active commuting to school, two schools in two different neighbourhood in Bornova/Izmir are selected.

The factors that influence walking to and from school are examined under the titles of physical and social factors. Physical factors are examined as distance between home and school, vehicular traffic, aesthetical features, sense of safety and land use and population density. Social factors are examined as parents characteristics and children

characteristics. To gather data about social factors, I developed a user survey with primary school children and their parents with the help of the permission of the Ministry of National Education, Izmir Provincial Directorate of Education. Also for variables about physical environment, data are taken from site observations and GIS data.

5.1.1. Built Environment Data

Built environment data are basically collected from physical environment databases from Şenol's TUBITAK project (2019) and site observations of the immediate built environment of selected schools. Built environment data are examined within the area of 150 m diameter circle of each school environments. Information about the physical environment such as land use of the neighbourhood and density of the built-up area is obtained with the help of GIS from Şenol's TUBITAK project (2019) data. After that three streets around each school are determined as most used streets within the area of 150 m diameter circle of each school by children. Site observations are made for each street and accordingly total of 6 observations for 6 streets are made. Within the context of these streets, information such as street width, pedestrian width, traffic density, aesthetic perception with regard to the neighbourhood, pedestrian road quality, the existence of traffic lights, and inappropriate parking status is collected from site observations of these streets. In order to analyze the data, built environment features of three streets in each school environment are scored. According to the scoring method, features that increase the usage of the streets are scored as 1 and features that decrease the usage of the streets are scored as 0.

5.1.2. Social Environment Data

To gather social environment data, I deployed user surveys with students (8-11 years old) and their parents with the help of the permission of the Ministry of National Education, Izmir Provincial Directorate of Education. These surveys consist of open and close-ended questions. Questions of the survey conducted with these students and their parents are compiled from questions of previous surveys that are conducted in the last

decade about children and their perception of the built environment. The survey questions consist of the socio-economic characteristics of the family, the child's personal characteristics, the child's way of accessing the school, the environmental perception of the child about the school path, and the thoughts of parents about their children's active transportation to school. The research is conducted with the 3rd and 4th-grade primary school students. Therefore, in the study, the age range of the target group is between 8 to 11-year-old children.

The surveys carried out at Doktor Cavit Özyeğin Primary School and Kars Halil Atila Primary School in Bornova/Izmir. Within these surveys, six class (three 3rd and three 4th grade) in Doktor Cavit Özyeğin Primary School as well as six class (three 3rd and three 4th grade) in Kars Halil Atila Primary School are determined to conduct the surveys. A total of 360 surveys (180 surveys in Doktor Cavit Özyeğin Primary School and 180 surveys in Kars Halil Atila Primary School) with students and their parents are made. However, 116 of the surveys are not completed by students and parents. Therefore 244 surveys with 8-11 years old primary school students and their parents are used as the data for this study.

5.1.2.1. Children's Survey

The survey which is carried out with the children is conducted with the permission of the Ministry of National Education, Izmir Provincial Directorate of Education. The surveys with children is completed in two stages.

- i) In the first stage, the questionnaire (see Appendix A) is completed with open and closed-ended questions with the target group in the classroom where the teacher of the class is supervised. Questions of the survey at this stage consisted of questions about personal information of children and understanding of children's views on the built environment.
- ii) In the second stage, in the pilot study, sketches related to the built environment of the schools (see Appendix B) are prepared for children

to ask them to describe their experiences and perceptions about the built environment of schools with writings and drawings on these sketches (draw and write technique). However, sketches are mostly left blank by children. Therefore it is determined that draw and write technique is not suitable for this study. After that, this part of the questionnaire is removed from the study.

5.1.2.2. Parents' Survey

The third stage is a questionnaire study consisting of open-ended and closed-ended questions with those student's parents. The questionnaires are sent to parents by those student's. The questionnaires are distributed in the class to the children and they are asked to transmit these questionnaires to their parents, after that they are asked to deliver them to their teachers in the classroom in a week. Questionnaires made with parents are composed of questions about the parents 'socio-economic status, views of parents about their neighbourhoods, and parents' understanding of their children's mobility in the built environment (see Appendix C). At the end of the questionnaire, parents are asked to mark the location of their house on the given map which includes the circles that are consisted of the diameter of 200m, 400m and 600m involve the house (see Appendix C).

5.1.2.3. Pilot Study

The study is started with class surveys with children and parents with a pilot study. The aim of the pilot study is to identify and revise questions and expressions which are not understood and unclear in the survey study conducted with children and parents. In this way, it is aimed to increase the efficiency of the answers given to the surveys and consequently the result of the study.

Within the scope of the pilot study, a class of 3rd-grade students is selected at the Doktor Cavit Özyeğin and Kars Halil Atila Primary Schools and the pilot study is conducted with the students and their parents in these classes. Because there are 30

students in each class, a total of 60 children and 60 parents completed questionnaires. The results of this study are evaluated separately and not considered as the main data of the study.

According to the analysis of the pilot study, there are a couple of questions that are not understood and mostly left blank by children and parents. Therefore these questions are revised and the final version of the questionnaire is prepared. Also, sketches are mostly left blank by children. Therefore it is determined that draw and write technique is not suitable for this study. After that, sketches are removed from the final version of the children's questionnaire.

5.2. Data Analysis

Social environment data that are collected from questionnaires are analysed by using the Statistical Package for Social Sciences (SPSS) Version 24. At the first stage, children and parents characteristics are analysed using the descriptive statistics techniques according to each child's parent's and neighbourhood characteristics. After that, in order to describe associations between influential factors (independent variables) and children's travel mode to school (dependent variable), regression analysis technique is conducted. Besides, children's independent mobility without the supervision of adults (especially parents) are examined according to children, parents and neighbourhood characteristics using this technique too. Moreover, to comprehend the relationship between all variables including dependent and independent, correlation analysis technique is used. Table 5.1 shows the variables that are analysed in order to examine the relationships between different influential factors for each children's travel mode to school and independent mobility without the supervision of adults (especially parents).

Meanwhile, the data that are obtained from open-ended and multiple-choice questions directed to children and their parents are analysed using the descriptive statistics technique. With these questions, it is aimed to understand children's and parents' perceptions of risk factors and the wishes about the immediate environment of each school.

Table 5. 1. Variables used for regression analysis at this study

<u>Variables</u>	<u>Descriptions for Variables</u>
Child characteristic	Data are collected from children's questionnaires
Walking to school (Dependent variable)	Children's travel mode to school
Children's independent mobility without the supervision of adults (especially parents) (Dependent variable)	With whom children go to school
Age	Each child's age
Gender	Each child's gender
School	Which school children attend
Having friends in the neighbourhood	If children have friends in the neighbourhood
Neighbourhood characteristics	Data are collected from parent's questionnaires
Distance	Distance between child's home and school
Household characteristics	Data are collected from parent's questionnaires
Year in neighbourhood	How many years the family live in the neighbourhood
Neighbourhood relations	Parents have any relations with their neighbours
Parent's walking habit	Parent's habit of walking in the neighbourhood
Household size	How many people live in the house
Living with both parents	If the child living with two or only one parents
Number of children in the house	How many children aged 12 or less live in the house
Household income	Total income of the household
Number of working people in the house	How many working people live in the house
Car ownership	If the family have a car and if they have, how many cars they have
Mother car using	If the mother uses the car more than the father
Phone ownership	If the children have a phone
Bicycle ownership	If the children have a bicycle
Parent's education level	What is the parent's education level
Parent's outdoor public space use habit	The parent's habit of outdoor public space use
Parents' perceptions on their child's active commuting to school	Parents' perceptions on their child's active commuting to school

Table 5. 2. Variables collected at site observations for the analysis of built environment

Built Environment Characteristics		Data are collected from site observations (in each school environment within the area of 150 m diameter circle)
Sidewalks and Bikeways	Width of sidewalk	Total score of the width of sidewalks of the three streets
	Structural condition of sidewalk	Total score for the structural condition of sidewalks in the three streets
	Obstructs on the sidewalk	Total score for obstructs on the sidewalks in the three streets
	Sidewalk amenities	Total score for sidewalk amenities in the three streets
	Signs for pedestrians	Total score for signs for pedestrians in the three streets
	Existence of bikeway	Total score for the existence of bikeways in the three streets
Vehicular Traffic	Bus stop on the street	Total score for the bus stop on the three streets
	Width of the street	Total score for the width of the three streets
	Speed limit on the street	Total score for the speed limit on the three streets
	Existence of crosswalk	Total score for the existence of crosswalk in the three streets
	Traffic density	Total score for traffic density in the three streets
	Existence of traffic calming	Total score for the existence of traffic calming in the three streets
Sense of Safety	Eyes on the street	Total score for "eyes on the street " in the three streets
	Security measures along the street	Total score for security measures along the street in the three streets
	Existence of mixed use buildings	Total score for the existence of mixed-use buildings in the three streets
	Existence of street light	Total score for the existence of street lights in the three streets
Aesthetical Features	Trees and plants along the street	Total score for trees and plants along the street in the three streets
	Existence of well-maintained buildings	Total score for the existence of well-maintained buildings in the three streets
	Existence of vacant lots and abandoned buildings	Total score for the existence of vacant lots and abandoned buildings in the three streets
	Litter on the street	Total score for litter on the three street in the three streets
Land Use and Population Density	Existence of parks	Total score for the existence of parks along the street in the three streets
	Existence of commercial and mixed use areas	Total score for the existence of commercial areas along the street in the three streets
	Existence of residential areas	Total score for the existence of residential areas along the street in the three streets
	Population density of the area	Total score for the population density in the three streets

Built environment data that are collected from site observations are analysed using the method of scoring. In order to analyse actual risk factors of the built environment for children to walk, features that increase the walking on the street score as "1" and features that decrease the walking on the street score as "0" on the physical environment observation checklist (see Appendix D). After that, scores of the streets that are used by children frequently within the area of 150 m diameter circle of each school (three streets around each school environment) are counted and final scores are obtained. Table 5.2 shows the variables that are analysed in order to examine actual risk factors. With this analyse, it is aimed to investigate relationships between actual and perceived risk factors of the immediate environment of each school for children and parents.

5.3. The Study Site

The study area is located in Bornova district, which extends to the northeast of the city of Izmir (Figure 5.1). Bornova is the third biggest district of Izmir with its 445,232 population. In addition, Bornova is the 3rd biggest district in Izmir according to primary school-age children population with the number of 28.064 (16%) children (TUIK, 2018).

For this thesis, Kars Halil Atila Primary School in Erzene neighbourhood and Doktor Cavit Özyeğin Primary School in Evka-3 neighbourhood are determined as the research schools to conduct the study (Figure 5.2). Although at the beginning of this study, two schools in Erzene neighbourhood and two schools in Evka-3 neighbourhood are selected, because two of these schools are being restored, the study is conducted in these two schools.

According to Şenol's TUBITAK project (2019), Erzene and Evka-3 neighbourhood in Bornova have the highest number of children that are going to primary school. Moreover, especially Erzene and Evka-3 neighbourhood have the highest size of neighbourhood park areas per capita (Şenol, 2019). Figure 5.3 shows the distribution of education and neighbourhood park areas in two neighbourhoods.



Figure 5. 1. Location of Bornova in Izmir Province

(Source: Google Map Customizer)

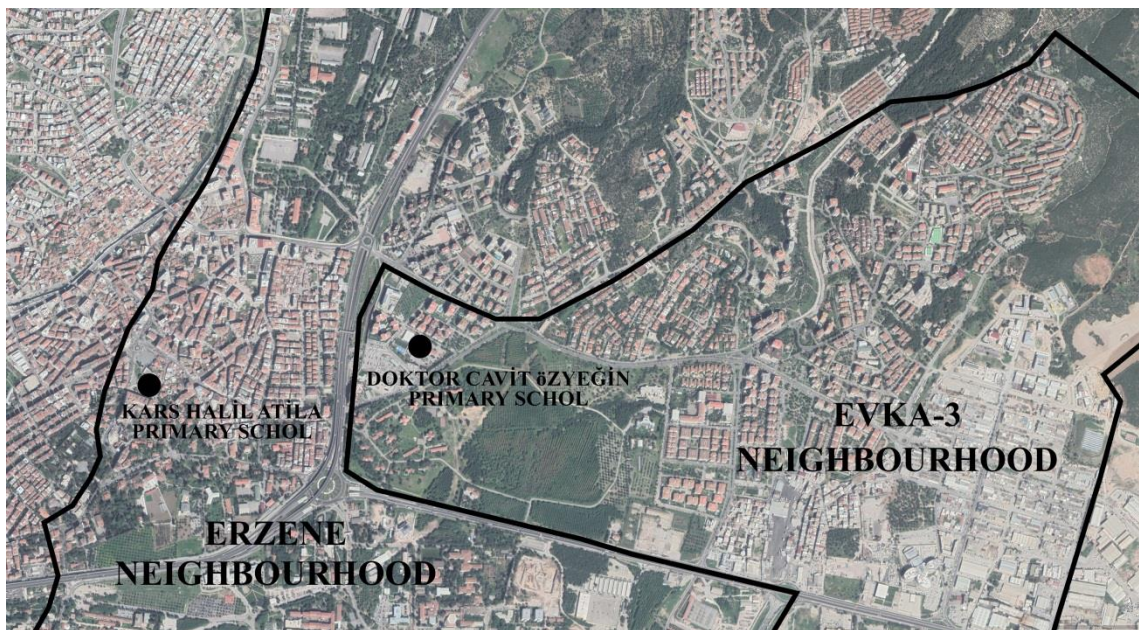


Figure 5. 2. Boundaries of Erzene and Evka-3 Neighbourhoods and Selected Schools

(Source: Google Earth)



Figure 5. 3. Education and Neighbourhood Park Areas in Erzene and Evka-3 Neighbourhood

(Source: Şenol, 2019)

Erzene Neighborhood is an old neighbourhood characterized as the commercial and institutional centre of Bornova. Evka-3 is a neighbourhood developed since the 1990s and characterized mostly with its multi-storey residential areas. As seen at Figure 5.5, the density of residential areas in Bornova is increasing especially in Erzene neighbourhood but while buildings in Erzene neighbourhood are mostly 7-8 storeys, towards Evka-3 the number of floors is increasing. With the increasing topographic slope (Figure 5.4) towards the Evka-3 neighbourhood, the amount of green space along with the forest area and the military area is increasing. Near the commercial centre of Bornova, Izmir Ege University Hospital area and Ege University Campus and Forest area are some of the largest green areas in Bornova. Together with the existence of the campus area, the military area, the forest area and the green areas inside the residential areas, we can see that green areas in Bornova are quite large and have physical contact with each other (Figure 5.5). When we look at the land use of the area, we see the small industrial area (mostly auto-repairing) located in the southeast part of the Evka-3 neighbourhood, Ege University campus area and the hospital area, as well as the primary and secondary school areas in the Bornova trade centre and the region, which are relatively less distributed (Figure 5.5).

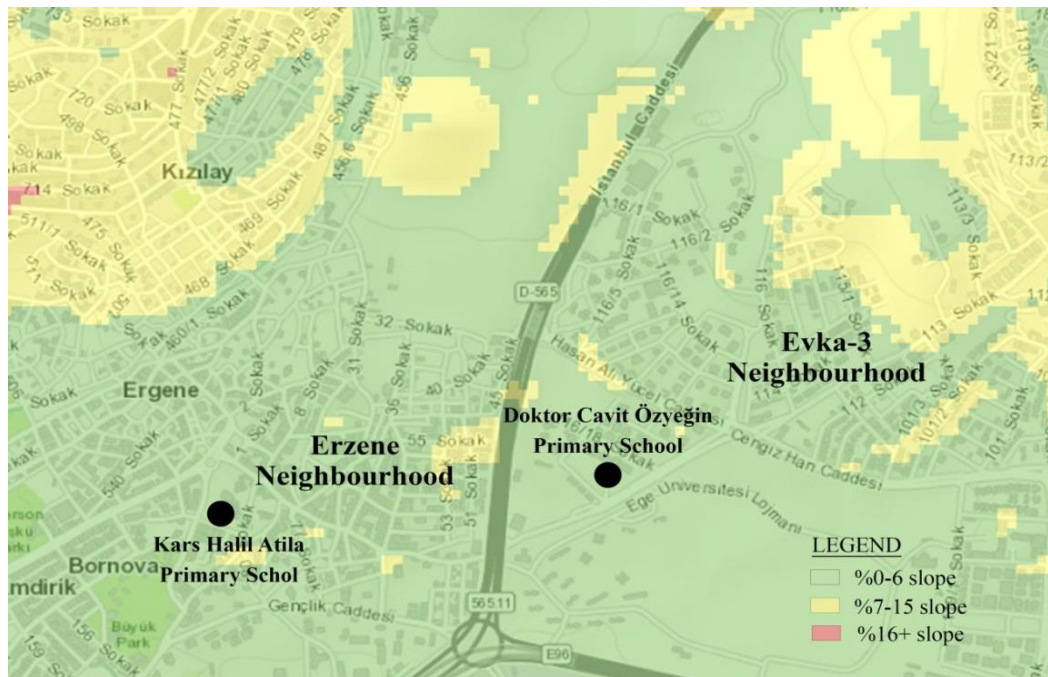


Figure 5. 4. Slope Analysis Around the Selected Schools

(Source: Esri: GIS Mapping Software)

Legend

-  express way
-  park area
-  forestry
-  shrubbery
-  cemetery
-  mosque
-  residential area
-  urban conservation area
-  bazaar area
-  hospital
-  recreational facility area
-  gas station
-  institutional area
-  military area
-  industrial area
-  commercial area
-  primary and secondary school
-  highschool
-  university area

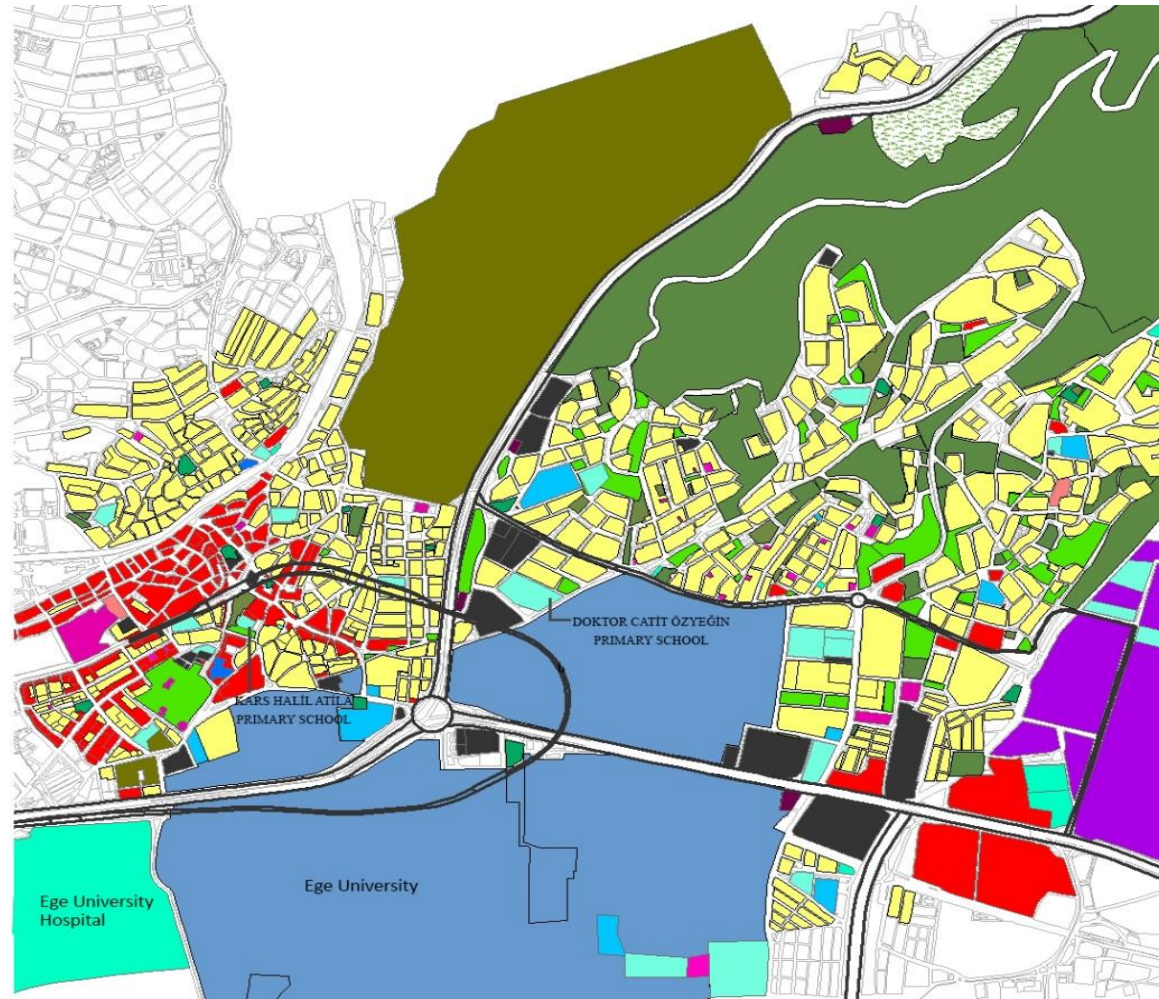




Figure 5. 5. Land Use Analysis Around the Selected Schools

(Source: Şenol, 2019)

Consequently, in order to identify how differently characterized neighbourhoods affect the children's choice of walking and bicycling to and from school, neighbourhoods of Erzene and Evka-3 are selected as study site for this research. Selected schools in these neighbourhoods have a double-shift schooling system. While 3rd and 4th-grade classes attend the lessons from morning till noon, 1st and 2nd classes attend the lessons from noon till evening. In order to describe built environment characteristics around two schools, a number of calculations (Table 5.3) are conducted with the help of Geographical Information Systems (GIS). These built environment characteristics are population density of the schools, density of the built area and land use of the school environment, traffic speed, area of the school and number of trees around the school environment. All calculations are made within the area of 150 m diameter circle (7 hectares) and land use and density variables are regulated as a percentage value.

If we compare the built environment characteristics of the areas where two schools are located (see Table 5.3), a groups of differences are observed. For instance, the residential density of the area around Doktor Cavit Özyeğin Primary School (21%) is higher than of the area around Kars Halil Atila Primary School (7%). Also, there is no mixed land use and commercial areas around Doktor Cavit Özyeğin Primary School. However, Kars Halil Atila Primary Schools is located in the central area of Bornova with commercial acitivites with the density of mixed land uses (24%) and commercial uses (6%) in the area. Besides all these physical and land use features, moreover, two areas have different densities of the built area. Accordingly, the share of built area around Kars Halil Atila Primary School is 41%, the share of built area around Doktor Cavit Özyeğin Primary School is 13%. Similarly, there are more pedestrians on the streets in the area around Kars Halil Atila than around Doktor Cavit Özyeğin Primary School. Finally, in terms of park areas and greenery, there are more green areas and trees around Doktor Cavit Özyeğin Primary School (4% and 113, respectively) than Kars Halil Atila Primary School (2% and 68, respectively). Similarly, while there is no playground around Kars Halil Atila Primary School, the share of playground area around Doktor Cavit Özyeğin Primary School is 4%.

Table 5. 3. Selected Sites and School Characteristics

	Doktor Cavit Özyeğin Primary School	Kars Halil Atila Primary School
School		
Area	2hectare	0.25 hectare
Population Density	411 per hectare	4000 per hectare
School Type	Public School Double shift schooling	Public School Double shift schooling
Opening and Closing Hours	7:30 am to 12.50 pm	7:30 am to 12.50 pm
Residential area (within the area of 150m diameter circle)	21%	%7
Commercial area (within the area of 150m diameter circle)	-	6%
Mixed-use area (within the area of 150m diameter circle)	-	24%
Playground area (within the area of 150m diameter circle)	4%	-
Green area (within the area of 150m diameter circle)	4%	2%
Density of built area(within the area of 150m diameter circle)	13%	41%
Number of trees (within the area of 150m diameter circle)	113	68
Traffic speed (at peak hours)	25km/h	20km/h

5.3.1. Doktor Cavit Özyeğin Primary School

Doktor Cavit Özyeğin Primary School is located in Evka-3 neighbourhood. As seen in Figure 5.7, the school is located in between a playground area, metro and bus station and housing estates. Evka-3 Metro Station and transportation hub is the main dominated factor of the school environment. Housing type around the school generally consists of luxury and high-rise housing estates. Especially towards the north part of the school, the density of housing estates is increasing. As well as there is a playground right next to the school, the density of green areas and forest areas around the school draw the attention. The largest green area around the school is Ege University forest area with the area of 29 ha.

Further, the school is quite close to one of the most important belt highways of Izmir. Because of this situation, school environment is highly effected the intense traffic. When we look at the traffic density of the streets around the school, after the belt highway, Cengizhan street is the street with the highest traffic density (Figure 5.6). Besides, because there is a parking lot near the school, there is a substantial degree of vehicle traffic.



Figure 5. 6. Cengizhan Street and Parking Lot Near the School

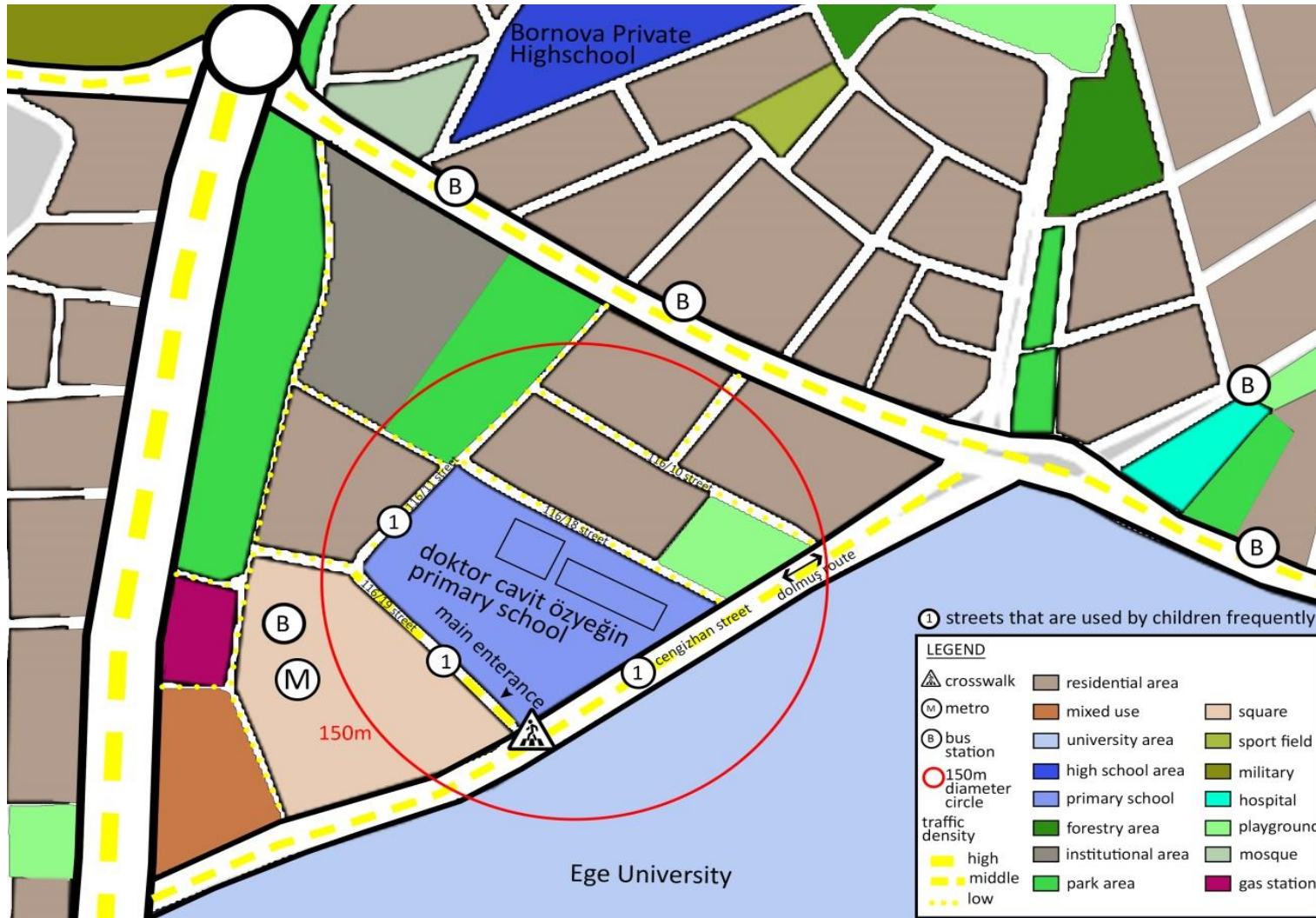


Figure 5. 7. Land use analysis of Doktor Cavit Özyeğin Primary School

According to site observations that are made to collect built environment data, although Cengizhan Street is one of the streets with the highest density of traffic, it is one of the most used streets by children for walking within the area of 150 m diameter circle. Another most commonly used street is the 116/19 street in front of the school. This street is mainly used by children coming from the metro or bus station towards the school. However, it is observed that the least used streets by the children are the narrow streets with no traffic in-between housing estates. On the other hand, it is observed that for children the most important attraction point of the immediate environment is the playground located near the school (Figure 5.8).



Figure 5. 8. Playground Area Near Doktor Cavit Özyeğin Primary School

5.3.2. Kars Halil Atila Primary School

Kars Halil Atila Primary School is located in Erzene Neighbourhood in the commercial centre of Bornova. As seen in Figure 5.10, the school is located in between a significant square of Bornova, commercial areas and a park area. Also, the government house of Bornova is located around the school. Because of mixed-use buildings and institutional buildings, the school is highly affected by the density of traffic, especially in peak hours. The buildings around the school usually consist of 7-8-storey mixed-use buildings. Even though there are a few green areas between buildings, the two most important recreation areas in Bornova which are Aşık Veysel Recreation

Area and Büyükpark, are located walking distance away (500 m) from the school. When we look at the traffic density, because the school is located in the centre of Bornova, streets around the school are mostly used by public transportation vehicles and they increase the traffic density.

There is no playground in the immediate environment of the school. The park area near the school is mostly used by children as a playground (Figure 5.9). The square near the school is one of the most significant attraction points of Bornova named Cumhuriyet square. Since there are many pigeons in the square, it is observed that children usually play with pigeons after school hours (Figure 5.11). Another one of the most important attraction points of the children is the "I Love Bornova" sculpture, which is at the exit of the school (Figure 5.12). It is observed that the most used streets by children around the school for walking are Kazım Karabekir, Fevzi Çakmak and Mustafa Kemal Street although these streets have a substantial degree of vehicle traffic. The other streets within the area of 150 m diameter circle are observed as less used streets by children. These streets are usually narrow streets and located between residential areas.



Figure 5. 9. Park Area Near Kars Halil Atila Primary School

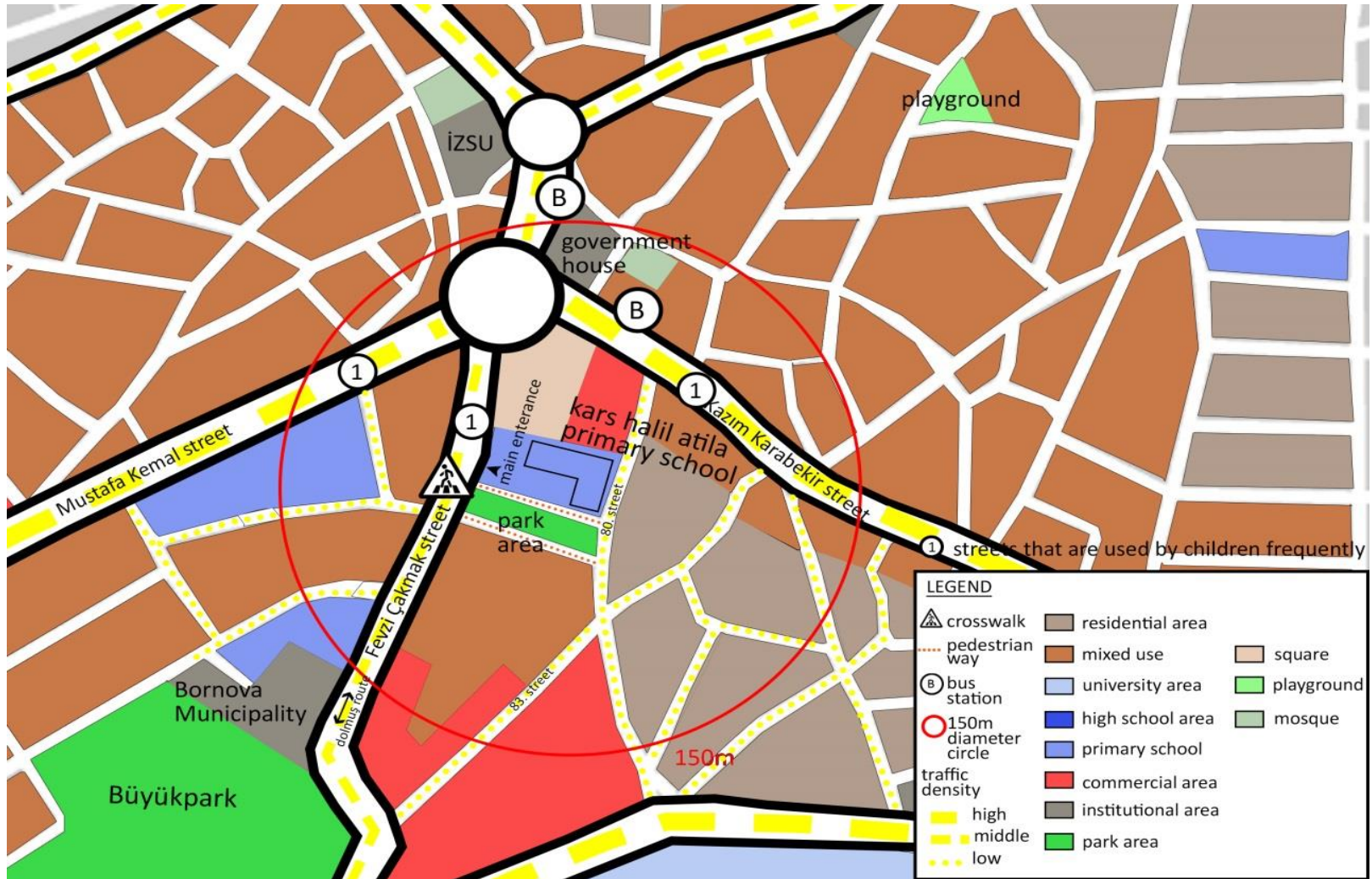


Figure 5. 10. Land use analysis of Kars Halil Atila Primary School



Figure 5. 11. Cumhuriyet Square



Figure 5. 12. "I Love Bornova" Sculpture

CHAPTER 6

CHILDREN'S COMMUTING PATTERNS TO SCHOOLS IN BORNOVA: NEIGHBOURHOODS' AND RESPONDENTS' CHARACTERISTICS

This chapter examines children's commuting patterns to schools according to neighbourhood and respondents (244 students and their 244 parents) characteristics. In order to investigate the relationship between children's commuting patterns and neighbourhood and respondents characteristics, three analyzes which are scoring, regression and descriptive analysis are employed. In order to analyze neighbourhoods characteristics, scoring analysis is employed by using data from site observations. Besides, in order to analyze respondents characteristics, regression analysis is employed by using data from questionnaire studies. Also, to compare respondents' answers according to children's age, gender and school, descriptive analysis is used.

Children's commuting patterns to school are discussed in the case of with and without the supervision of an adult especially parents. Results are examined according to neighbourhood characteristics, children characteristics and parents characteristics. In the following part of the chapter Kars Halil Atila Primary School will be mentioned as KHA and Doktor Cavit Özyeğin Primary School will be mentioned as DCÖ.

6.1. Neighbourhood Characteristics of Two Schools

Built environment characteristics of neighbourhoods are examined according to site observations conducted in the immediate environment of two schools and Yandex traffic condition data. To analyse built environment characteristics of each school surrounding, the most used three streets by children within the area of 150 m diameter circle in school environments are selected. Chosen streets around DCÖ are Cengizhan street, 116/11 street, 116/19 street and chosen streets around KHA are Fevzi Çakmak, Mustafa Kemal and Kazım Karabekir street (Figure 6.1, Figure 6.2). Besides, Figure 6.3 shows the most used streets around immediate surroundings of schools.

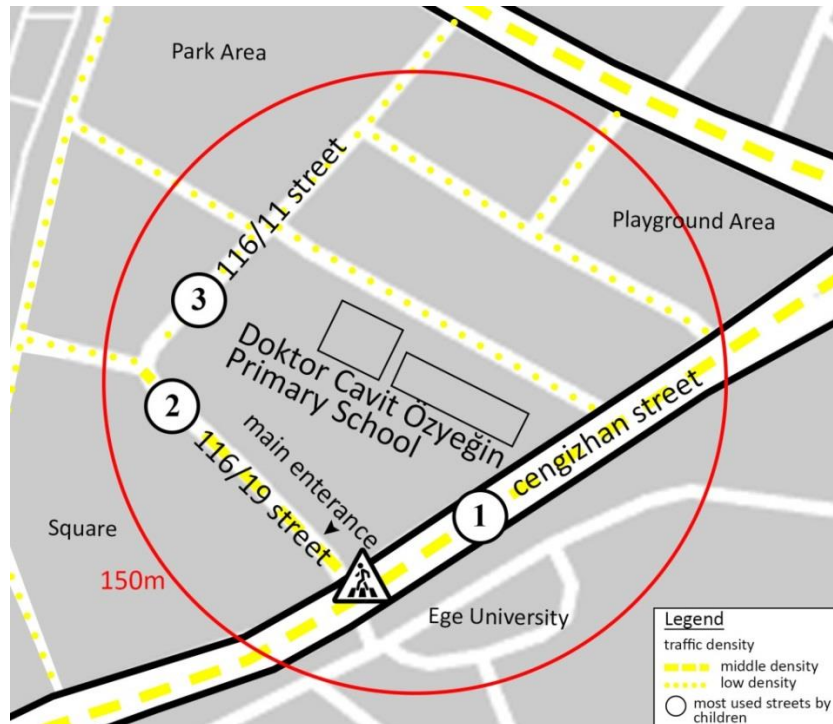


Figure 6. 1. Streets That Are Scored According to Built Environment Characteristics Around DCÖ

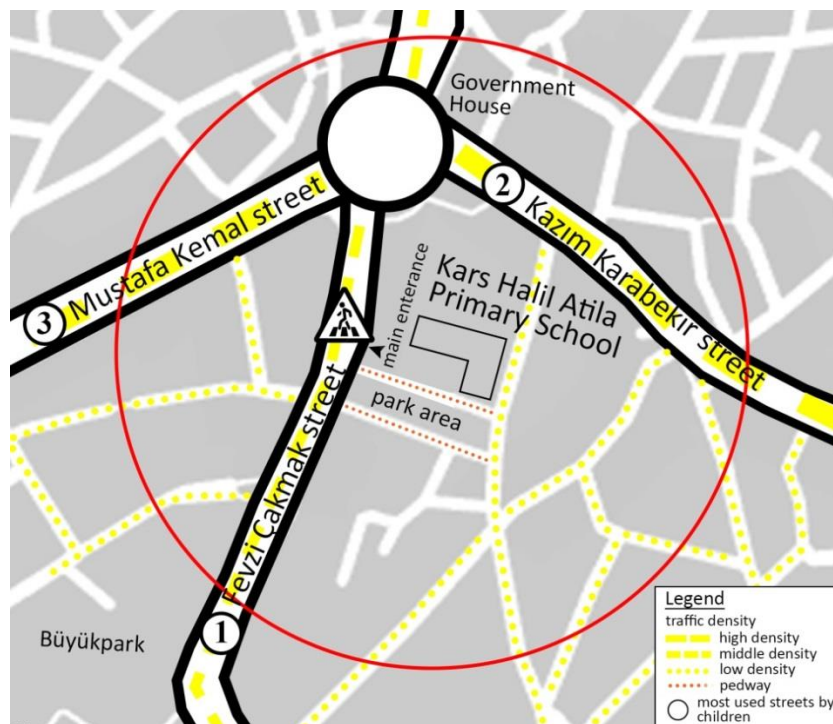


Figure 6. 2. Streets That Are Scored According to Built Environment Characteristics Around KHA

**MOST USED STREETS AROUND DOKTOR
CAVİT ÖZYEĞİN PRIMARY SCHOOL BY
CHILDREN**



**MOST USED STREETS AROUND KARS
HALİL ATİLA PRIMARY SCHOOL BY
CHILDREN**



Figure 6. 3. Most Used Streets Around Schools by Children

(Source: Google Map)

These streets in the immediate environment of each school are scored according to site observations and Yandex data and total scores of three streets in each school environment are obtained. Total scores for streets in each school environment are shown in Table 6.1. Built environment features are scored according to sidewalk and bikeways features, vehicular traffic features, sense of safety features and aesthetical features. These built environment features are determined according to previous studies that are focused on children's school travel.

Table 6. 1. Scores of Built Environment Features Around DCÖ and KHA

Built Environment Features	Measures (observed in 3 streets in both of the schools within the area of 150m diameter circle)	Coding (1: features that increase the usage of the street 0: decrease)	Streets Around DCÖ			Streets Around KHA		
			1	2	3	1	2	3
Sidewalks And Bikeways	What is the width of pedestrian path or sidewalk?	Higher than min standard (1.5m)=1, less than=0	0	0	0	1	1	1
	What is the condition of sidewalk?	Good=1, poor (need of repair)=0	1	1	1	1	1	1
	Are there any features that obstruct the path? (sign, trash can, parked car, etc.)	Yes=0 No=1	0	0	0	0	0	0
	Are there sidewalk amenities on the street? (bench, garbage bin, etc.)	Yes=1 No=0	0	0	0	1	1	0
	Are there signs for pedestrians on the street?	Yes=1 No=0	1	1	0	1	1	1
	Are there bike way along the street?	Yes=1 No=0	0	0	0	0	0	0
Total score of sidewalks and bikeways features of streets in the school surrounding (out of 18)			5			11		
Vehicular Traffic	Is there a bus stop on the street?	Yes=1 No=0	1	0	0	0	0	1
	Is it safe the width of the street?	Higher than 2 lanes=0 equal or less than=1	0	1	1	1	1	0
	Is the speed limit more than 30km/h?	Yes=0 No=1	1	1	1	1	1	1
	Are there enough crosswalk along the street?	Yes=1 No=0	0	1	1	1	1	1
	Is there high density traffic?	Yes=0 No=1	0	1	1	0	0	0
	Are there measures on the street that slow down the traffic? (speed bump, curb extension, etc.)	Yes=1 No=0	1	1	1	1	1	1
Total score of vehicular traffic features of streets in the school surrounding (out of 18)			13			12		
Sense of Safety	Are there "eyes on the street"? (windows at street level, active use on the street level, etc.)	Yes=1 No=0	1	1	0	1	1	1
	Are there any security measures along the street? (camera, etc.)	Yes=1 No=0	1	1	1	1	1	1
	Are there mixed-use buildings along the street?	Yes=1 No=0	0	0	0	1	1	1
	Are there street lights along the street?	Yes=1 No=0	1	1	1	1	1	1
Total score of sense of safety features of streets in the school surrounding (out of 12)			8			12		
Aesthetical Features	Are there trees and plants along the street?	Yes=1 No=0	1	1	1	1	1	1
	Are the buildings along the street well-maintained?	Yes=1 No=0	1	1	1	1	1	1
	Are there vacant lots or abandoned buildings along the street?	Yes=0 No=1	1	1	0	1	1	1
	Are there a lot of litter on the sidewalks?	Yes=0 No=1	1	1	1	1	1	1
Total score of aesthetical features of streets in the school surrounding (out of 12)			11			12		
Land Use and Population Density	Are there parks along the street?	Yes=1 No=0	1	0	1	1	0	0
	Are there commercial and mixed use areas along the street?	Yes=1 No=0	0	0	0	1	1	1
	Are there residential areas along the street?	Yes=1 No=0	1	1	1	1	1	1
	Is the street crowded?	Yes=1 No=0	0	0	0	1	1	1
Total score of land use and population density of streets in the school surrounding (out of 12)			5			10		

Within this analysis built environment features are compared between KHA and DCÖ and actual risk factors around schools are analysed. According to results, built environment features have different scores among the immediate built environment of two schools. Thus, this may affect perceived risk factors for parents and children. For example, while sidewalk and bikeway features around KHA are 11 points, DCÖ are 5 points. While traffic environment features around KHA has fewer points (12) than DCÖ (13), however, this difference is not significant. According to safety features around the school environment, while KHA is scored as 12 points out of 12, DCÖ is scored as 8 points out of 12. Besides, while aesthetic features around DCÖ has 11 points out of 12 points, KHA has 12 points, although this difference is not significant. Moreover, while land use and population density features around DCÖ has 5 points, KHA has 10 points. Therefore, it seems that KHA has more scores in all built environment features than DCÖ, except vehicular traffic features.

6.2. Study Respondents' Characteristics and Children's Commuting Patterns to School

Respondents' answers to the questions are examined according to children's gender, age and school by using descriptive analysis techniques. Respondents' answers to the questions such as what is the distance between home and child's school, how children travel to school and with whom children travel to school are discussed under the related titles. Besides, demographic and socio-economic characteristics of the household, parents' behaviours and perceptions about their children's school travel and parental limitations on children's school travel are examined under the related titles.

Table 6.2 includes the results of linear regression analysis. Within this analysis, children's walking to school and children's independent mobility are analysed according to children characteristics, neighbourhood characteristics and characteristics of the household children living in. The results of the analysis and the significance level of each of these factors related to children's school travel mode are examined according to child characteristics, neighbourhood characteristics and household characteristics in the following part of this chapter.

Table 6. 2. Results of the Regression Model

Dependent Variables	Children’s Walking to School		Independent Mobility to School Without Supervision of Adults	
	<i>B</i>	<i>Sig.</i>	<i>B</i>	<i>Sig.</i>
<i>Child Characteristics (data taken from child’s survey)</i>				
<i>school_KHA</i>	,567	,049**	,100	,438
<i>child_age</i>	-,151	,404	,142	,074*
<i>child_gender_BOY</i>	,250	,394	,335	,008***
<i>child_have_friends</i>	,376	,167	-,071	,557
<i>Neighborhood Characteristics (data taken from parent’s survey)</i>				
<i>distance</i>	-,580	,001***	,052	,530
<i>Parent Characteristics (data taken from parent’s survey)</i>				
<i>year_in_neighborhood</i>	-,259	,197	,100	,081*
<i>neighborhood_relations</i>	-,076	,830	-,038	,808
<i>parents_walking_behaviour</i>	,273	,006***	,038	,402
<i>household_size</i>	-,346	,071*	,102	,235
<i>living_with_both_parents</i>	-,289	,287	,010	,931
<i>children_in_house</i>	,012	,959	-,121	,262
<i>income</i>	-,090	,550	,086	,196
<i>working_people_in_house</i>	,454	,064*	-,166	,130
<i>car_ownership</i>	-,173	,045**	-,438	,058*
<i>mother_car_using_habit</i>	-,142	,072*	-,079	,329
<i>children_phone_ownership</i>	-,034	,331	,279	,066*
<i>children_bicycle_ownership</i>	-,080	,831	-,217	,189
<i>parents_education_level</i>	-,132	,612	-,201	,079*
<i>parents_indoor_public_space_using_habit</i>	,385	,277	-,453	,003***
<i>parents_perception_walking_good_for_child’s_health</i>	,266	,051*	,022	,587
<i>parents_positive_safety_perception_about_neighborhood</i>	,015	,897	-,057	,273
<i>parents_perception_school_close_for_walking</i>	,460	,032**	,199	,001***
<i>parents_perception_child_old_enough_for_walking</i>	-,188	,101	,085	,096*
	R=0,782_R square=0,612		R=0,769_R square=0,591	
R square: The amount of variance in the dependent variable that is accounted for or explained by the independent variable. *** 1%, ** 5%, * 10% indicating the degree of statistical significance.				

- **Who are these children?**

In total, surveys have been completed with 244 children, 138 (57%) girls and 106 (43%) boys (Table 6.3). 61 (49%) female and 64 (51%) male children, totally 125 children participated in the survey conducted in DCÖ (Figure 6.4). In addition, a total of 119 children, 77 (65%) female and 42 (35%) male children, are participated in the survey in KHA (Figure 6.4).

Table 6. 3. Characteristics of the Children

Gender	Female	138
	Male	106
Age	11	7
	10	100
	9	111
	8	26
	Total	244 child

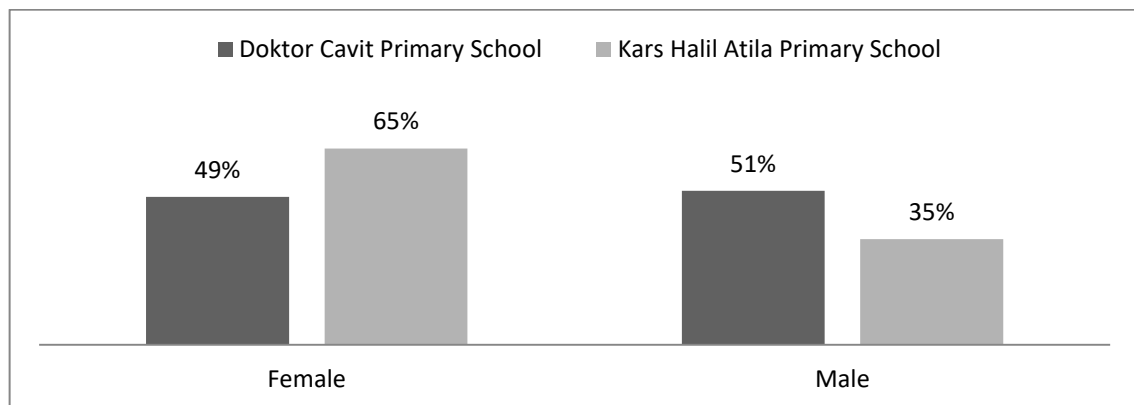


Figure 6. 4. Gender of the Children in DCÖ and KHA

The surveys are conducted with the 3rd and 4th-grade students at the DCÖ and KHA. According to this, 26 of 244 children are 8 years old, 111 are 9 years old, 100 are 10 years old and 7 are 11 years old. When we look at the age distribution by schools, 12 out of 125 children (9%) are 8 years old, 51 (41%) are 9 years old, 57 (46%) are 10 years old and only 5 (4%) are 11 years old in DCÖ. In KHA, of 119 children

respondents, 14 (12%) are 8 years old, 60 (50%) are 9 years old, 43 (36%) are 10 years old and only 2 (2%) are 11 years old (Figure 6.5). As it is understood, the majority of the children who participated in the surveys are 9 and 10 years old children.

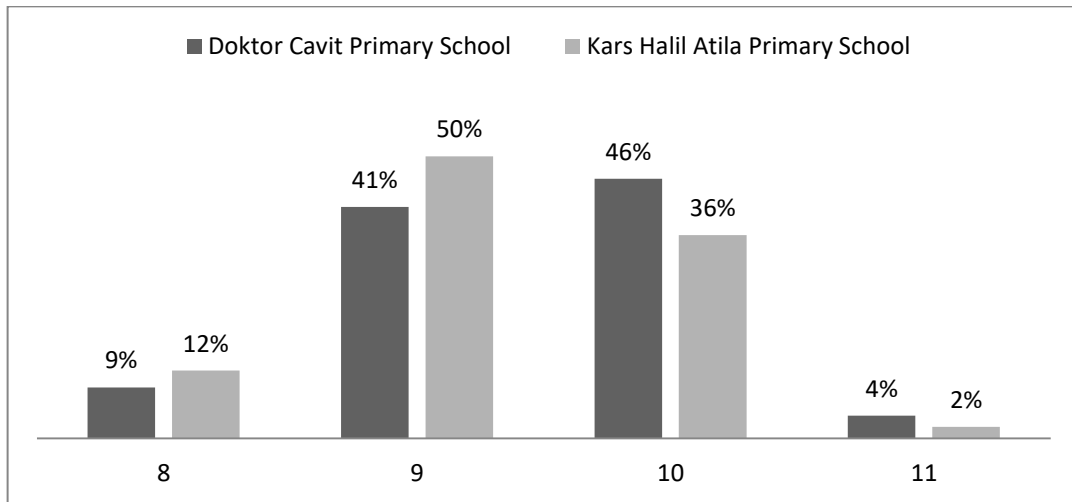


Figure 6. 5. Age of the Children in DCÖ and KHA

- **What is the distance between children’s school and home?**

Each child's parents are asked to mark the location of their house on the given map within the 200m, 400m and 600m diameter circles (see Appendix C). According to the analysis of the answers, as seen in Table 6.2, the distance factor has the highest level of significance that effect on children's school travel mode choice among the other factors ($p=0,001$). When the distance between children’s home and school is increasing, children’s tendency to walk to school is decreasing. However there is an important difference is found between answers in KHA and DCÖ. While more than half of children in DCÖ (52%) reside in places more than 600 meters away from the school, less than half of the children in KHA (37%) reside in places more than 600 meters away from the school (Figure 6.6). This result is particularly important when considering the different characterized environments may affect the distribution and proximity of primary schools in the neighbourhoods and this may lead to a lack of schooling around the home.

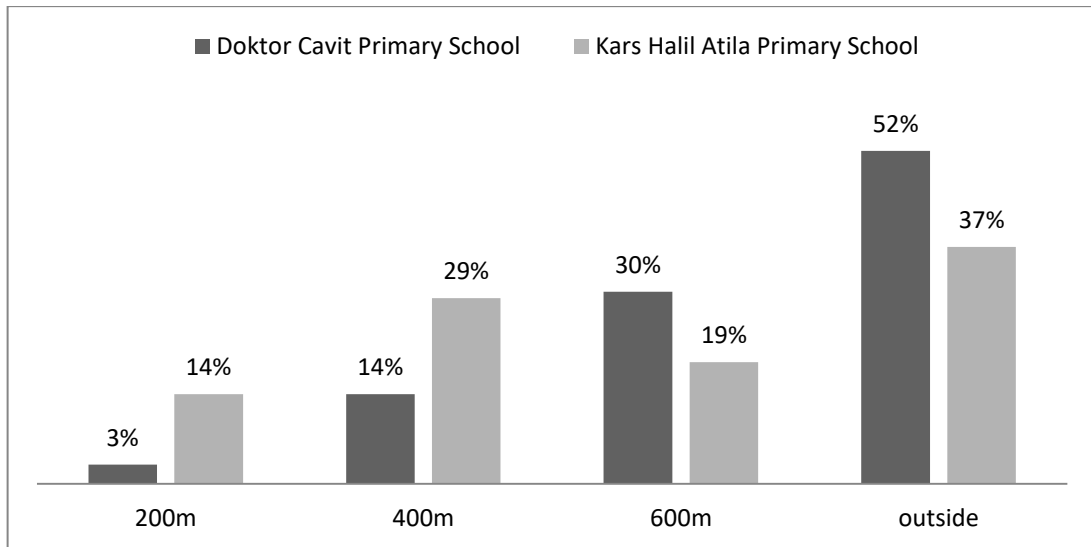


Figure 6. 6. Distances Between Children's Home and School

- **How do children travel to school?**

59 (24%) of all students travel to school by walking, 9 (4%) of them by public transportation vehicles, 129 (53%) by school bus and 47 (19%) by car. As it seems the majority of 244 children use motorized transportation modes to travel to school while only 24% of children use non-motorized modes. Walking to school among children changes according to children's age, gender and school. According to these comparisons, while only 7% of children in DCÖ travel to school by walking, 42% of children in KHA travel to school by walking (Figure 6.7). On the other hand, there are no children in both schools travel to and from school by cycling. As it is understood from this point, the rate of walking to school among children in KHA is higher than that of DCÖ. Also in regression analysis, it seems that children's tendency to walk to school increase in KHA ($p < 0,05$). This difference between two schools may be explained with the situation that relatively more children in KHA who live in places less than 600 meters away from to school. Also, it may because neighbourhood features around KHA are more convenient for children to walk to school.

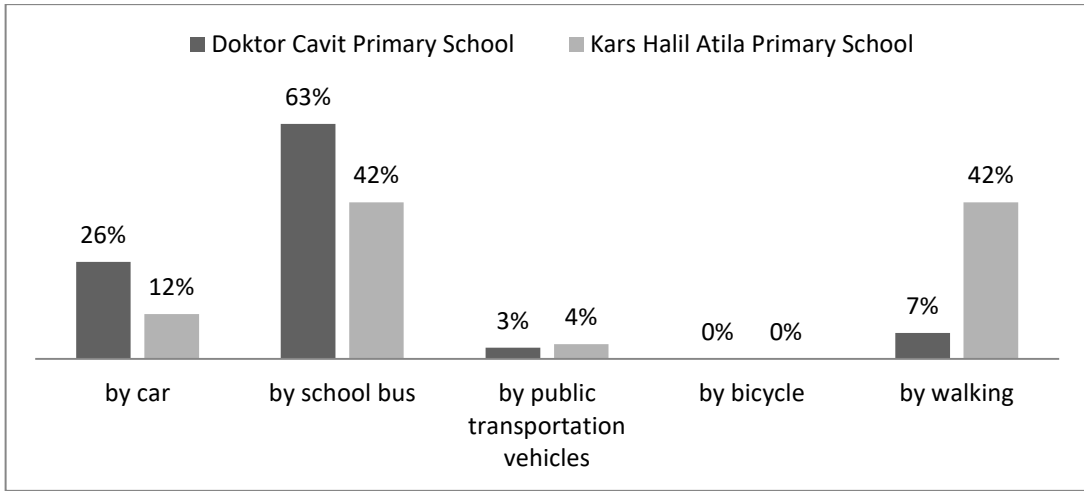


Figure 6. 7. Children's Mode of School Travel According to School Among All Respondents

When looking at differences in school travel mode according to children's gender, while there is no significant association between gender and tendency to walk, the number of female children who travel to school by car (21%) is more than those males children (17%) among 244 children (Figure 6.8). On the other hand, while 7% of male children use public transportation vehicles to travel to school, only 1% of female children travel to school by public transportation vehicles. In spite of these differences, most of the children both girl and boy travel to school by school bus.

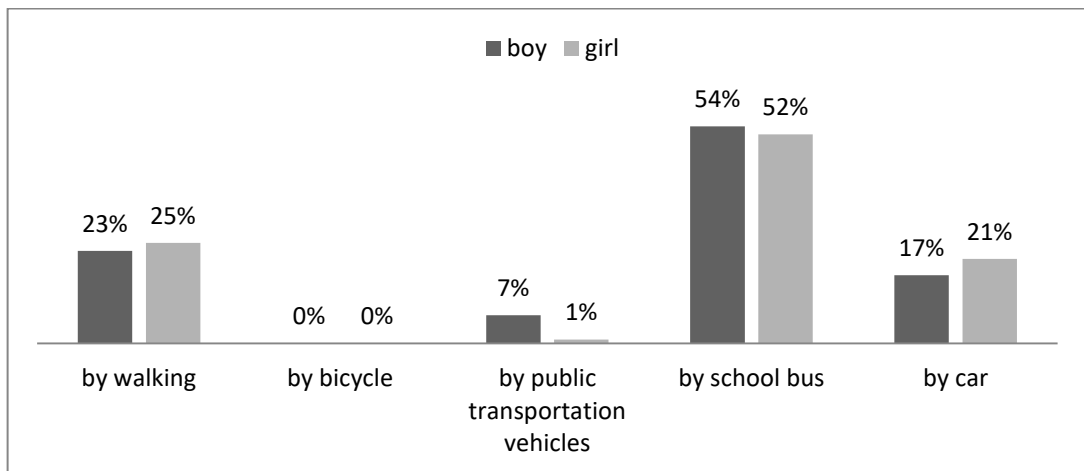


Figure 6. 8. Children's Mode of School Travel According to Gender Among All Respondents

On the other hand, the majority of 10-11 years old students travel to school by school bus while less than half of 8-9 years old student travel to school by school bus. Also, it seems that younger children (8-9 years old) are walking to school (29%) more than older children (10-11 years old) (18%) (Figure 6.9), although there is no significant relationship between children’s age and their choice of walking to school. It may be because the age difference between children respondents is not enough considerable (8-11 years old children).

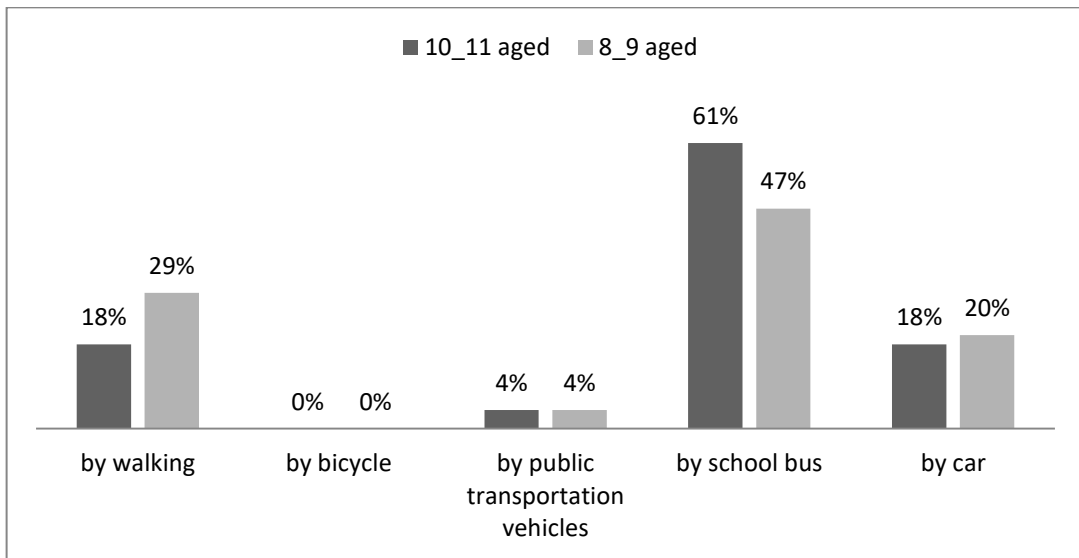


Figure 6. 9. Children’s Mode of School Travel According to Age

- **With whom do children travel to school?**

When 244 children are asked with whom they commute to school, almost half of them (44%) indicated that they commute to school with their family members, although only 3% of them commute alone.

However, if we look at differences according to school, gender and age, there are some significant points among them. For example, while the majority of children (63%) in DCÖ commute to school with school bus, the majority of children (54%) in KHA commute to school with their family members (Figure 6.10). As it is understood from the answers, it is seen that almost all of those children who commute to school by walking in KHA commute to school with their family members. According to results,

almost all children in both schools are dependent on the supervision of adults in school travel. Moreover, in both schools, almost none of the children commute to school alone.

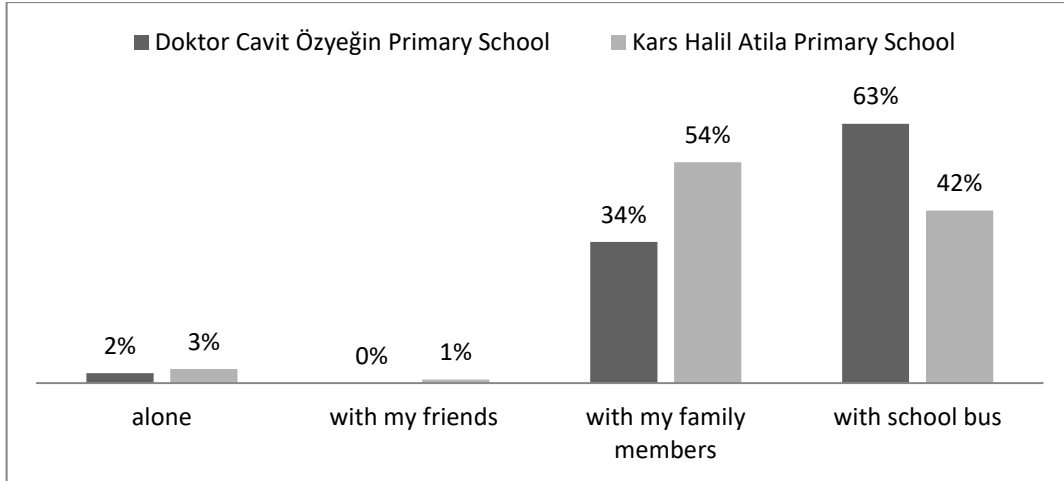


Figure 6. 10. Children's Independent School Travel in DCÖ and KHA

While 42% of all boy respondents commute to school with their family members and 5% of them alone, 46% of all girl respondents commute to school with their family members and only %1 of them alone (Figure 6.11). According to results, it seems that girls are more dependent on adults (especially their parents) in mode choice to travel to school than boys ($p < 0,01$) (Table 6.2).

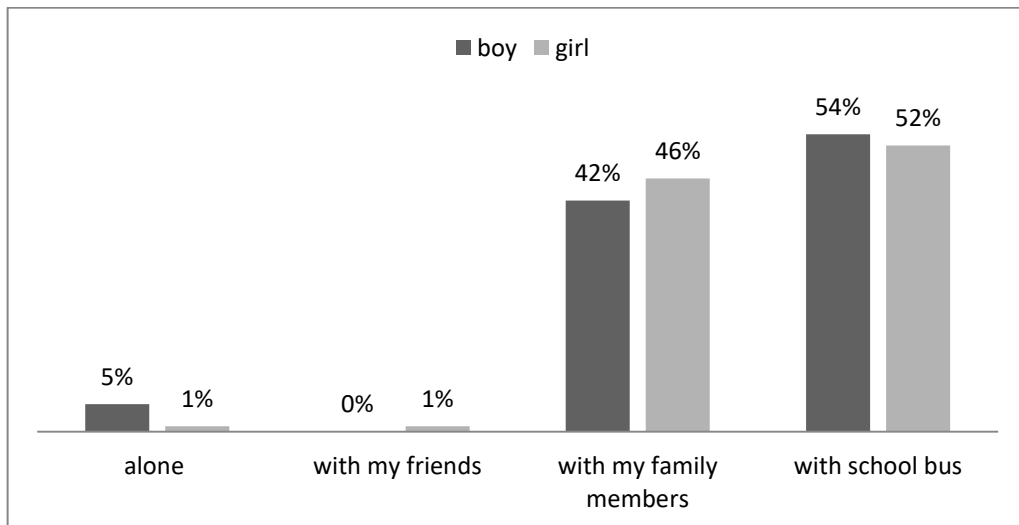


Figure 6. 11. Children's Independent School Travel According to Gender

Furthermore, while less than half of 10-11 years old children respondents (36%) travels to school with their parents, half of the 8-9 years old children respondents (50%) stated that they travel to school with their parents (Figure 6.12). In addition, while 61% of 10-11 years old children travel to school with school bus, 47% of 8-9 years old children travel to school by school bus. Associatively, according to regression analysis results, a positive relationship between the increase in age and independent travel to school without the supervision of adults especially parents is observed ($p < 0,1$) (Table 6.2).

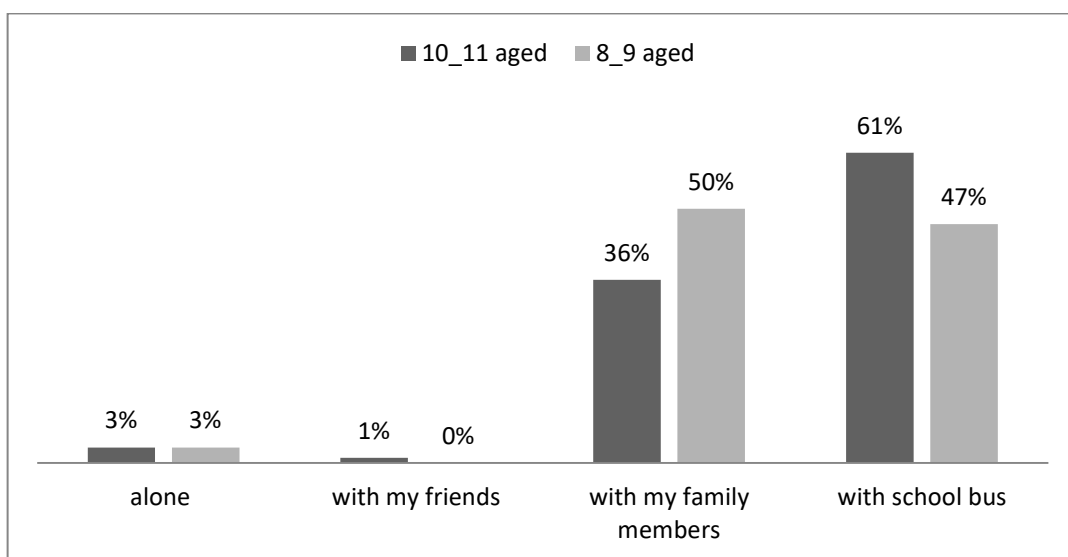


Figure 6. 12. Children's Independent School Travel According to Age

- **What are the demographic and socio-economic characteristics of the household?**

A positive significant relationship between the children in the households who lived more years in the neighbourhood and independent commuting to the school without the supervision of adults especially parents are observed ($p < 0,1$). This may be because of that parents who live in the neighbourhood more years are familiar to the environment and feel comfortable to allow their children travel to school alone.

Although, according to regression results there is no relationship between neighbourhood relationships of the household and children's active and independent

travel to school, according to descriptive analysis results, a difference between answers of parents in two school is observed. Relatively a higher number of parents in DCÖ than KHA indicate that they have good neighbourhood relationships (87%, 71%, respectively).

According to regression analysis results, children with one or more car in their household and children whose mothers used the car more than the fathers are found more likely to commute to school by car ($p < 0,05$ and $p < 0,1$ respectively). In addition, it is found that children with at least one car in their household are more dependent on adults (especially their parents) in the choice of school travel mode ($p < 0,1$). Moreover, a difference in the household's car ownership among the two schools is observed according to descriptive analysis results. While the majority of the households in DCÖ (66%) have at least one car, 54% of parents in KHA have at least one car (Figure 6.13). Therefore, this result may be interpreted as one of the reasons for the higher proportion of children in DCÖ who are driven to the school.

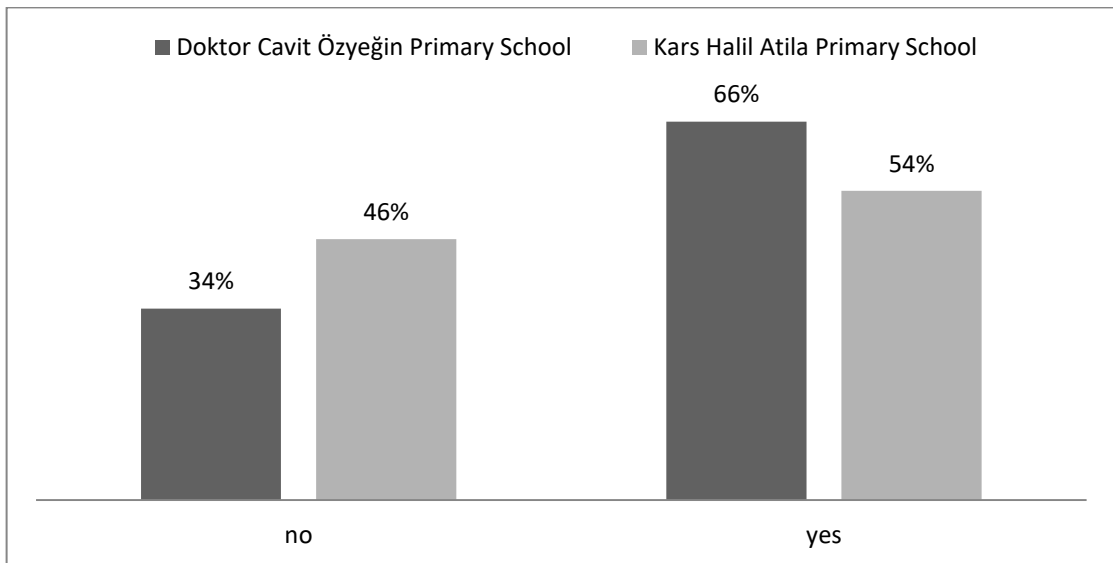


Figure 6. 13. Car Ownership in DCÖ and KHA

According to findings from this research, the household income is not associated with mode choice for school transportation. In addition, it is found that children who have a phone have more independent mobility without the supervision of adults

especially parents in their school travel ($p < 0,1$). Also, in parallel with previous researches, children whose parents have more education level are more likely to be dependent on adults (especially their parents) in school travel ($p < 0,1$).

Further, it appears that a negative relationship between the number of people lives in the house and children's tendency to walk to school is found ($p < 0,1$). When the number of people lives in the house is increasing, children's tendency to walk to school is decreasing. This is consistent with previous research that also reports that when the number of people in the house increases, the probability of one of the family members drive children to school may increases. On the other hand, in contrast to previous researches, when the number of working people in the house increases, children's tendency to walk to school increases ($p < 0,1$). This may be a result of the presence of family members who commute to work by walking and on the way to work they can escort children to school.

- **What are the parents' walking behaviours in the neighbourhood and perceptions about children's school travel?**

Parents' own walking behaviours are also found to affect children's school travel mode (Table 6.2). It is found that children of parents who regularly walk in the neighbourhood are more likely to commute to school by walking ($p < 0,01$). Also, parents are asked to answer a question about their open space usage habits. According to results, it is found that children whose parents have a tendency to spend time in outdoor public spaces with their children rather than indoor public spaces are more likely to be independent on adults (especially their parents) in their school travel ($p < 0,05$). According to descriptive analysis results, while 93% of parents who have male children like to spend time in outdoor public spaces with their children, parents who have female children like to spend time in outdoor public spaces in a fewer percentage (%73) (Figure 6.14).

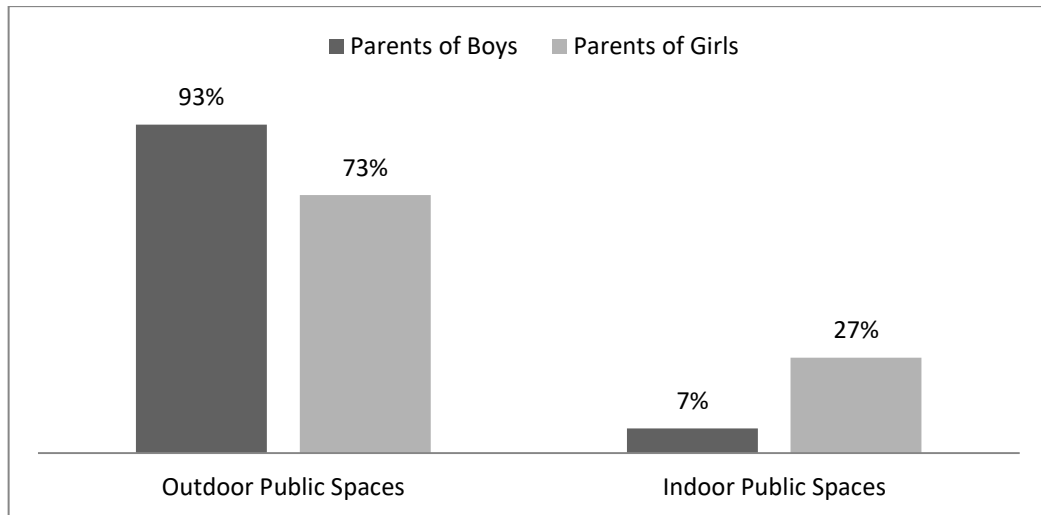


Figure 6. 14. Parent's Outdoor Public Space Use Behaviour

Furthermore, parents are asked to evaluate the given statements about children's school travel according to their perceptions. According to regression results (Table 6.2), children whose parents think that walking to school is good for their children's health and distance between the school and home is walkable for their children are more likely to commute to school by walking ($p < 0,1$, $p < 0,05$, respectively). Besides, children whose parents think that the distance between home and school is walkable for their children are more likely to have independent commuting to school without the supervision of adults (especially their parents) in school travel ($p < 0,01$).

Further, according to descriptive analysis, there are differences between parent's perceptions about children's school travel among the two schools. It is observed that the frequency of the statement that "walking to school is good for my child's health" in KHA (34%) more than in DCÖ (23%) (Figure 6. 15). Further, a higher proportion of parents believe that their child's school is close for walking to school for children in KHA than in DCÖ (18%, 7%, respectively). Supportively, while almost half of the parents in DCÖ (42%) think that driving children to school is more convenient for them, only 19% of parents in KHA think like that. These results may be because of that there are more children in DCÖ than in KHA who live in places more than 600m away from school.

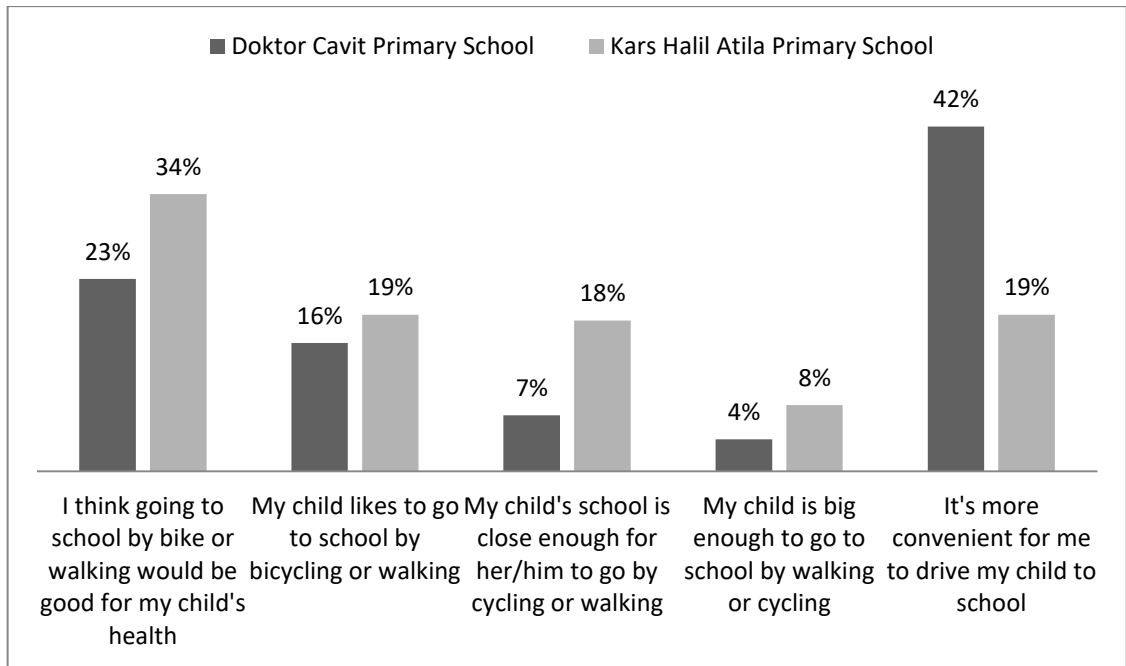


Figure 6. 15. Parents Who Say "Absolutely I Agree" to the Statements

Besides, while 12% of parents who have 10-11 years old children think that their child is big enough to travel to school by walking, only 3% of parents who have 8-9 years old children think that their child is big enough to travel to school by walking (Figure 6. 16).

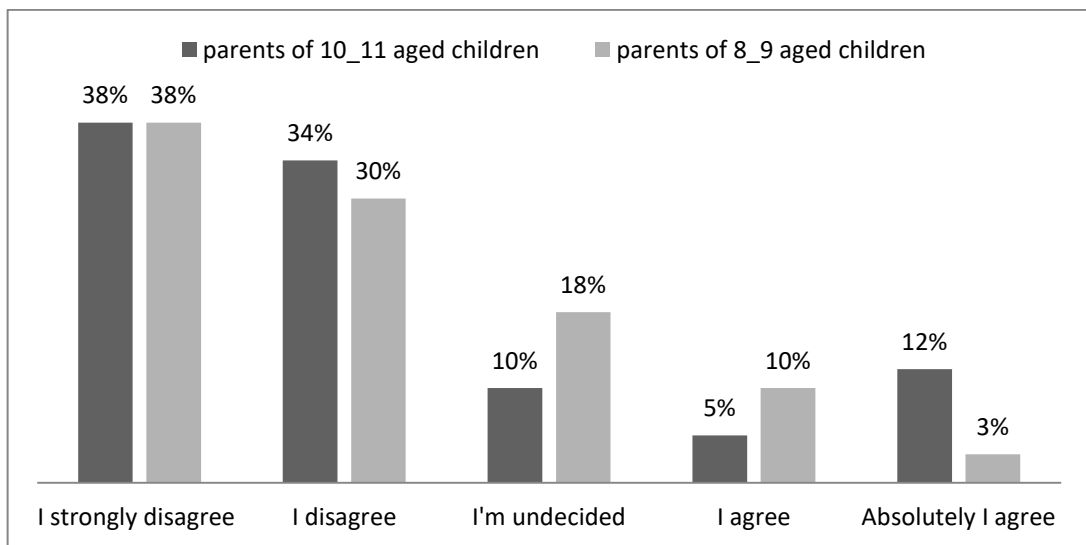


Figure 6. 16. Parents' Answers to the Statement "My child is big enough to go to school by walking or cycling" According to Their Children's Age

Also, while parents who have girls are relatively more negative (42%) than parents who have boys (34%) in the thought that their child is big enough to walk to school (Figure 6. 17).

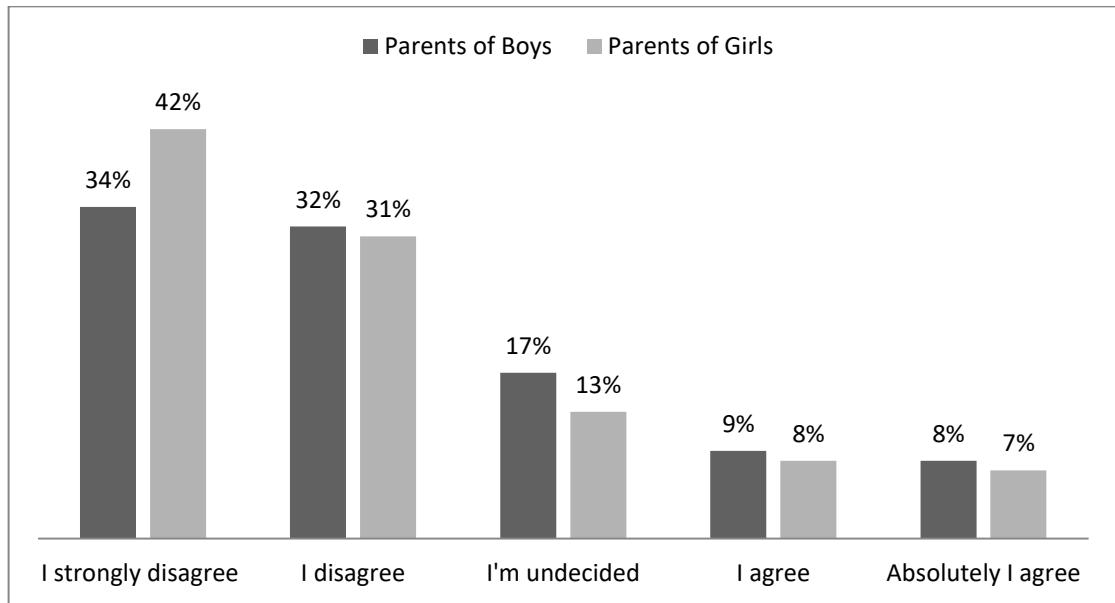


Figure 6. 17. Parents' Answers to the Statement "My child is big enough to go to school by walking or cycling" According to Their Children's Gender

- **What are the parental limitations on children?**

One of the most important research points of this study is to examine parental limitations on children's spatial mobility in the neighbourhood. In order to analyse in which level parents affect children's independent mobility in the environment, parents are asked to answer the question "which places do you allow your children to go alone?". According to results, as seen in Figure 6.18, the options which are "playing on the street" and "going to market" are some of the most chosen options by parents of 244 children. On the other hand, almost none of the parents mark "to get on the bus", "playing out after dark" and going to the commercial centre" options.

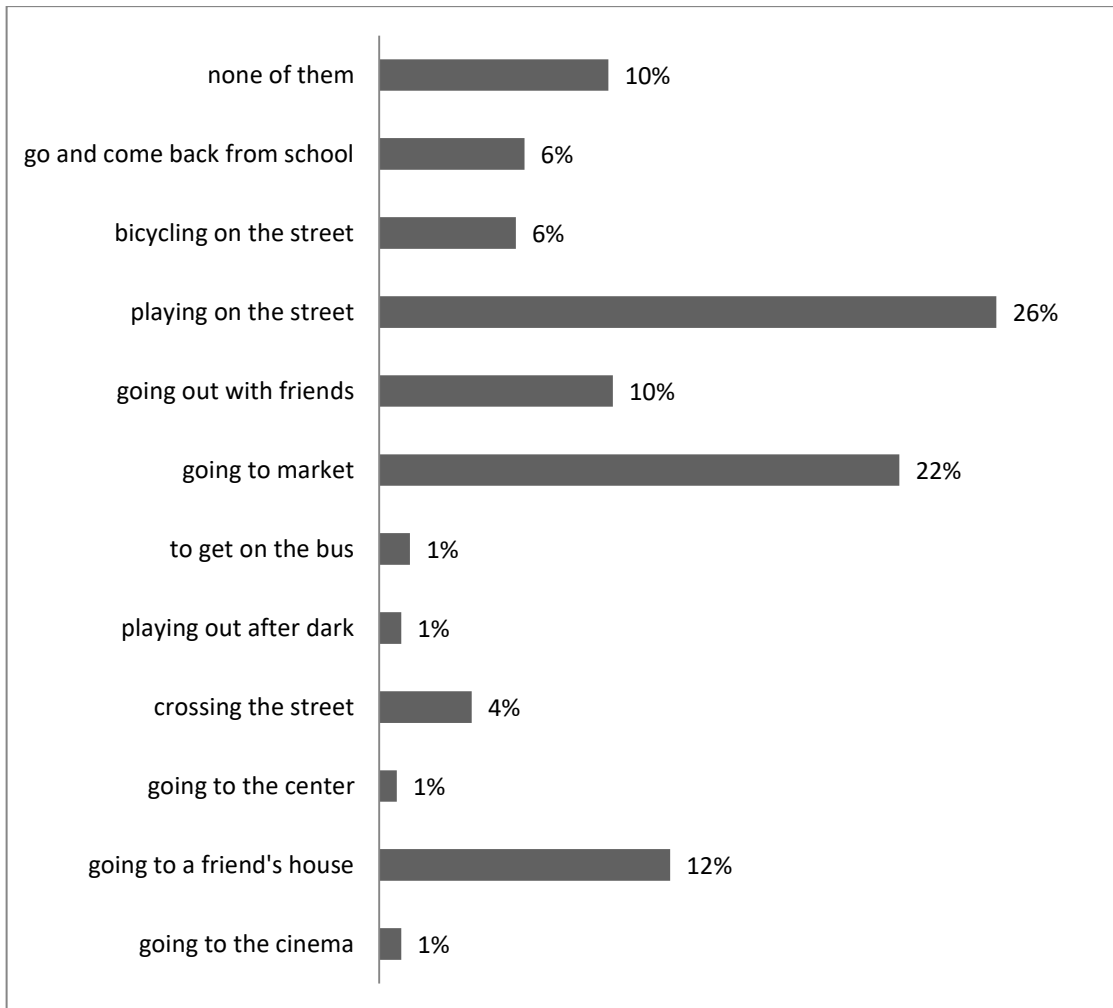


Figure 6. 18. Places in Which Children Have Permission to Go Alone

When examined how parental licenses differ according to the school environment, child's age and gender, it seems that children in KHA have more limitations about independent commuting to the school rather than children in DCÖ (4%, 2%, respectively). When considering that children in KHA live in places closer to the school than children in DCÖ, this result is not surprising. Besides, while 15% of parents in KHA identify that they do not allow their children to go anywhere alone in the neighbourhood, only 6% of parents in DCÖ identify that they do not allow their children to go anywhere alone in the neighbourhood (Figure 6.19).

As seen in Figure 6.20, while parents of female children state that they do not allow their children to go anywhere in the neighbourhood at the rate of 14%, parents of male children mark this option at the rate of 5%. As can be understood from Figure 6.20, girls mostly have more restricted by their parents than boys both in school travel and mobility around the neighbourhood.

In parallel with gender differences, age differences also have a significant impact on parental restrictions on children. As can be seen from Figure 6.21, 8-9 years old students have more limitations to go to places in the neighbourhood on their own than 10-11 years old students (16%, 3%, respectively). Further, while parents of 10-11 years old children state that they allow their children to go to and come back from school alone at the rate of 8%, parents of 8-9 years old children choose this option at the rate of 4%.

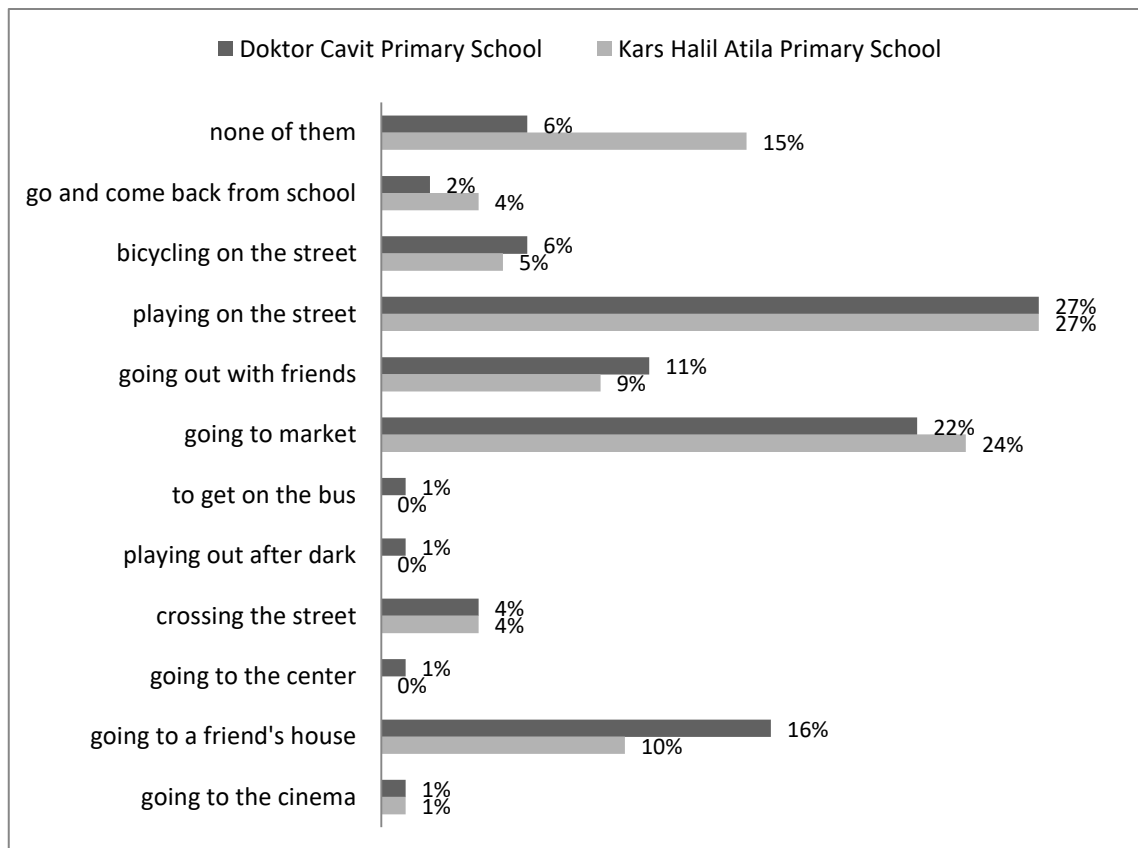


Figure 6. 19. Places in Which Children Have Permission to Go Alone According to Children's School

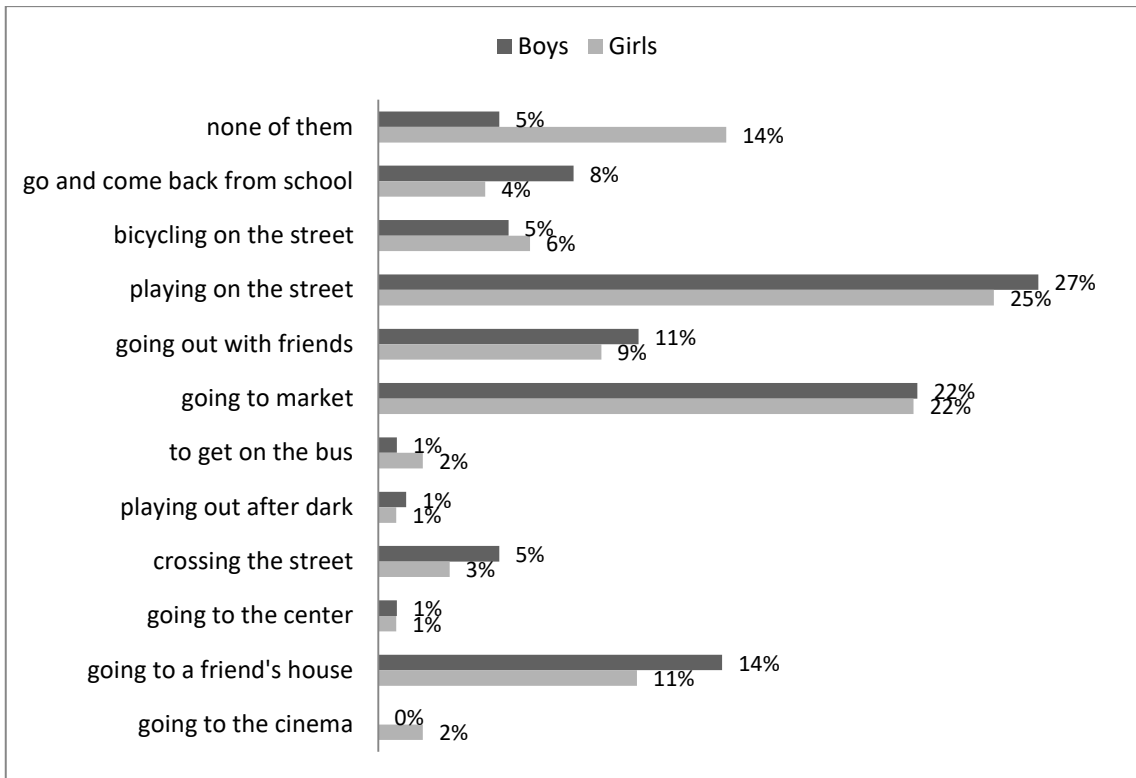


Figure 6. 20. Places in Which Children Have Permission to Go Alone According to Children's Gender

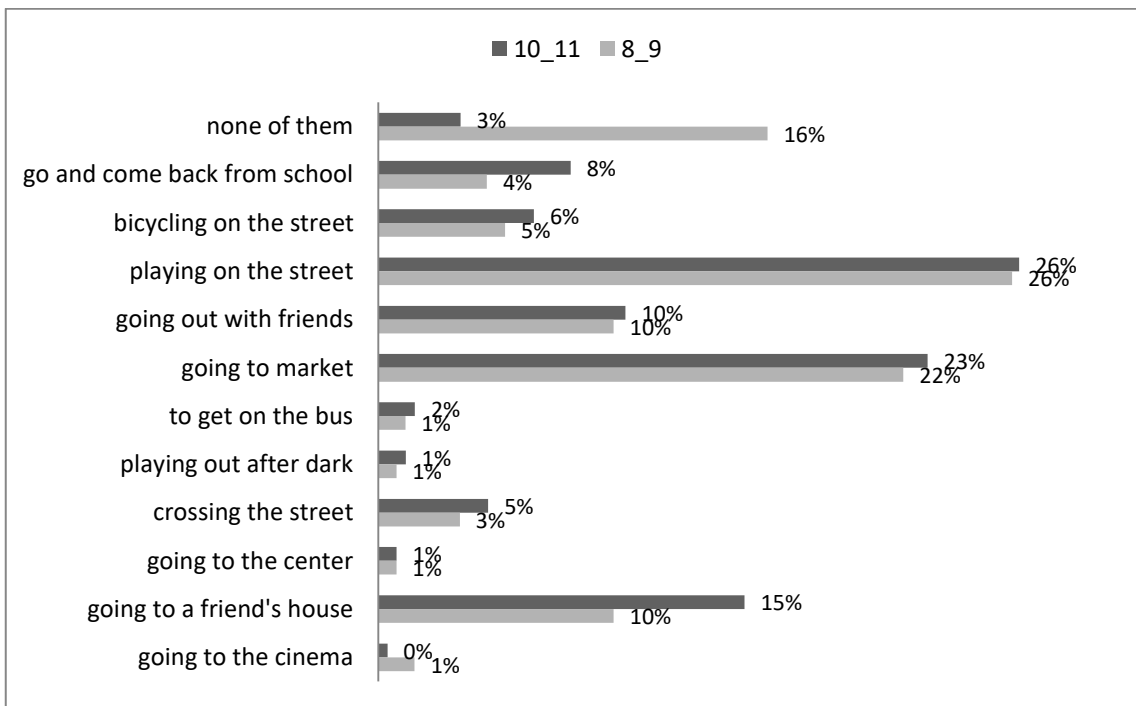


Figure 6. 21. Places in Which Children Have Permission to Go Alone According to Children's Age

6.4. Summary

This chapter details the social and physical factors that affect children's active school travel within the example of 8-11 years old primary school students in two schools of two neighbourhoods in Bornova/Izmir. Within the context of questionnaire studies with 240 students and their parents and site observations around the immediate surroundings of schools, results of descriptive analysis and regression analysis are presented and affecting factors of children's travel mode to school are discussed.

According to results, the most influential factor which affects children's active commuting to the school found as the distance between children's home and the school. Also, it is found that children in the two schools have different rates of walking to school. This may be a result of different characterized school environments have effect on children's mode choice of commute to school. Further, it is seen that female and younger children are more restricted by their parents than male and older children. Another significant influence is parental perceptions and behaviours about the built environment. It is found that children whose parents have more positive thoughts of the children's active travel to school and independent mobility in the neighbourhood are more likely to commute to school by walking. Correspondingly, children who live in the same neighbourhood for so long tend to be more independent of their parents in school travel than their counterparts. Besides, it is found that household car ownership has a negative effect on children's active and independent commuting to school. Consequently, Table 6.4 shows the differences and similarities between findings of this study and expected influential factors which affect children's travel mode to school.

Table 6. 4. Expected Influential Factors Which Affect Children’s Commuting Patterns to School and Findings of This Study

Influential Factors Which Affect Children’s Commuting Patterns to School		Expected Impacts According to Literature	Findings of This Study
Parents’ Characteristics	Increase in years live in neighbourhood	+	+
	Increase in neighbourhood relations	+	insignificant
	Parents walking habit	+	+
	Increase in household size	unclear	-
	Living with both parents	+	insignificant
	Number of children in the house	-	insignificant
	Increase in income	-	insignificant
	Number of working people in the house	-	+
	Car ownership	-	-
	Mothers car using habit	-	-
	Child bicycle ownership	+	insignificant
	Child phone ownership	+	+
	Increase in parental education	-	-
	Parents outdoor space use habit	+	+
Parent’s supportive perception about active commuting to school	+	+	
Children’s Characteristics	Increase in Age	+	+
	Gender (boy)	+	+
	Children have friends in neighbourhood	+	insignificant
Neighbourhood Characteristics	Increase in distance between home and school	-	-

CHAPTER 7

PERCEIVED RISK FACTORS AND EXPECTATIONS ABOUT SCHOOL SURROUNDINGS IN BORNOVA

According to the analysis on neighbourhood characteristics of two schools, the following part of this chapter is aimed at how the actual risk factors in the immediate built environment of each school effect on children's and parents' perceptions of the built environment. Besides, this study assumes that children and their parents mostly have not a similar view of their environment and thus children's perceptions and expectations about the built environment need to be investigated more. Therefore this chapter is aimed to indicate parents' and especially children's perceptions and expectations about the built environment of the schools.

7.1. Children's and Their Parents' Perceived Risk Factors About School Surroundings

- **Parents' Perceived Risk Factors About School Surroundings**

Parents are asked to evaluate the statement "I think my neighbourhood is safe enough for my child to go to school by bicycling or walking alone". According to descriptive analysis results, while only 2% of parents in KHA identify that they absolutely agree to this statement and 28% of them identify that they strongly disagree to this statement, 9% of parents in DCÖ identify that they absolutely agree to this statement and 21% of them identify that they strongly disagree to this statement (Figure 7.1).

Analysing differences among parents' perceptions about their children's safety in the built environment according to their children's age and gender is seen quite significant for this research.

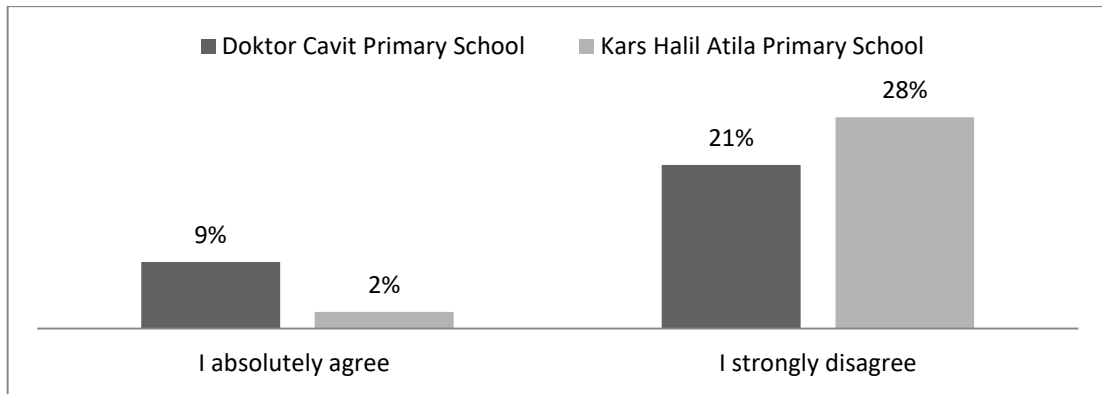


Figure 7. 1. Parents' Answers to the Statement "I think my neighbourhood is safe enough for my child to go to school by bicycling or walking alone" According to Their Children's School

As expected some important differences are found. For example, parents of 10-11 years old and male children think more positively that their neighbourhood is safe enough for their children to walk to school alone than parents of 8-9 years old and female children (Figure 7.2, Figure 7.3).

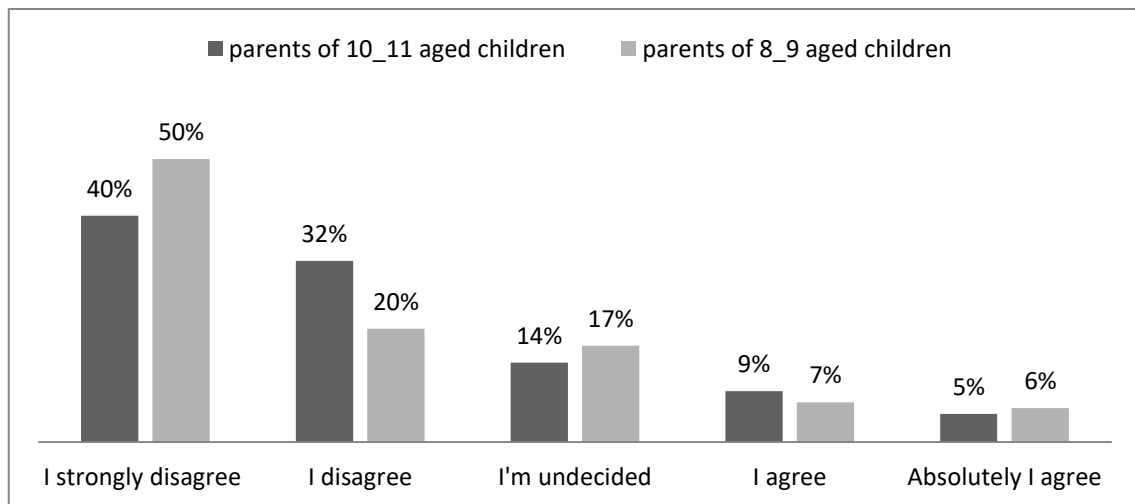


Figure 7. 2. Parents' Answers to the Statement "I think my neighbourhood is safe enough for my child to go to school by bicycling or walking alone" According to Their Children's Age

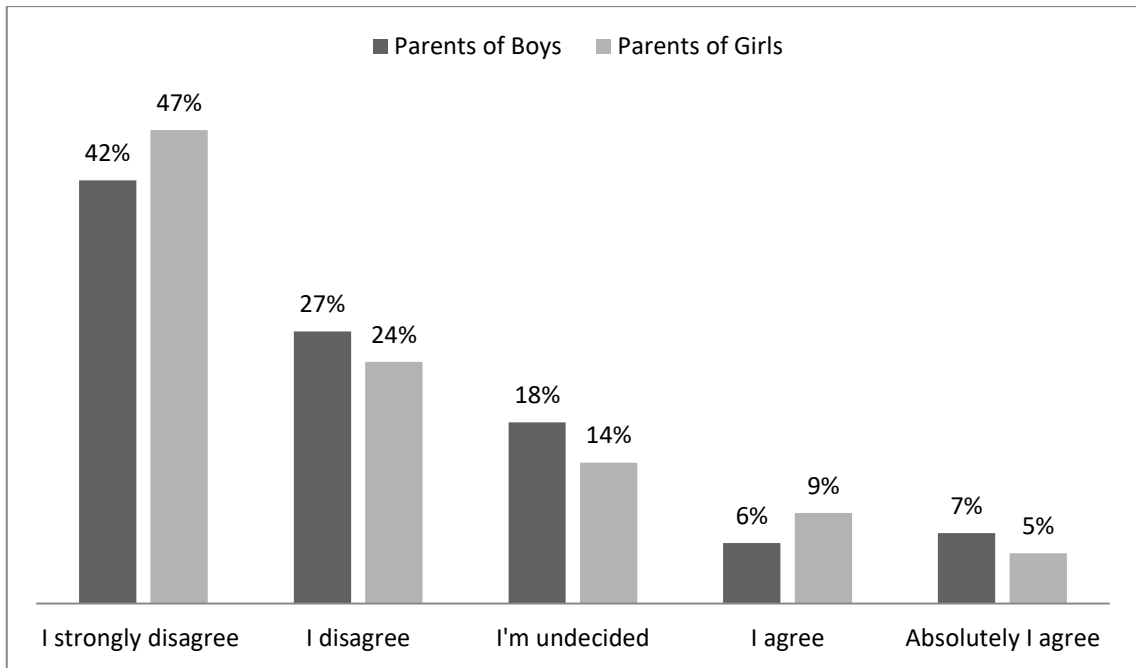


Figure 7. 3. Parents' Answers to the Statement "I think my neighbourhood is safe enough for my child to go to school by bicycling or walking alone" According to Their Children's Gender

As seen in Figure 7.4 and Figure 7.5, it is observed that parental perceptions of the traffic environment are more negative than their children. Thus, it means that children do not encounter traffic environment problems as normally parents think that. However, children are more concerned about narrow and empty streets than their parents in each school. In addition, children's and parent's concerns can differ according to the immediate built environment characteristics of schools. For example, while underpasses and overpasses seem to a worrisome factor for parents in DCÖ (8%), this factor has a fewer percentage (3%) in terms of parents in KHA. This is perhaps because there is an overpass near DCÖ. Parents are also more concerned about stray dogs than children in each school. Moreover, while, walking through a crowded street is seen as a concerning factor for children than for parents in DCÖ (14%, 10%, respectively), this factor appears as a more worrying factor for parents than for children in KHA (15%, 12%, respectively).

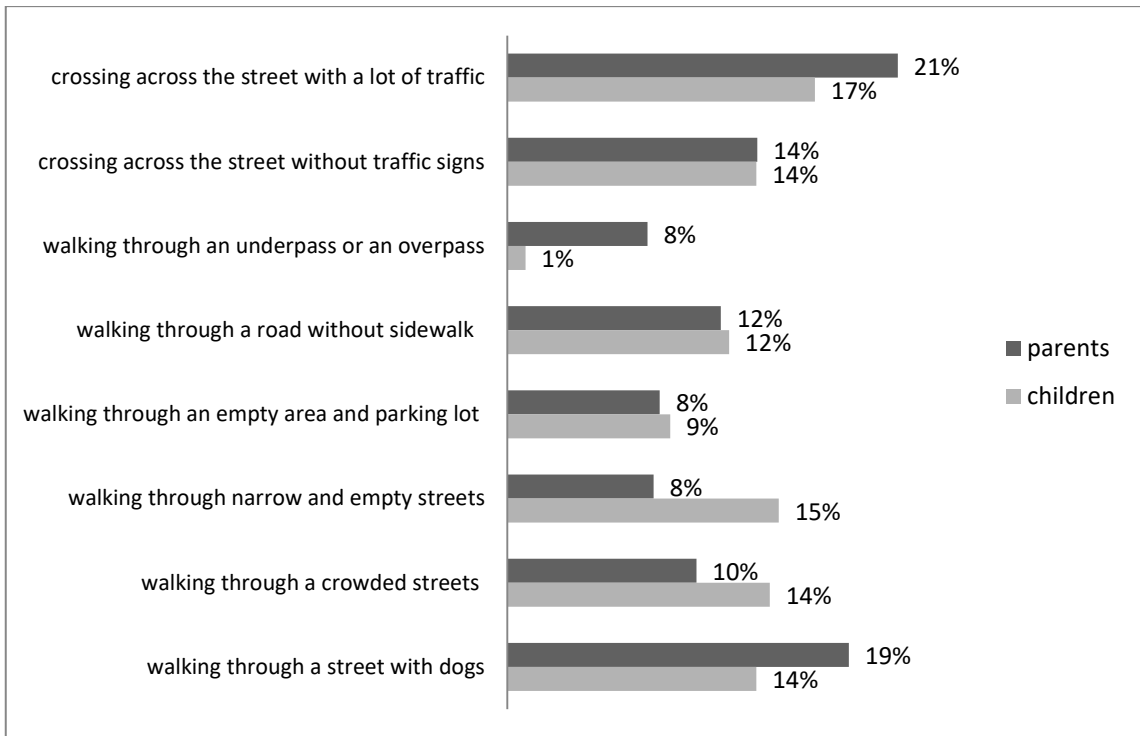


Figure 7. 4. Perceived Risk Factors for Parents and Children in DCÖ

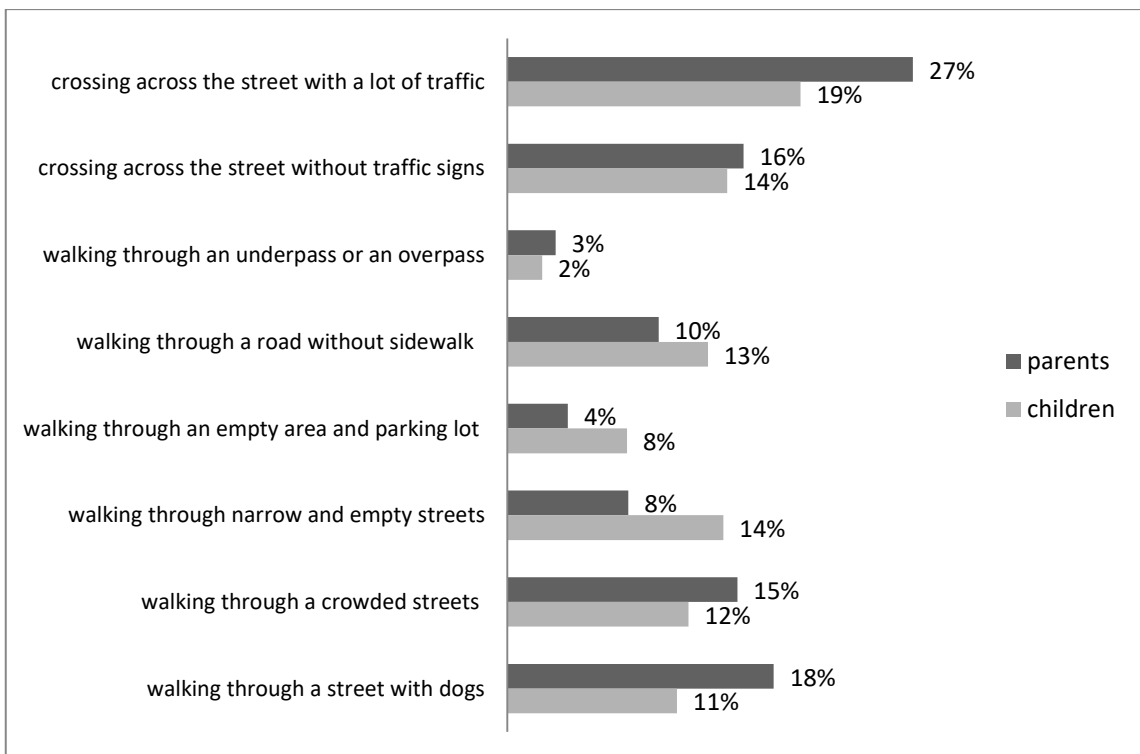


Figure 7. 5. Perceived Risk Factors for Parents and Children in KHA

When parents are asked the reasons for concerns about their children’s active school travel, parents’ answers are unfamiliar people, stray dogs, vehicular traffic and distance between home and school. Parents in each school are most concerned about vehicular traffic and after unfamiliar people (Figure 7.6). Figure 7.6. shows that the distance between home and school is a more concerning factor for parents in DCÖ than KHA (16%, 4%, respectively). Since more children in DCÖ than KHA live in places more than 600m away from school, this result seems confirmative. On the other hand, as it is seen in Table 6.1 traffic environment features entail a risk for children in KHA more than children in DCÖ. In parallel with this, parents in KHA are more concerned about traffic-related features than parents in DCÖ (%48, %40, respectively) (Figure 7.6).

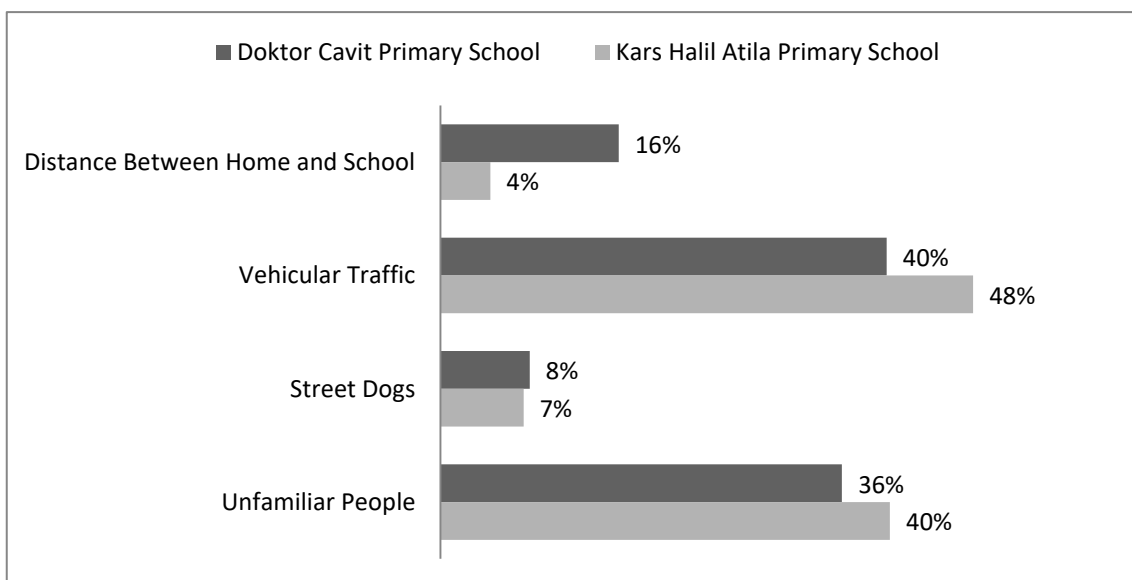


Figure 7. 6. Parent’s Concerns About Their Children’s Active School Travel in DCÖ and KHA

Results show that there are differences between the answers of parents who have 8-9 years old children and 10-11 years old children (Figure 7.7). For example, while parents of younger children are more concerned about vehicular traffic (45%, 43%, respectively) and unfamiliar people (39%, 37%, respectively) around the school neighbourhood, parents of older children are more concerned about distance between home and school than parents of younger children (12%, 8%, respectively).

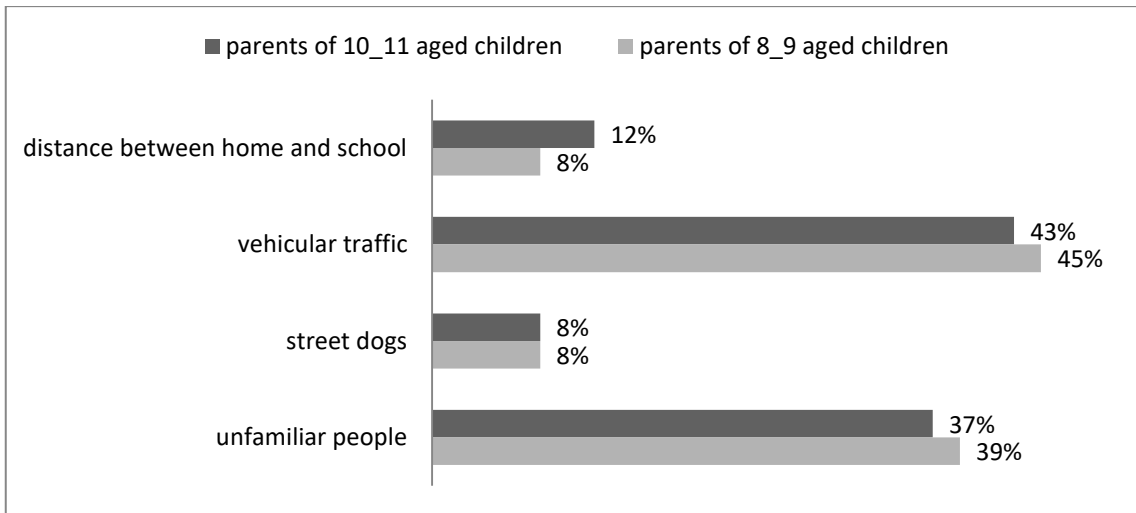


Figure 7. 7. Parent’s Concerns About Their Children’s Active School Travel According to Children’s Age

Another significant difference is between the answers of parents who have female children and male children (Figure 7.8). It is observed that parents of girls are more worried about unfamiliar people (41%) around the school environment than parents of boys (35%).

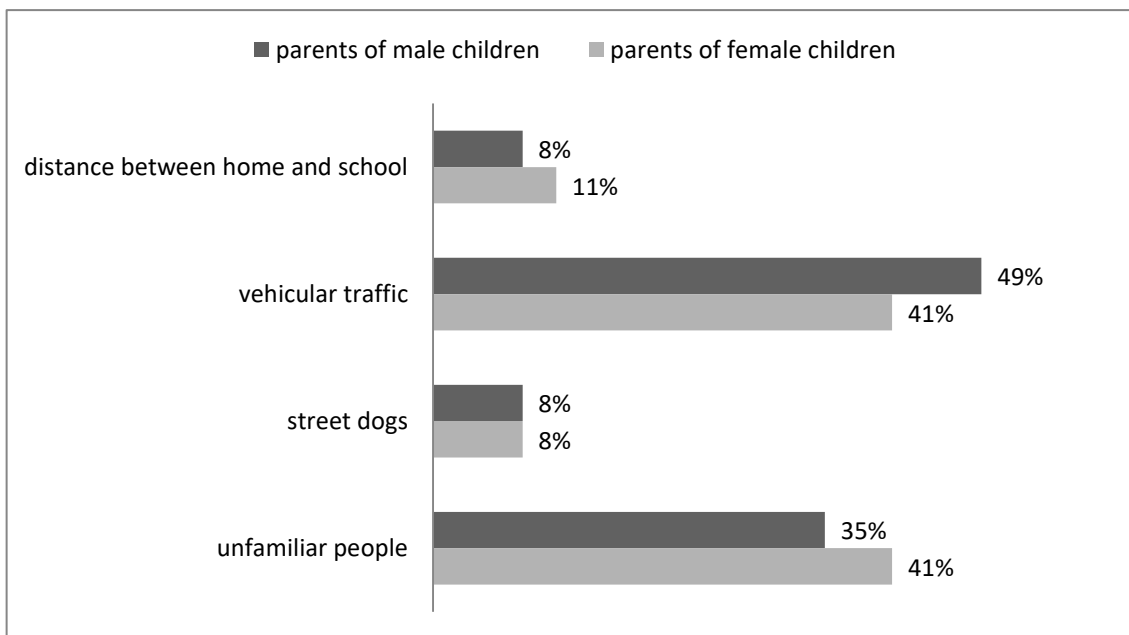


Figure 7. 8. Parent’s Concerns About Their Children’s Active School Travel According to Children’s Gender

- **Children's Perceived Risk Factors About School Surroundings**

To understand children's concerns about their social and physical environment is one of the most significant research subjects for this study. Therefore, children are asked to identify their fears and concerns about the school environment with an open-ended question. Children's answers are categorized under the titles of "dark and isolated streets ", "vehicular traffic and car accidents", "stray dogs" and "unfamiliar people". As it is seen while parents do not mention about dark and isolated streets, for children this feature is seen as a fearsome factor. Also, it seems that children are not worried about the distance between home and school as parents are. Children mostly stated:

"I'm scared of car accidents and I do not like car horns because they scare me."

"I am afraid of isolated streets and stray dogs, they can bite me."

"I am afraid of being kidnapped on my way to school."

As seen in Figure 7.9, children in DCÖ are more concerned about vehicular traffic and car accidents (47%) than children in KHA (34%). However when looking at actual risk factors in Table 6.1, traffic environment features more pose a risk around KHA than DCÖ. Also, although dark and isolated streets are seen as worrisome factors by children in KHA more than children in DCÖ, according to built environment features of the immediate environments of the schools, the safety feature is found encouraging factor for walking around KHA more than around DCÖ. This result may be interpreted that perceived and actual risk factors for children can be different. Further, another significant difference in Figure 7.9 is a higher proportion of children in KHA are scared of stray dogs (39%) considering children in DCÖ (30%).

When looking at children's fears according to age (Figure 7.10), it is observed that while younger children (8-9 years old) scared of unfamiliar people, stray dogs and dark and isolated streets more than older children (10-11 years old), older children scared of vehicular traffic and car accidents more than younger children.

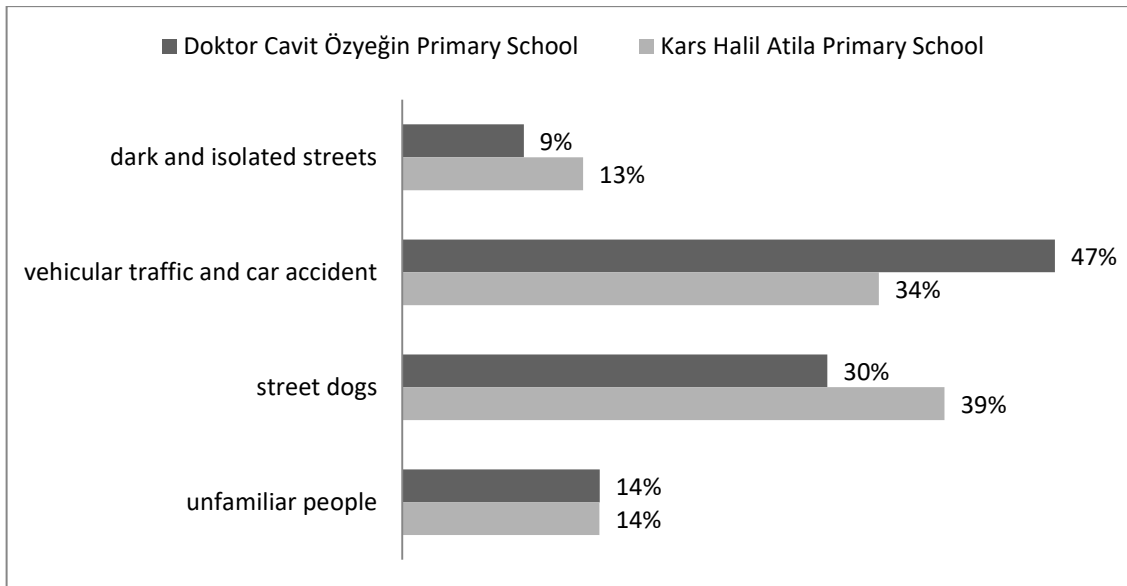


Figure 7. 9. Children’s Fears About Active Travel to School in DCÖ and KHA

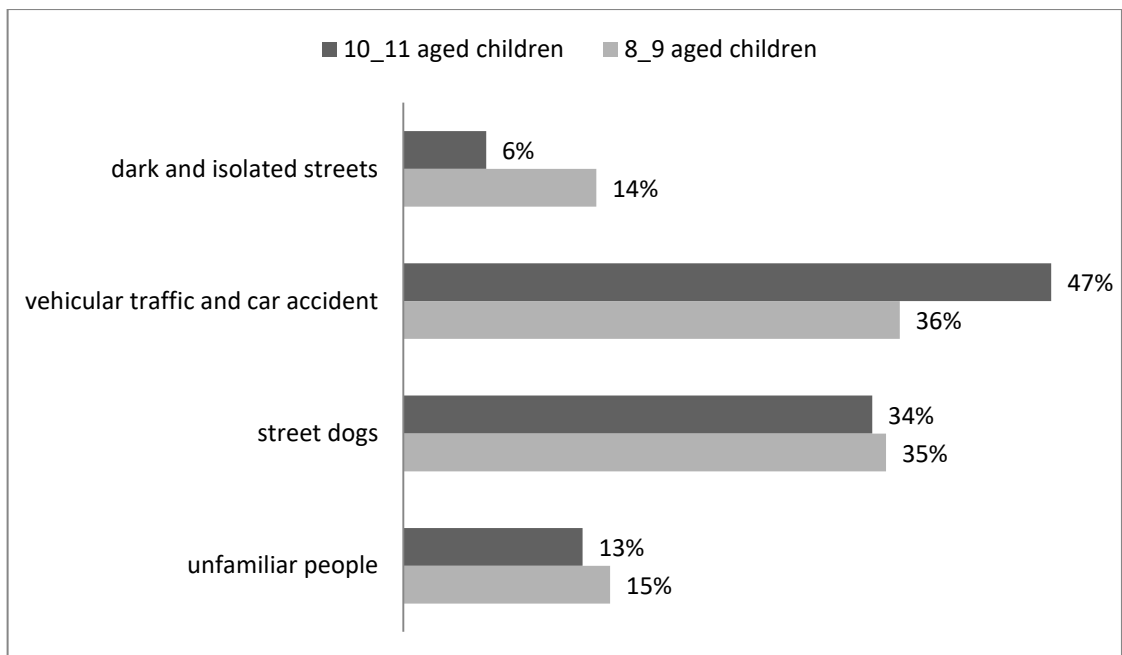


Figure 7. 10. Children’s Fears About Active Travel to School According to Age

Female and male children mostly scared of vehicular traffic and car accidents (Figure 7.11). Differently, more girls are concerned about dark and isolated streets (13%) and stray dogs (36%) more than boys (7%, 32%, respectively).

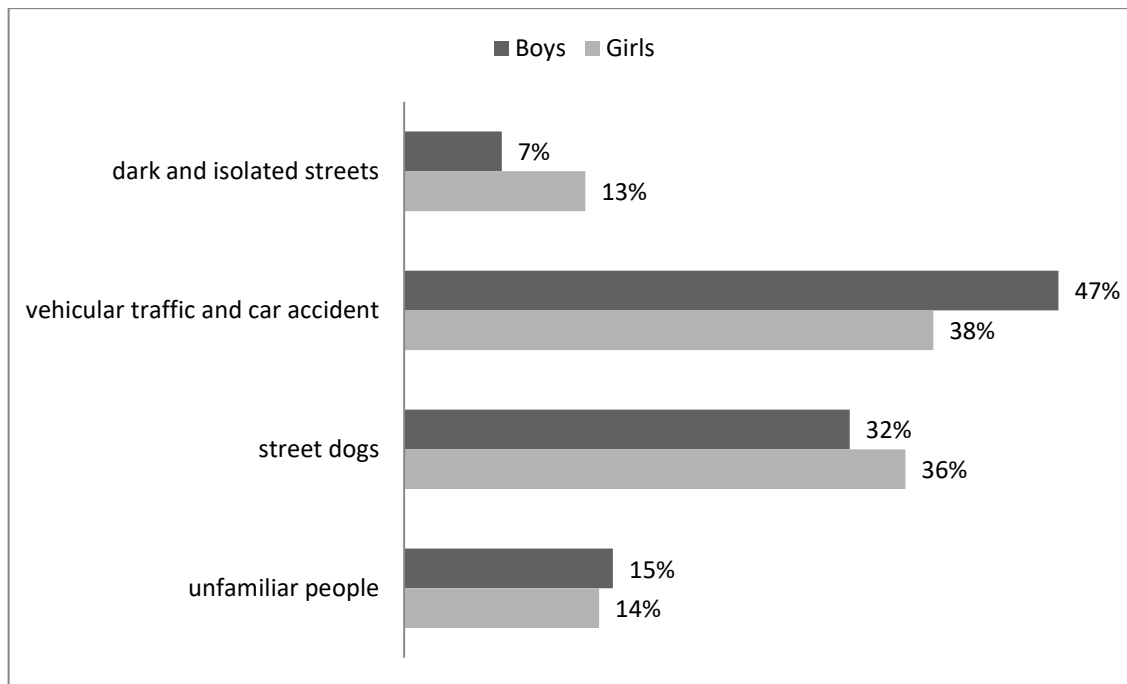


Figure 7. 11. Children’s Fears About Active Travel to School According to Gender

7.2. Children’s and Their Parents’ Expectations from the Immediate Built Environment of Schools

- **Parents’ Expectations from the Immediate Built Environment of Schools**

In order to examine the built environment features that could encourage children’s active school travel, close-ended and open-ended questions are asked to parents. Parents mostly want improvements related to traffic environment (Figure 7.12). Their most frequent choices are "more security guards helping to children crossing the streets" (11%), "less car in the street" (11%) and "slower cars" (10%). Also, one of the most frequent answers is "more bicycle roads" (10%). On the other hand, less frequently chosen answers are streets with more people (2%) and more shops in the neighbourhood (2%). According to these results, it may be said vehicular traffic features in streets are seen more significant for parents than crowded and lively streets.

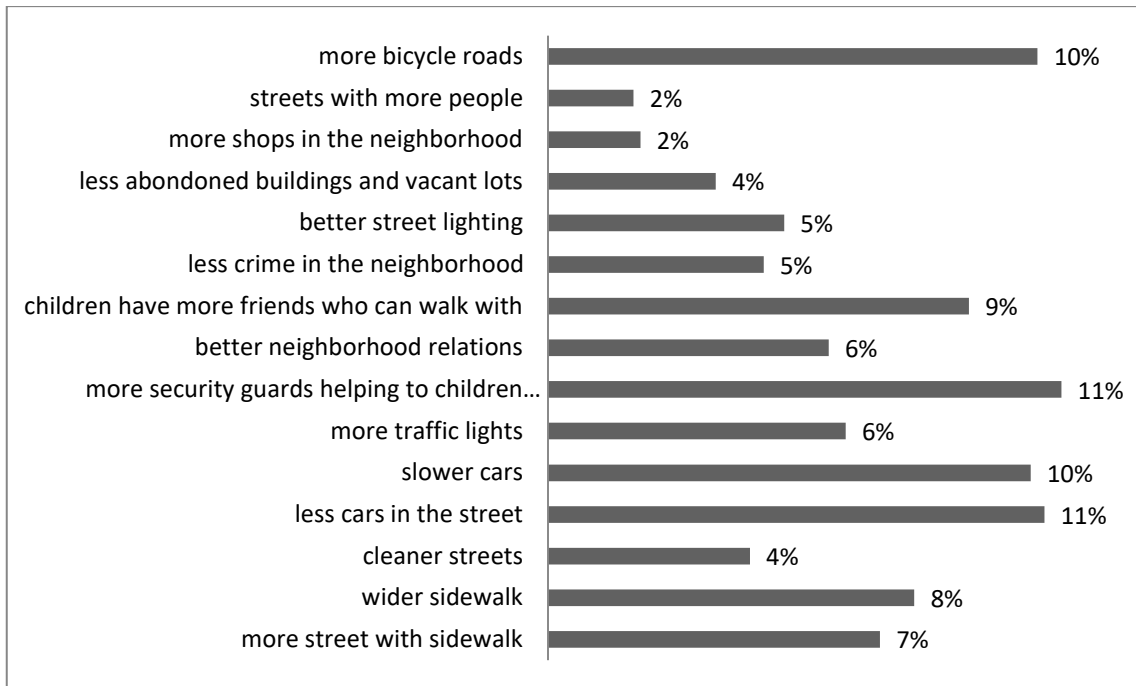


Figure 7. 12. Parent's Expectations on Safe School Environments

To question that "which kind of improvements would you want on the streets en route to the school encourage you to let your child walk to the school?" parents' answers are categorized as "more bicycle road", "wider and more accessible sidewalk", "safer vehicular traffic", "safer people" and "closer distance between home and school". Parents in each schools mostly specified that if there were safer people around the school environments, then if there were safer vehicular traffic around the school environments, they would allow children to walk to school (Figure 7.13). A significant difference between the parents of the two schools is observed. While parents in DCÖ more frequently mentioned closer distance between home and school (21%), parents in KHA only mentioned it at the rate of 6%. This results perhaps because more children in DCÖ than KHA reside in places more than 600m away from school than. Also, 16% of answers in DCÖ and 14% of answers in KHA showed that if there were bicycle roads on the way to school, the parents would allow children to go to school by cycling. Besides, more parents in KHA expect safer people, safer vehicular traffic and wider and more accesible sidewalks in order to allow their children to go to school by walking.

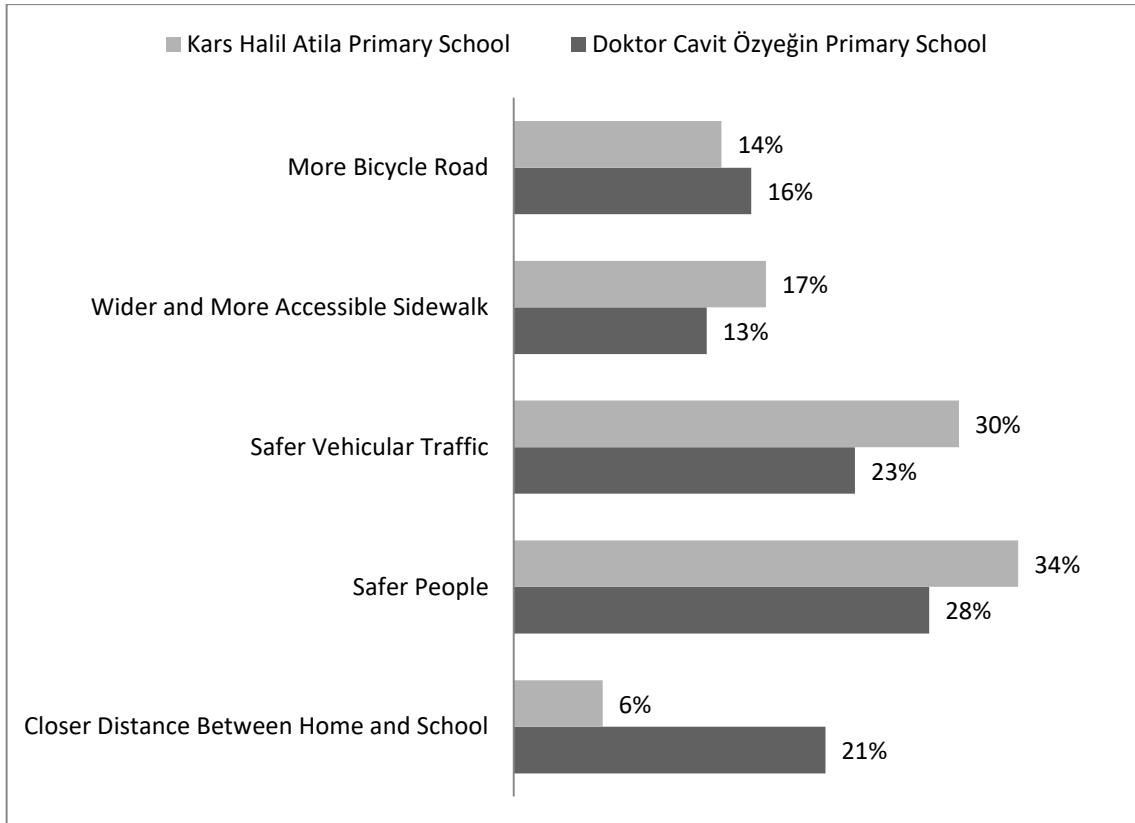


Figure 7. 13. Parent’s Expectations on Safe School Environments in DCÖ and KHA

- **Children’s Expectations from the Immediate Built Environment of Schools**

To understand children’s own perceptions and expectations of the school environment in which they spend their majority of the time, children are asked to describe their expectations on immediate school environments. After that, children’s wishes are classified under the titles of "wider and more accessible roads", "more bicycle roads", "safer vehicular traffic", "cleaner and more aesthetic streets", "safer people", "streets without stray dogs", "more parks and fun places on the street", "lighter and crowded streets", "more quiet streets" (Figure 7.14). As can be seen, children have more various and creative expectations for school environment than parents. While parents do not mention about aesthetic features, playgrounds and fun activities on the way to school, children seem to care about these features. According to children’s answer, as seen in Figure 7.14, the most frequent answers are about wider and more accessible sidewalk:

"I wish there were wider sidewalks on the streets and they were unobstructed and smooth."

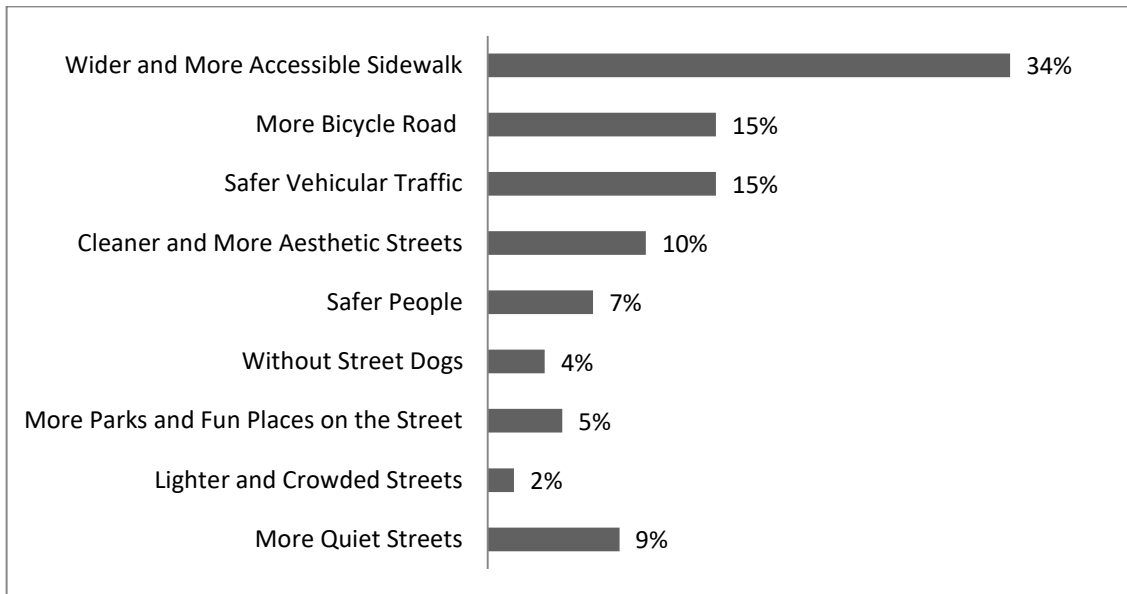


Figure 7. 14. Children's Expectations on Safe School Environments

However, when almost half of the answers of children in DCÖ expect wider and more accessible sidewalks (41%), children in KHA expect wider and more accessible sidewalks at the rate of 26% (Figure 7.15). Another most frequently mentioned feature is about safer vehicular traffic. Having safer vehicular traffic on the way to school is more frequently specified by children in DCÖ (18%) than children in KHA (12%). Children in both schools stated:

"I wish drivers would not drive fast and there was no traffic on the way to school."

Having cleaner and more aesthetic streets is the third most frequently mentioned expectation by children in KHA (14%). Also, while children in KHA mentioned wishing more quiet streets at the rate of 13%, children in DCÖ stated only at the rate of 5%. Accordingly, when considering KHA is located in the commercial centre of the district, because of the dense population and crowd, children may expect cleaner, aesthetic and quieter streets more than children in DCÖ. Another remarkable

expectation of children in DCÖ and KHA is the fact that children would like to have more parks and fun activities en route to school. Children expressed that:

"I would love to have clean and nice streets without smelly garbage."

"I wish the streets were not noisy and not crowded and people in the street were always familiar."

"I wish cheerful streets in which all children play and also an amusement park, beautiful flowers and trees."

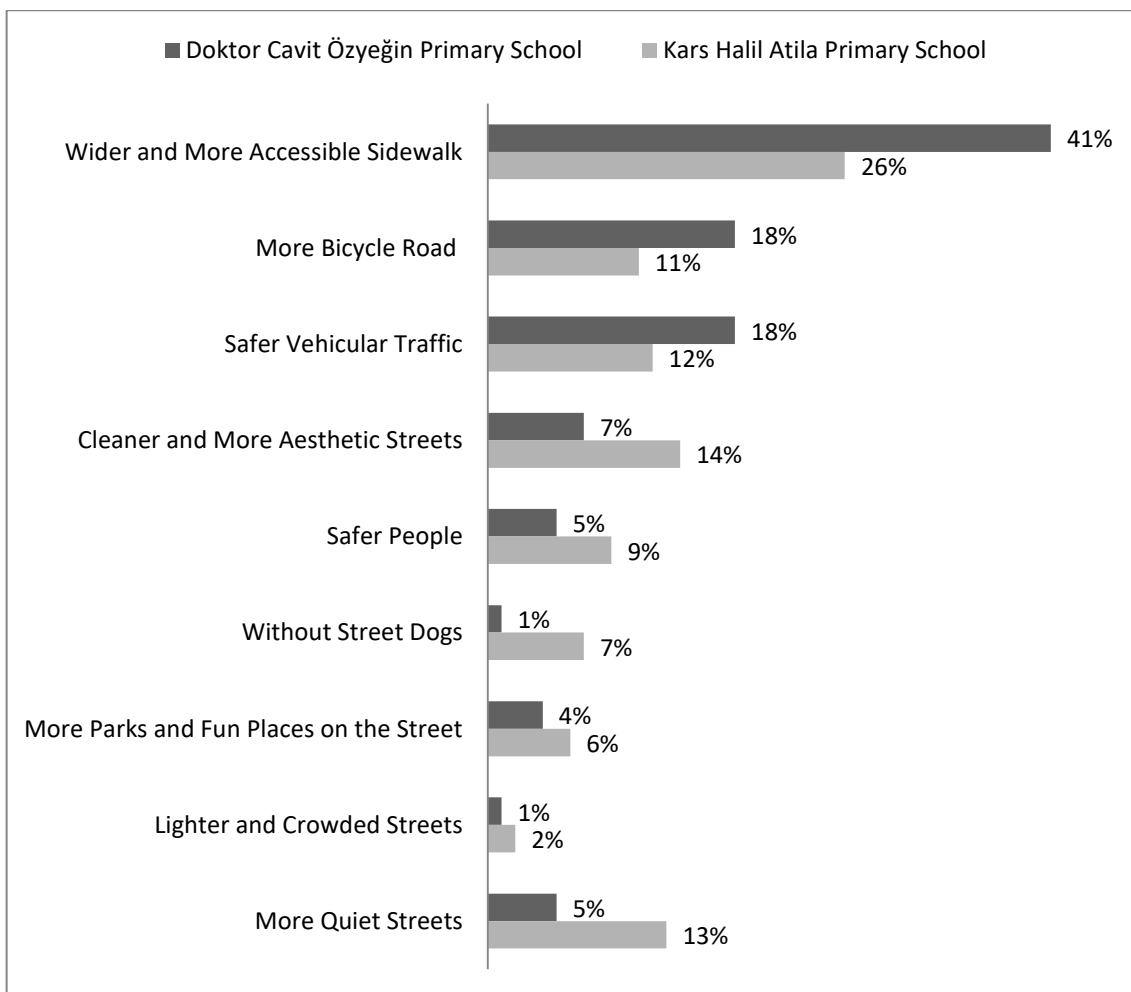


Figure 7. 15. Children's Expectations on Safe School Environments in DCÖ and KHA

Figure 7.16 shows that cleaner and more aesthetic streets, streets without stray dogs, more parks and fun places on the streets, more quiet streets are mostly desired by 8-9 years old children more than 10-11 years old children.

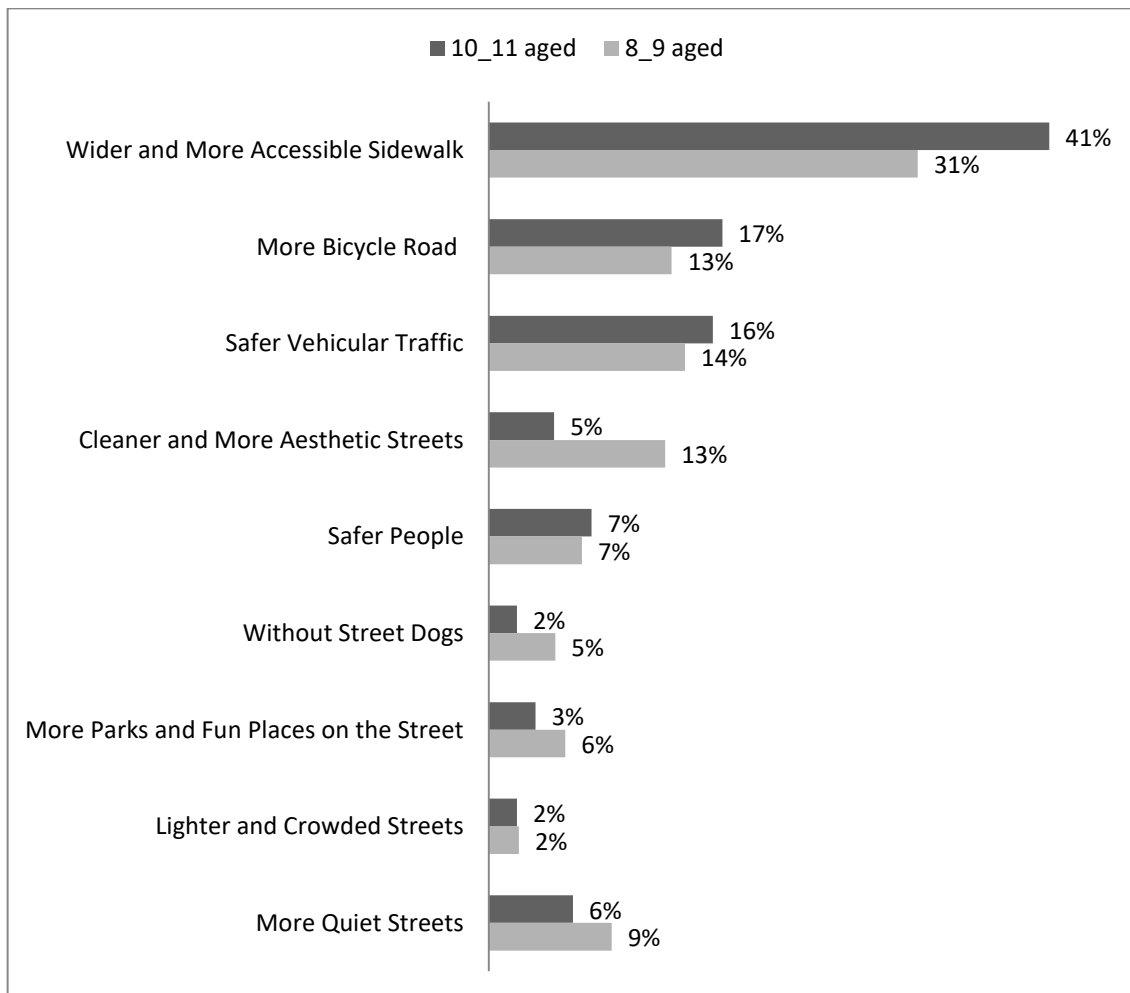


Figure 7. 16. Children’s Expectations on Safe School Environments According to Age

Finally, differences between expectations of boys and girls are examined as seen in Figure 7.17. According to answers, it is observed that while girls state that they wish lighter and crowded streets at the rate of 3%, none of the boys mentions lighter and crowded streets. Besides, while boys wish to walk more quiet streets at the rate of 10%, girls expect more quiet streets at the rate of 8%. Also, while girls state that they wish to walk in the streets without stray dogs at a rate of 5%, boys wish to walk in the streets without stray dogs at a rate of 2%.

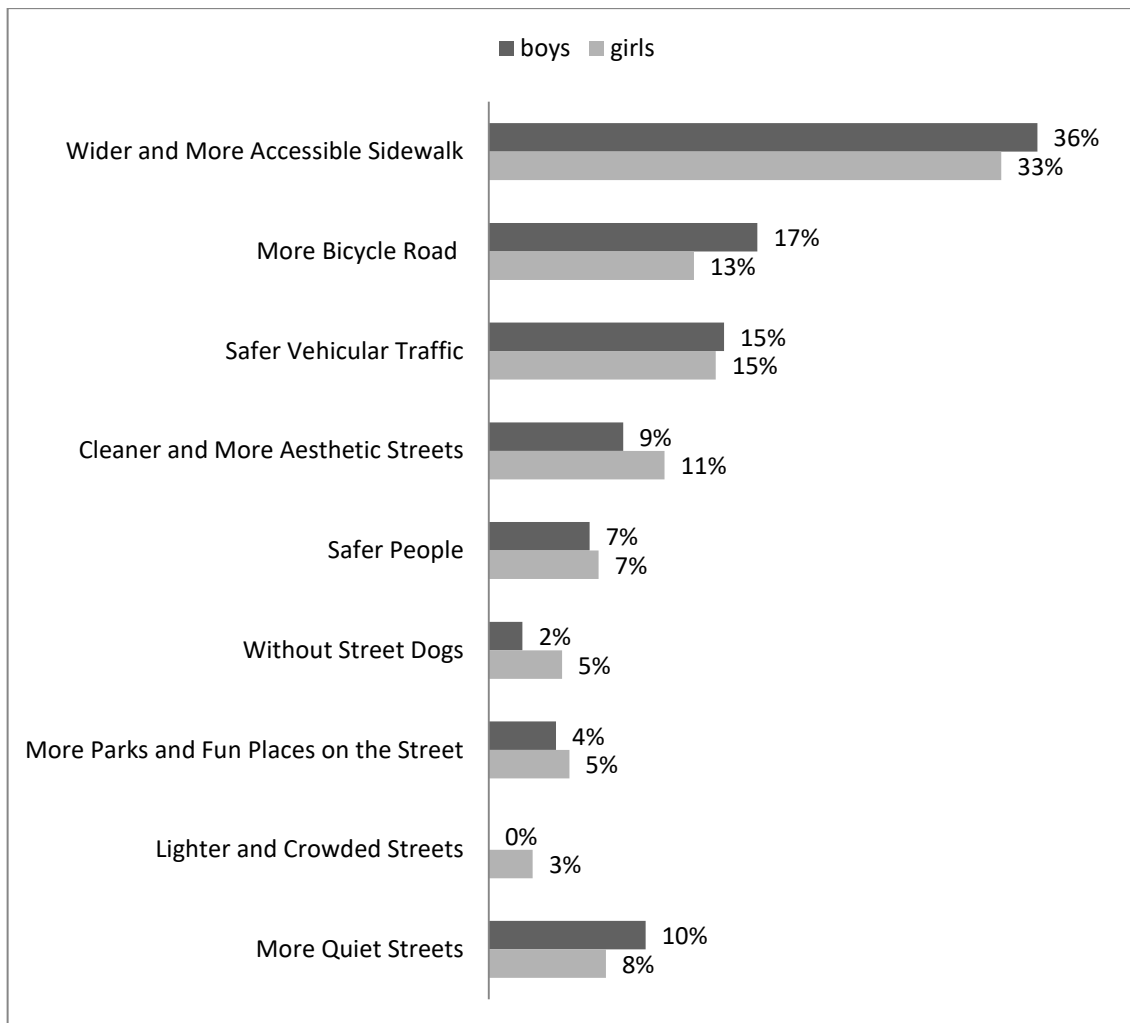


Figure 7. 17. Children’s Expectations on Safe School Environments According to Gender

7.3. Summary

This chapter details 240 children’s and their parents’ perceptions and expectations on the immediate environment of the school within the example of 8-11 years old primary school students in two schools of two neighbourhoods in Bornova/Izmir. In order to describe perceptions and expectations of children and parents about the immediate surroundings of schools results of descriptive analysis and regression analysis are discussed.

In order to indicate the association between actual and perceived risk factors about physical environment of schools, with the help of site observations, physical environment features and children's and parents' perceptions about immediate surroundings of school is compared. According to results, there are some common points on actual and perceived risk factors in terms of physical environment features around the immediate surroundings of schools.

Moreover, In terms of physical environment characteristics, there are some differences between children's and parents' perceptions. While children are more positive about the built environment features, parents tended to think negatively. Moreover, it is observed that concerns of parents and children are different from each other. While parents are mostly worried about vehicular traffic and unfamiliar people around the school, children are mostly scared of vehicular traffic and stray dogs around the school. Finally, considering children's and parents' expectations on the built environment of schools, it is observed that while parents mostly expect safer traffic features and safer people en route to school, children mostly expect wider and accessible sidewalks and bikeways and more aesthetic and fun streets on the way to school.

CHAPTER 8

CONCLUSION AND RECOMMENDATIONS

This study examines the factors affecting children's active commuting to school and also the perceptions and expectations of children and parents about the immediate environment of the school. Following a literature review based on the studies on children development and its relationship with the physical environment and an extensive research on the factors affecting children's walking to school is conducted, the thesis introduced different projects implemented for encouraging children to walk to school. Consequently, relying on the quantitative and qualitative research methods the study data is gathered at two schools (DCÖ and KHA) of two neighbourhoods in Bornova. The study analyzed the data to present the factors affecting children's school travel mode and perceptions and expectations of the children and parents in the case of these two schools and their surroundings or immediate built environment in Bornova. This study is one of the first studies in Izmir (Turkey) investigating the social and physical built environment related factors shaping children's travel mode and habits of walking to school and also the perceptions and expectations of parents and children (here 8-11 years old) about the immediate environment of their schools. The findings of the study are significant to develop policies for children's spatial mobility in the built environment and summarized and discussed as followed titles.

- **Child and Household Related Factors Shaping Children's Active Commuting to Schools**

The study findings in Bornova case show that gender and age of the children have a significant effect on children's travel mode to school. For example, when commuting to school, more female children travel by car and more male children use the public transportation vehicles. Also, 8-9 years old students more travel to school by walking than 10-11 years old students, however, they are more dependent on their parents. Related to these findings, girls and younger children are more restricted by parents about independent mobility in their neighbourhood without the supervision of adults

(especially parents). Interestingly, in spite of these differences, the majority of children in this study (53%) travel to school by their school bus.

According to results, certain characteristics of households and especially of parents affect childrens' active and independent commuting to school. Firstly, car and phone ownership in the household appear as significant. Those children living in the households with at least one car ownership are more likely to commute to school by car and more likely to be dependent on their parents when commuting to school. Also, children who own a phone are more independent from adults (especially their parents) in school travel. Secondly, children who live in a household with fewer people are more likely to walk to school. Also, it seems that children of the households living in the same neighbourhood for longer time are more likely to be independent in travel to school. It is perhaps because parents of these children feel more familiar with the neighbourhood, they can allow their children to travel to school independently..

Similarly, thirdly, parents' habits with walking and using open spaces seem to affect children's daily habits for school commuting. Accordingly, children whose parents have a tendency to spend time indoor public spaces (especially, shopping malls) are more likely to be dependent on their parents in school travel. Also, children with parents who regularly walk in the neighbourhood are more likely to commute to school by walking. These habits are also observable at parents' perceptions about their children's travel mode to school: children whose parents think that walking to school is good for their children's health and also that the distance between home and school is walkable by their children are more likely to commute to school by walking. Similarly, those children with parents who perceive the distance to school as walkable for their children are more likely to be independent of their parents at school commuting.

Consequently, similar to the literature findings, these results in Bornova case suggest that especially parental perceptions and concerns about their neighbourhood's and school surroundings' social and physical environment are significant and must be taken into account for developing policies for children's active and independent mobility to school. This suggests that urban design and planning implementations must develop in the ways that comfort parents' concerns and encourage parents to allow their children to walk to school and use public spaces independently.

- **Neighbourhood Related Factors Shaping Children’s Active Commuting to Schools**

According to the results of this thesis, it seems that the distance between home and school is one of the most influential factors that affect children's travel mode to school. Therefore, although children's active commuting to schools can be supported by the physical designs of the school surroundings, the spatial distribution of schools and children’s access to schools are some of the essential problems that have to be solved. Hence, the spatial distribution of schools in each neighbourhood and equal opportunities between schools in every aspect are some of the most important subjects that need attention by policymakers. As can be seen from the findings, the equal distribution of schools among and in neighbourhoods seems important for creating child-friendly cities.

According to site observations and online sources about vehicular traffic data (<https://yandex.com.tr/>), actual risks factors for children in the immediate built environment of DCÖ and KHA are narrow and poor quality sidewalks, lack of bikeways, dense vehicular traffic, lack of fun activities and aesthetical features, also around DCÖ, there is a lack of mixed-use areas (see Table 6.1). Comparing the school surroundings of DCÖ and KHA, it seems that, although both school surroundings have dense vehicular traffic, around KHA there are wider and better quality sidewalks and more mixed-use areas and aesthetically rich streets for children to walk. This is one of the reasons for the higher rate of walking to school in children in KHA.

- **Parents’ and Children’s Perceptions and Expectations on the Immediate Built Environment of DCÖ and KHA**

In this study, parents and their children seem to have different opinion about the built environment these children experience, whereas physical characteristics of the immediate environment of schools affect children’s and parents’ perceptions and behaviours. Whereas parents are more concerned about vehicular traffic and unfamiliar people around their child’s school environment, children are more scared of vehicular traffic and car accidents and stray dogs around the school environment. Besides, while parents specify that they have expectations on safer vehicular traffic and safer people

around the school environment to allow their children to walk to school, children are interested in more accessible, “aesthetically rich” and “fun” streets to walk. These differences suggest that children’s and parents’ expectations about the physical environment should be asked and considered separately by policy-makers and urban designers.

- **What can Urban Design do to Improve Children’s Outdoor Public Space Use in School Surroundings?**

When looking at children’s and parents’ perceptions and expectations about the immediate surroundings of schools, it seems that mostly physical environment features have a substantial impact on children’s tendency to walk to school, whereas parents’ perception of neighbourhood safety and social environment has an important effect on children's school travel mode. Therefore, urban design implementations affect not only the quality of the physical environment but also the quality of the social environment relatedly for encouraging children to walk to school. Hence, successful urban design practices are crucial in order to create quality and safe environments for society, especially children.

In this study, especially results of questionnaire with parents and children suggest multiple urban design implementations. Urban design implementations can not increase children's active commuting to school in all case, especially, when the distance between home and school is not suitable for children to walk. However, urban design implementations can encourage children's active use (for play and socialization) of streets in school surrounding. In Bornova cases, this thesis expects that the design of the following physical features in schools’ surroundings can encourage children’s active commuting to school but also importantly, active use of the streets in school surroundings especially at school time.;

- streets with wider and accessible sidewalks
- safer vehicular traffic and pedestrian crossings
- streets with no "dangerous" people
- separated bikeways
- cleaner streets

- flowers and trees along the streets
- more green areas with “fun” elements along streets
- well-illuminated streets

Meanwhile, when risk factors for children’s active commuting to school is examined at each street around two schools according to site observations and Yandex traffic condition data, some of the streets have high risk level. Accordingly, Cengizhan Street around DCÖ has a high degree of vehicular and pedestrian traffic but the sidewalks are too narrow and also there is no bikeways there. Here urban design implementations can be about these problems. For instance, these implementations can include multiple tools of traffic calming (such as speed humps, different pavement materials and curb extensions), improvement of sidewalks with wider dimensions and good quality surface and also creating a safe bikeway along the sidewalks (as in Chapter 4) might encourage children’s tendency to walk and cycle to school. Also, according to site observations at the streets of 116/19 and of 116/11 around DCÖ, these streets can be improved with façade colors, street furnitures, flowers and trees along the street in order to encourage to have a walking area with elements that children can consider as attractive and “fun.” Similarly, presence of mixed-use buildings and green areas along the streets and also the implementations of “play streets” (see Figure 4.8) can increase children’s active use of streets in school surroundings. As observed, there are vacant lots around the surrounding of DCÖ especially along the street of 116/11. Vacant lots and abandoned buildings can negatively impact on children’s active use of streets in school surroundings. Therefore, child-friendly urban design implementations such as playgrounds in such vacant lots, can develop children’s active use of streets in school surroundings. Also it can support children’s physical and mental development in their daily life.

Besides, according to physical environment data around KHA, some streets that are used also highly by students in this study during school time (such as Kazım Karabekir, Fevzi Çakmak and Mustafa Kemal) have a high degree of vehicular and pedestrian traffic. Here closures of streets to vehicular traffic at certain times and urban design implementations such as playful curb extensions and playful design of signs on the pedestrian crossing (see Figure 4.5) might increase children's use. Also, when considered parents’ and children’s expectations and actual risk factors about the immediate surroundings of schools, urban design implementations related to safer

vehicular traffic and wider and fun sidewalks and bikeways (as in Chapter 4) can be applied in order to encourage children's use of school surroundings.

Moreover, this study has driven its data from questionnaires not only with parents but also with children. As specified in the CFC strategies (UNICEF, 2018), children's participation in the decisions about the built environment which they experience it every day is quite precious to develop policies about the physical environment. Also, parents' participation in the decisions about the built environment of school surroundings is quite essential too. Correspondingly, urban designers and policy-makers should learn about children's and parents' perceptions and expectations about the school surroundings and after that, they should meet their expectations with the successful urban design implementations.

Considering the differences between children's and adults' expectations about the physical environment, it is clear that urban spaces produced solely for adults do not respond to children's expectations. Because outdoor public spaces, especially the streets, are crucial for the development of children, this is an alarming problem that has to be solved. At this study, while parents expect safer vehicular traffic and safer people around the school environment to allow their children to walk to school, children expect more accessible, aesthetic and fun streets to walk. Therefore, urban designers and decision-makers should take these differences into consideration and design urban spaces, especially streets, according to the expectations of children.

Finally, researches on child-friendly environments around the world have been developed in the last 50 years. In Turkey, there is not enough research on environmental designs for children users. The aim of this study has been to contribute our knowledge about children's daily experiences in various built environments in Turkey. Still, the findings of this study can not be generalized because each place has own characteristics and dynamics.

REFERENCES

- Appleyard, D.; Lintell M.; Gerson M. S. *Livable streets*. Berkeley: University of California Press, 1981.
- Banerjee, T.; Uhm, J.; Bahl, D. *Walking to School: The Experience of Children in Inner City Los Angeles and Implications for Policy*. *Journal of Planning Education and Research*, 2014, 34 (2).
- Biddle, S.; Gorely T.; Stensel D. *Health-enhancing physical activity and sedentary behaviour in children and adolescents*. *Journal of Sports Sciences*, 2004, 22 (8), 679-701.
- Bishop, J.; Foulsham, J. *Children's Images of Harwich*. Kingston Polytechnic Architectural Psychology Research Unit, 1973, no: 3.
- Boarnet, M. G.; Anderson, C. L.; Day, K.; McMillan, T.; Alfonzo, M. *Evaluation of the California Safe Routes to School Legislation: Urban Form Changes and Children's Active Transportation to School*. *The American Journal of Preventive Medicine*, 2005, 28 (2), 134-140.
- Boreham, C.; Riddoch, C. *The physical activity, fitness and health of children*. *Journal of Sports Sciences*, 2001, 19 (12), 915-929.
- Bristol City Council. *New Build Home Zone Design Guidelines, First Edition*, 2003.
- Brown, B.; Mackett, R.; Gong, Y.; Kitazawa, K.; Paskins, J. *Gender differences in children's pathways to independent mobility*. *Child Geography*, 2008, 6, 385-401.
- Carbonara-Moscatti, V. *Barriers To Play Activities In The City Environment: A Study Of Children's Perceptions*, 1985.
- Carver, A.; Veitch, J.; Salmon, J.; Hume, C.; Timperio, A.; Crawford, D. *Children's independent mobility - is it influenced by parents' perceptions of safety?*. Melbourne: Deakin University, 2010.

- Cavill, N.; Kahlmeier, S.; Racioppi, F. Physical Activity and Health in Europe: Evidence for Action. Copenhagen, WHO Regional Office for Europe, 2006.
- Churchman, A. Is There a Place For Children in The City. *Journal of Urban Design*, 2003, 8(2), 99-111.
- Committee on Environmental Health. The Built Environment: Designing Communities to Promote Physical Activity in Children. *Official Journal of the American Academy of Pediatrics*, 2009, 123 (6).
- Cooper, A. R.; Page, A. S.; Foster, L. J.; Qahwaji, D. Commuting to school: are children who walk more physically active?. *The American Journal of Preventive Medicine*, 2003, 25 (4), 273-276.
- Courtyard Housing, 2007. http://www.courtyardhousing.org/images_shared.html (accessed May 18, 2019)
- Cummins, S. K.; Jackson, R. J. The Built Environment and Children's Health. *Pediatric Clinics of North America*, 2001, 48 (5), 1241-1252.
- Çanakçıoğlu, N. G. Çocukta Mekan Algısının Gelişimi ve Mekansal İmge Zenginliği Bakımından Malzemenin Önemi. *Mimarlıkta Malzeme*, 2012, Vol 2.
- Davison, K. K.; Lawson, C. T. Do attributes in the physical environment influence children's physical activity? A review of the literature. *International Journal of Behavioral Nutrition and Physical Activity*, 2006, 3 (19).
- Easton, S.; Ferrari, E. Children's travel to school: the interaction of individual, neighbourhood and school factors. *Transport Policy*, 2015, 44, 9-18.
- Ewing, R.; Schroeder, W.; Greene W. School Location And Student Travel: Analysis Of Factors Affecting Mode Choice. *Transportation Research Record: Journal of the Transportation Research Board*, 2004, no. 1895, 55-63.

- Fişek, G. O.; Yıldırım, S. M. Çocuk Gelişimi Türkiye’de Okul Öncesi Çocuk Gelişimi ve Eğitimi Projesi. M.E.B Devlet Kitapları, İstanbul: Milli Eğitim Basımevi, 1983.
- Freeman, C.; Tranter, P. Children and Their Urban Environment: Changing World, 2011
- Fyhri, A.; Hjorthol, R.; Mackett, R. L.; Fotel, T. N.; Kytta, M. Children’s Active Travel and Independent Mobility in Four Countries: Development, Social Contributing Trends and Measures. *Transport Policy*, 2011, 18 (5), 703-710.
- Gill, T. Hackney Play Streets Evaluation Report, 2015.
- Hackney Play, 2019. <http://www.hackneyplay.org/> (accessed May 18, 2019)
- Hensher, D. A.; Reyes, A. J. Trip Chaining as a Barrier to the Propensity to Use Public Transport. *Transportation*, 2000, 27 (4), 341-361.
- Heurlin-Norinder, M. Children, Environment and Independent Mobility, 1996.
- Hillman, M.; Adams, J.; Whitelegg, J. One False Move... A Study Of Children’s Independent Mobility. Policy Studies Institute: London, 1990
- Hume, C.; Timperio A.; Salmon, J.; Carver, A.; Giles-Corti, B.; Crawford, D. Walking and Cycling to School: Predictors of Increases Among Children and Adolescents. *American Journal of Preventive Medicine*, 2009, 36 (3), 195–200.
- Jacobs, J. The Death and Life of Great American Cities, 1993 Modern Library ed., New York: Random House, 1961.
- James, A.; Prout, A. Constructing and Reconstructing Childhood: Contemporary Issues in the Sociological Study of Childhood London: Falmer Press, 1997.
- Jenks, C. Childhood, London: Routledge, 2005.

Jones, O. *Melting Geography: Purity, Disorder, Childhood and Space*, 2000

Kirazođlu, F. S. *Fiziksel Çevre - Çocuk İlişkileri, Açık Oyun Mekanları Ve Çocuk Dostu Çevre Kriterleri Üzerine Bir Deđerlendirme; Bakırköy Ve Beylikdüzü Örnekleri*. Yüksek Lisans Tezi, İTÜ, 2012.

Kytta, M. The Extent Of Children's Independent Mobility And The Number Of Actualized Affordances As Criteria For Child-Friendly Environments. *Journal of Environmental Psychology*, 2004, 24 (2), 179-198.

Larsen, K.; Gilliland, J.; Hess, P.; Tucker, P.; Irwin, J.; He, M. The Influence of the Physical Environment and Socio-demographic Characteristics on Children's Mode of Travel to and from School. *American Journal of Public Health*, 2009, 99 (3), 520-526.

Lee, M. C.; Orenstein, M. R.; Richardson, M. J. Systematic Review of Active Commuting to School and Children's Physical Activity and Weight. *Journal of Physical Activity and Health*, 2008, 5 (6), 930-949.

Loukaitou-Sideris, A.; Stieglitz, O. Children in Los Angeles Parks. *The Town Planning Review*, 2002, 73 (4), 467-488.

Mackett, R.; Brown, B.; Gong, Y.; Kitazawa, K.; Paskins, J. Children's Independent Movement in the Local Environment. *Built Environment*, 2007, 33, 454-468.

Mayall, B. *Towards a Sociology for Childhood: Thinking from Children's Lives*, Berkshire: Open University Press, 2002.

McDonald, N. C. Critical Factors for Active Transportation to School among Low-Income and Minority Students: Evidence from the 2001 National Household Travel Survey. *American Journal of Preventive Medicine*, 2008, 34, 341-344.

McDonald, N. C. Exploratory Analysis of Children's Travel Patterns. *Transportation Research Record: Journal of the Transportation Research Board*, 2006, no: 1977, pp 1-7.

- McGill, H. C. Jr.; McMahan, C. A.; Herderick, E. E.; Malcom, G. T.; Tracy, R. E.; Strong, J. P. Origin of Atherosclerosis in Childhood and Adolescence. *The American Journal of Clinical Nutrition*, 2000, 72 (5), 1307-1315.
- McMillan, T. E. The Relative Influence Of Urban Form On A Child's Travel Mode To School. *Transportation Research Part A: Policy and Practice*, 2007, 41 (1), 69-79.
- Metcalf, B.; Voss, L.; Jeffrey, A.; Perkins, J.; Wilkin, T. Physical Activity Cost of the School Run: Impact on Schoolchildren Being Driven to School. *BMJ*, 2004, 329 (7470), 832-833.
- Mitra, R.; Buliung, R. N.; Roorda, M. J. Built Environment and School Travel Mode Choice in Toronto, Canada. *Transportation Research Record: Journal of the Transportation Research Board*, 2010, 2156 (1), 150-159.
- National Physical Activity Plan Alliance. *The 2016 United States Report Card on Physical Activity for Children and Youth*, Columbia, SC, 2016.
- O'Brien, M.; Jones, D.; Sloan, D.; Rustin, M. Children's Independent Spatial Mobility in the Urban Public Realm. *Childhood*, 2000, 7 (3), 257-277.
- Oğuz, D. Çocukların Açık Yeşil Alan Kullanım Desenlerinin Belirlenmesi: Çayyolu Örneği. Ankara Üniversitesi Bilimsel Araştırma Projeleri (BAP), Proje No: 09B4347012, 2011.
- Özdemir, A.; Yılmaz, O. Assessment of Outdoor School Environments and Physical Activity in Ankara's Primary Schools. *Journal of Environmental Psychology*, 2008, 28 (3), 287-300.
- Piaget, J. *The Construction of Reality in the Child*, Ballantine Books: New York, 1954.
- Prezza, M. The Influence of Psychosocial and Urban Factors on Children's Independent Mobility And Relationship to Peer Frequentation. *Journal of Community & Applied Social Psychology*, 2001, 11 (6), 435-450.

- Rathus, S. A. *Childhood and Adolescence: Voyages in Development*, Cengage Learning, 2013, p 48.
- Reframing Studio, 2012. <https://www.reframingstudio.com/projects/kindlint> (accessed Apr 25, 2019)
- Roof, K.; Oleru, N. Public Health: Seattle and King County's Push for the Built Environment. *Journal of Environmental Health*, 2008, 75 (1), 24-27.
- Rosenberg, D. E.; Sallis, J. F.; Conway, T. L.; Cain, K. L.; McKenzie, T. L. Active Transportation to School Over 2 Years in Relation to Weight Status and Physical Activity. *Obesity*, 2006, 14 (10), 1771-1776.
- Rosenbloom, S. The Transportation Needs of Single Salaried Mothers: a Critical Analysis. *Journal of Specialized Transportation Planning and Practice*, 1989, 3, 247-275.
- Safe Routes Partnership, 2017. <https://www.saferoutespartnership.org> (accessed Apr 25, 2019)
- Salmon, J.; Timperio, A.; Cleland, V.; Venn, A. Trends in Children's Physical Activity and Weight Status in High and Low Socio-economic Status Areas of Melbourne, Victoria, 1985–2001. *Australian and New Zealand Journal of Public Health*, 2005, 29 (4), 337-342.
- Schlossberg, M.; Greene, J.; Phillips, P. P.; Johnson, B.; Parker, B. School Trips: Effects of Urban Form and Distance on Travel Mode. *Journal of the American Planning Association*, 2006, 72 (3), 337-346.
- Schoeppe, S.; Duncan, M. J.; Badland H. M.; Oliver M.; Browne M. Associations Between Children's Independent Mobility And Physical Activity. *BMC Public Health*, 2014, 14 (91).
- Sidharthan, R.; Bhat, C. R.; Pendyala, R. M.; Goulias, K. G. A Model Of Children's School Travel Mode Choice Behavior Accounting For Spatial And Social Interaction Effects. *Transportation Research Record: Journal of the Transportation Research Board*, 2011, 2213 (1).

- Sivri Gökmen, H. Çocuk Dostu Kent Üzerine Stratejiler, TMMOB 2. İzmir Kent Sempozyumu Bildiriler Kitabı, 2013, pp 821-830.
- Spencer, C.; Woolley, H. Children And The City: A Summary Of Recent Environmental Psychology Research. Child: Care, Health and Development, 2000, 26 (3), 181-197.
- Stewart, O. Findings From Research on Active Transportation to School and Implications for Safe Routes to School Programs. J. Plan. Lit, 2011, 26 (2), 127-150.
- Sturm, R. Childhood Obesity: What We Can Learn From Existing Data on Societal Trends. Preventing Chronic Disease, 2005, 2 (2).
- Sustainable Design, 2011. <http://ucdesustainability.blogspot.com/> (accessed Apr 5, 2019)
- Şenol, F. Mevcut Mahalle Parklarının “İhtiyaca Dayalı Hakçalık” Açısından Değerlendirilmesi: İzmir’deki mahalle parklarını kimler neden kullanıyor ve kullan(a)mıyor?. TÜBİTAK projesi No:215K239, 2019.
- Tandoğan, O. Çocuk İçin Daha Yaşanılır Bir Kentsel Mekan: Dünyada Gerçekleştirilen Uygulamalar. Megaron, 2014, 9 (1), 19-33.
- Timperio, A.; Crawford, D.; Telford, A.; Salmon, J. Perceptions About the Local Neighbourhood and Walking and Cycling Among Children. Prev Med. 2004, 38, pp 39-47.
- TUIK, 2018. <https://biruni.tuik.gov.tr/medas/?kn=95&locale=tr> (accessed Apr 11, 2019).
- T.C. Sağlık Bakanlığı. Türkiye Beslenme ve Sağlık Araştırması 2010: Beslenme Durumu ve Alışkanlıklarının Değerlendirilmesi Sonuç Raporu. Ankara, Sağlık Bakanlığı Sağlık Araştırmaları Genel Müdürlüğü, 2014.

United Nations General Assembly, Convention on the Rights of the Child, 1989.
<https://www.ohchr.org/Documents/ProfessionalInterest/crc.pdf> (accessed May 5, 2019).

UNICEF. The State of the World's Children: Childhood Under Treat, 2005.

UNICEF. Child Friendly Cities and Communities Handbook, 2018.
<https://www.unicef.org/eap/media/1591/file/Child%20Friendly%20Cities%20and%20Communities%20Handbook.pdf> (accessed March 20, 2019).

UNICEF. Turkey Child Friendly Cities Catalogue, 2014-2016.
<https://childfriendlycities.org/turkey/> (accessed Apr 19, 2019).

UNICEF. Türkiye'de Çocukların Durumu Raporu, 2011.

Valentine, G. Public Space and the Culture of Childhood Aldershot: Ashgate, 2004.

VicHealth. Streets Ahead 2008–2011 Program evaluation report, Victorian Health Promotion Foundation, Melbourne, 2011.

Whitzman, C.; Mizrachi, D. Vertical Living Kids: Creating Supportive High Rise Environments for Children in Melbourne, Australia. Melbourne: The University of Melbourne, 2009.

Yarlagadda, A. K.; Srinivasan, S. Modeling Children's School Travel Mode And Parental Escort Decisions. *Transportation*, 2008, 35 (2), 201-218.

APPENDIX A

SURVEY QUESTIONS FOR CHILDEN

Öğretmenler İçin Ön Bilgi

Bu anket çalışması İzmir Yüksek Teknoloji Enstitüsü, Şehir ve Bölge Planlama Bölümü'nden Doç.Dr.Fatma Şenol'un danışmanlığını yaptığı ve Gülce Abatay tarafından yürütülen "Çocukların Farklı Mahallelerdeki Okullara Aktif Gidiş-Geliş: Sokakların Çocuk Dostu Çevreler Olarak Tasarımı" başlıklı Kentsel Tasarım Yüksek Lisans Tezi kapsamında gerçekleştirilmektedir.

Projenin amacı, 3. ve 4. sınıftaki öğrencilerin okula bisikletle veya yürüyerek gidiş-geliş hallerini ve olanaklarını etkileyen temel faktörleri belirlemek ve ardından, bu aktif ulaşım olanaklarını çocukların hayatlarında kullanmalarına yönelik sokakların fiziksel tasarımına dair öneriler ve stratejiler geliştirmektir.

Bu anketi sınıfınızdaki 3. ve 4. sınıf öğrencilerinin doldurması bu araştırmanın gerçekleşmesi için önemlidir. Öğrencilerinizi çalışmaya dair bilgilendirme ve yönlendirme konusundaki katkılarınız ve ayırdığınız değerli zamanınız için teşekkür ederiz.

ANKET

1. Kaç

Yaşındasınız:

.....

2. Cinsiyetinizi işaretleyin: (1)Kız (2)Erkek

3. Mahalle içinde nerelere yürüyerek veya bisikletle gidip geliyorsunuz? (birden fazla kutuyu işaretleyebilirsiniz)

- Okul
- Park
- Market
- Spor sahası (basketbol, futbol, vb)
- Arkadaşımın evi
- Diğer (Lütfen yazınız)

4. Evden okula nasıl gidip geliyorsunuz?

- a) Yürüyerek
- b) Bisikletle
- c) Otobüs, minibüs gibi toplu taşıma araçlarıyla
- d)Okul Servisiyle
- d) Arabayla
- e) Diğer (Lütfen yazınız)

.....

5. Evden okula kiminle gidip geliyorsunuz?
a)Tek başıma b)Arkadaşlarımla c)Aile üyelerimle d)Servisle
d) Diğer (Lütfen yazınız).....

6. Okulda veya sınıfınızda mahalleden arkadaşlarınız var mı ?
 Evet
 Hayır

7. Evden okula gidip gelirken yolda aşağıdakilerden hangilerini görüyorsunuz?
(birden fazla kutuyu işaretleyebilirsiniz)

- Park/oyun parkı/spor alanı
- Restoran
- Giysi Dükkanı
- Süpermarket
- Cami
- Hastane
- Banka
- Diğer Okullar
- Yaya geçidi
- Bisiklet yolu
- Ağaçlı yollar
- Oturmak için banklar
- Evlerin bahçeleri
- Otobüs durakları
- Trafik ışıkları
- Sokak ışıkları
- Terkedilmiş eski binalar
- Kalabalık sokaklar
- Dar sokaklar
- Kamyonet
- Boş sokaklar
- Çöp konteyneri
- Yoğun trafik
- Benzin istasyonu
- Diğer (lütfen yazınız).....

8. Evden okula gidip gelirken nasıl hissediyorsunuz?

a) Eğleniyorum b) Neşeli oluyorum c) Korkuyorum d)Mutsuz oluyorum
e) Diğer (Lütfen yazınız)
.....

9. Evden okula gidip gelirken yolda neleri sevmiyorsunuz? (birden fazla kutuyu işaretleyebilirsiniz)

- Çok trafik olan bir yolda karşıdan karşıya geçmek
- Altgeçit veya üstgeçitten geçmek
- Kaldırımın olmayan yoldan yürümek
- Trafik ışığı olmayan bir yolda karşıdan karşıya geçmek
- Boş arazi veya otoparkın içinden geçmek
- Dar ve boş sokaklardan geçmek
- Çok kalabalık olan sokaklardan geçmek
- Köpeklerin olduğu sokaktan geçmek
- Diğer (lütfen yazınız).....

10. Evden okula gidip gelirken yolda sizi korkutan şeyler nelerdir?

.....
.....

11. Eviniz ile okulunuz arasındaki sokaklarda yürümek veya bisiklete binmek için sokakların nasıl olmasını isterdiniz?

.....
.....

12. Aileniz tek başınıza veya arkadaşlarınızla nerelerde dolaşmanıza izin veriyor? (birden fazla kutuyu işaretleyebilirsiniz)

- evden okula gidip gelme
- parka gitme
- caddede bisiklet sürme
- sokakta oyun oynama
- arkadaşlarımla dışarıya çıkma
- markete gitme
- otobüs/ minibüse binme
- karanlık olduktan sonra sokakta veya parkta oynama
- caddede karşıdan karşıya geçme
- mahalle dışına/ merkeze gitme
- arkadaşımın evine gitme
- sinemaya gitme
- Diğer (Lütfen yazınız)

APPENDIX B

“DRAW-AND-WRITE” SURVEY FOR CHILDREN

Öğretmenler İçin Ön Bilgi

Bu anket çalışması İzmir Yüksek Teknoloji Enstitüsü, Şehir ve Bölge Planlama Bölümü’nden Doç.Dr.Fatma Şenol’un danışmanlığını yaptığı ve Gülce Abatay tarafından yürütülen “Farklı Yapılı Çevrelerde Çocukların Okula Aktif Gidiş-Gelişi: Çocuk Dostu Bir Mahalle Olarak Sokak Tasarımı” başlıklı Kentsel Tasarım Yüksek Lisans Tezi kapsamında gerçekleştirilmektedir.

Projenin amacı, 3. ve 4. sınıftaki çocukların okula bisikletle veya yürüyerek gidiş-geliş hallerini ve olanaklarını etkileyen temel faktörleri belirlemek ve ardından, bu aktif ulaşım olanaklarını çocukların hayatlarında kullanmalarına yönelik sokakların fiziksel tasarımına dair öneriler ve stratejiler geliştirmektir.


Aşağıdaki “çiz ve yaz” anket çalışması, okul çevresine dair hazırlanmış krokiler üzerinde 3. ve 4. sınıf öğrencilerin okul çevresinde nelerden keyif aldıkları, nerelerde zaman geçirmekten hoşlandıkları ve nereleri güvensiz bulduklarına dair görüşlerinin belirlenmesini amaçlar. Öğrencilerin kendilerini resim, yazı veya her ikisiyle ifade etmeleri beklenmektedir. Verilen cevaplar yalnızca bilimsel araştırma amacıyla kullanılacaktır; öğrencilerin sadece “kız/erkek” olarak cinsiyetlerini ve sizin de aşağıdaki bilgileri doldurmanız yeterlidir.

Öğrencilerinizi çalışmaya dair bilgilendirme ve yönlendirme konusundaki katkılarınız ve ayırdığınız değerli zamanınız için teşekkür ederiz.


“ÇİZ VE YAZ” (3. ve 4. sınıf öğrenciler için)


Tarih:.....

Kaçıncı sınıftasınız:.....

Aşağıdaki kroki üzerinde evinizin yerini  sembolü ile işaretleyin (eğer eviniz krokinin dışında kalıyorsa yazarak belirtin)

Okul çevresinde nerelere sıklıkla gidersiniz?  Sembolü ile işaretleyin

Okul çevresinde nereleri eğlenceli bulursunuz?  Sembolü ile işaretleyin

Okul çevresinde nerelerden korkarsınız ve zaman geçirmeyi sevmezsiniz?  Sembolü ile işaretleyin

Aşağıdaki kroki üzerinde göstererek, çizerek ya da yazarak bizimle paylaşmısınız?

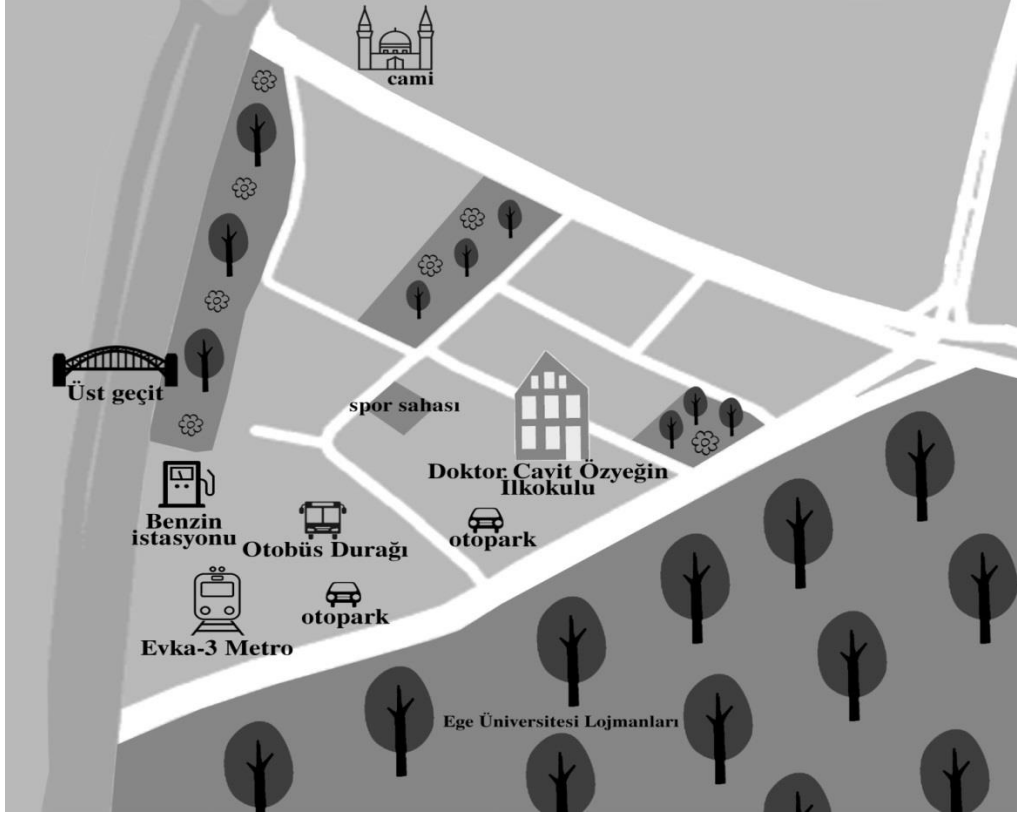


Figure B. 1. Sketch for Students in Doktor Cavit Özyeğin Primary School

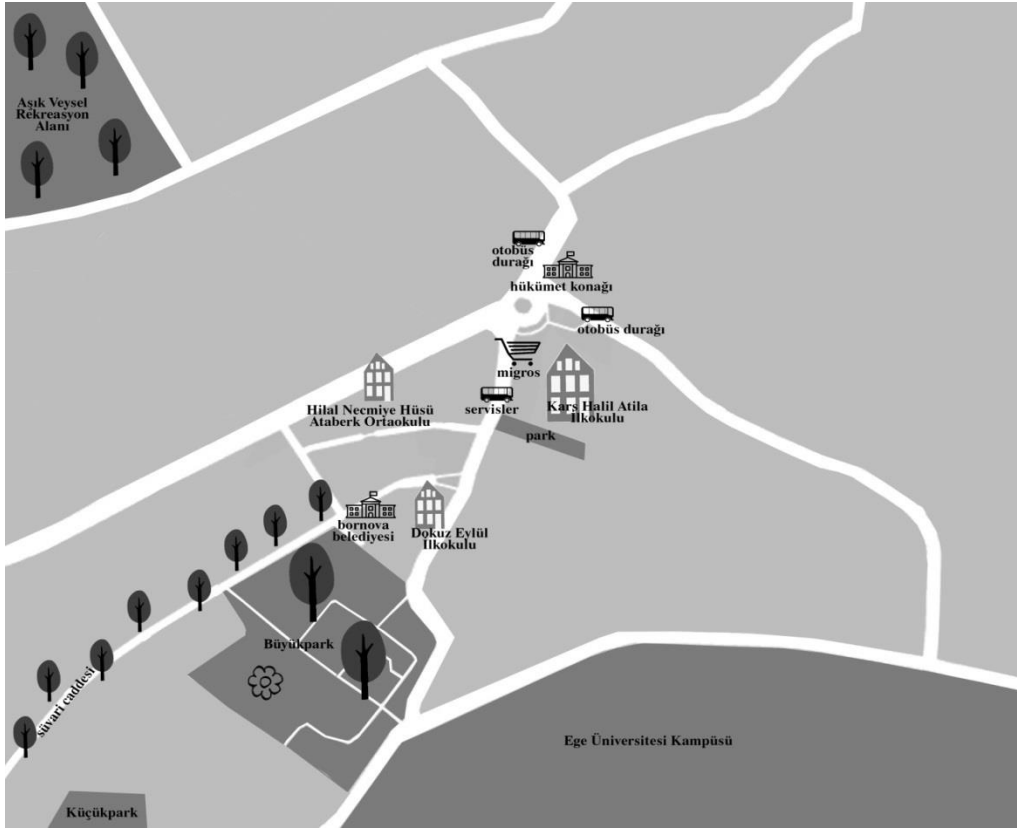


Figure B. 2. Sketch for Students in Kars Halil Atilla Primary School

APPENDIX C

SURVEY QUESTIONS FOR PARENTS

VELİLER İÇİN ÖN BİLGİ:

Bu anket çalışması İzmir Yüksek Teknoloji Enstitüsü, Şehir ve Bölge Planlama Bölümü'nden Doç. Dr. Fatma Şenol'un danışmanlığını yaptığı ve Gülce Abatay tarafından yürütülen "Farklı Yapılı Çevrelerde Çocukların Okula Aktif Gidiş-Gelişi: Çocuk Dostu Bir Mahalle Olarak Sokak Tasarımı" başlıklı Kentsel Tasarım Yüksek Lisans Tezi kapsamında gerçekleştirilmektedir. Projenin amacı, 3. ve 4. sınıf öğrencilerin okula bisikletle veya yürüyerek gidiş-geliş hallerini ve olanaklarını etkileyen temel faktörleri belirlemek ve ardından, bu aktif ulaşım olanaklarını çocukların hayatlarında kullanmalarına yönelik sokakların fiziksel tasarımına dair öneriler ve stratejiler geliştirmektir.

Bu anketi 3. ve 4. sınıf öğrencilerin velilerinin doldurması bu araştırmanın gerçekleşmesi için önemlidir. Eğer siz öğrenci velisi iseniz, bu anketi doldurmanız için yardımınızı rica ediyoruz. Bu çalışmaya katılmama veya katıldıktan sonra çalışmadan çıkma hakkında sahipsiniz. Anketi doldurmanız, araştırmaya katılım için onama verdiğiniz biçiminde yorumlanır. Anketteki soruları yanıtlarken kimsenin baskısı veya telkini altında olmayın. Vereceğiniz cevaplar yalnızca bilimsel araştırma amacıyla kullanılacak ve kimseyle paylaşılmayacaktır.

Katkılarınız ve ayırdığınız değerli zamanınız için teşekkür ederiz.

Aşağıdaki her bir soru için altında verilen cevaplardan size uygun olanı işaretlemeniz ve açıklama istenen sorulara düşüncelerinizi yazmanız yeterlidir.

Anket öncesi veya sonrasında sorunuz olursa [+905464041828](tel:+905464041828) telefon numarasından Gülce Abatay'a ulaşabilirsiniz.

"3. ve 4. SINIF" ÖĞRENCİLERİN VELİLERİ İLE ANKET

Mahalle ve komşuluk ilişkileri ile ilgili sorular

1. Çocuğunuzun okulu ile eviniz arasındaki yürüme mesafesi dakika olarak ne kadar?
2. Kaç yıldır bu mahallede ikamet etmektedir?
3. Mahallenizde komşuluk ilişkileriniz var mı?.....

4. Mahalle içinde alışveriş, komşu, okul, park ve benzeri yerlere giderken ulaşımınızı genellikle nasıl sağlıyorsunuz?

- a) Yürüyerek b) Bisikletle c) Otobüs, minibüs gibi toplu taşıma araçlarıyla d) Arabayla e) Diğer (Lütfen yazınız)

.....

5. Çocuğunuzla birlikte mahallede zaman geçirirken gitmekten hoşlandığınız alanlar var mı?

- Evet
 Hayır

5.1. Bu alanlar nereler? Ve bu alanların hangi özelliklerini beğeniyorsunuz?

.....
.....

6. Çocuğunuzla birlikte mahallede zaman geçirirken gitmekten hoşlanmadığınız alanlar var mı?

- Evet
 Hayır

6.1. Bu alanlar nereler? Ve bu alanların hangi özelliklerini beğenmiyorsunuz?

.....
.....

Çocuğunuzun mahalledeki dolaşımına ilişkin düşünceleriniz

7. Çocuğunuzun yanında bir “büyük” olmadan neleri yapmasına izin vermezsiniz? (Yazınız)

.....
.....

8. Çocuğunuzun yanında siz olmadan tek başına veya arkadaşlarıyla mahallede nerelerde dolaşmasına izin verirsiniz? Aşağıdaki seçeneklerden ilgili olanları işaretleyin.

- evden okula gidip gelme
 caddede bisiklet sürme
 sokakta oyun oynama
 arkadaşlarıyla dışarıya çıkma
 markete gitme
 otobüs/ minibüse binme
 karanlık olduktan sonra sokakta veya parkta oynama
 caddede karşıdan karşıya geçme
 mahalle dışına/ merkeze gitme
 arkadaşının evine gitme
 sinemaya gitme
 Diğer (Lütfen yazınız)

9. Çocuğunuzun mahalle içindeki dolaşımı ilgili endişeleriniz var mı? Varsa nelerdir?

.....
.....

10. Çocuğunuz okula yürüyerek veya bisikletle gidip gelirken aşağıdakilerden hangilerini yapmak zorunda kalıyor? (birden fazla kutuyu işaretleyebilirsiniz)

- Çok trafik olan bir yolda karşıdan karşıya geçmek
- Trafik ışığı olmayan bir yolda karşıdan karşıya geçmek
- Altgeçit veya üstgeçitten geçmek
- Kaldırımı olmayan yoldan yürümek
- Boş arazi veya otoparkın içinden geçmek
- Terkedilmiş binaların olduğu sokaktan geçmek
- Dar ve boş sokaklardan geçmek
- Çok kalabalık olan sokaklardan geçmek
- Köpeklerin olduğu sokaktan geçmek
- Diğer.....

11. Çocuğunuzun evden okula yürüyerek gidip gelmesi ile ilgili endişeleriniz var mı? Varsa nelerdir?

.....
.....

12. Çocuğunuzun ev ve okul arasındaki dolaşımıyla ilgili aşağıdaki ifadelere ne derecede katılıyorsunuz?

(1 kesinlikle katılmıyorum, 2 katılmıyorum 3 kararsızım, 4 katılıyorum, 5 kesinlikle katılıyorum)

Bisikletle veya yürüyerek okula gitmenin çocuğumun sağlığı açısından iyi olacağını düşünüyorum.	1	2	3	4	5
Mahallemin çocuğumun okula bisikletle veya yürüyerek tek başına gidebilmesi için yeterince güvenli olduğunu düşünüyorum.	1	2	3	4	5
Çocuğum okula yürüyerek veya bisikle gidip gelmekten hoşlanır.	1	2	3	4	5
Çocuğumun okulu bisikletle veya yürüyerek gidebilmesi için yeterince yakın uzaklıkta.	1	2	3	4	5
Çocuğum okula yürüyerek veya bisikletle gidebilmek için yeterince büyük.	1	2	3	4	5
Çocuğumu okula arabayla götürüp getirmek benim için daha uygun.	1	2	3	4	5

13. Çocuğunuzun dış mekanlarda oyun, spor, yürüyüş ve benzeri hareketli zaman geçirmesi ile ilgili düşüncelerinizi bizimle paylaşır mısınız?

.....
.....

14. Aşağıdakilerden hangileri olsaydı çocuğunuzun okula güvenli bir şekilde yürüyerek veya bisikletle gidip gelebileceğini düşünürdünüz? (birden fazla kutuyu işaretleyebilirsiniz)

- Daha fazla kaldırım olan yol olsaydı
- Kaldırımlar daha geniş olsaydı
- Sokaklar daha temiz olsaydı
- Daha az araba olsaydı
- Arabalar daha yavaş hareket etseydi
- Daha fazla trafik ışığı olsaydı
- Karşıdan karşıya geçmelerine yardımcı olan görevliler olsaydı
- Mahallede komşuluk ilişkileri daha iyi olsaydı
- Daha fazla arkadaş okula yürüyerek veya bisikletle gidip gelseydi
- Mahalledeki suç oranı daha az olsaydı
- Sokak ışıklandırmaları daha iyi olsaydı
- Etrafta terkedilmiş binalar ve boş arsalar olmasaydı
- Etrafta daha fazla dükkan olsaydı
- Sokaklar daha kalabalık olsaydı
- Etrafta bisiklet yolları olsaydı
- Diğer.....

15. Eviniz ile çocuğunuzun okulu arasındaki sokaklar nasıl olsaydı, çocuğunuzun ev ve okul arasında yürüyerek veya bisiklete binerek gidip gelmesine izin verirdiniz?

.....
.....

Ailenin / Hanenin sosyo-ekonomik durumu ile ilgili sorular

16. Hanede kaç çocuğunuz var?

16.1. Kaç tanesi 12 yaşında veya daha küçük?.....

17. Evde kaç kişi yaşıyorsunuz?.....

17.1. Eve kimlerle yaşıyorsunuz?.....

18. Hanenizde kaç çalışan var?.....

19. Aylık ortalama hane geliriniz aşağıdaki hangi aralıktadır?

a)300-2000tl b)2001-3500tl c)3501-5500tl d)5501-7500tl d)7501-10000tl e)10001+

20. Aracınız var mı? (1)hayır (2)evet

- 20.1. Varsa, kaç tane?.....
- 20.2. Aracınızı daha çok kim kullanıyor?.....
- 20.3. Aracınızı hangi amaçlar için kullanıyorsunuz?.....
21. Çocuğunuzun cep telefonu var mı? (1)hayır (2)evet
22. Çocuğunuz bisiklete sahip mi? (1)hayır (2)evet
23. En son bitirdiğiniz okul derecesi nedir?
a)Okuma yazma bilmiyorum b)Sadece okur yazarım c)ilkokul
d)ortaokul/lise e)üniversite f)lisansüstü
24. Aşağıdaki haritada görmüş olduğunuz 200m, 400m ve 600m çapında oluşturulmuş halkalar içerisinde eviniz hangi halkanın içinde yer almaktadır? İşaretleyiniz.



Figure C. 1. Map for Parents of Students in Doktor Cavit Özyeğin Primary School

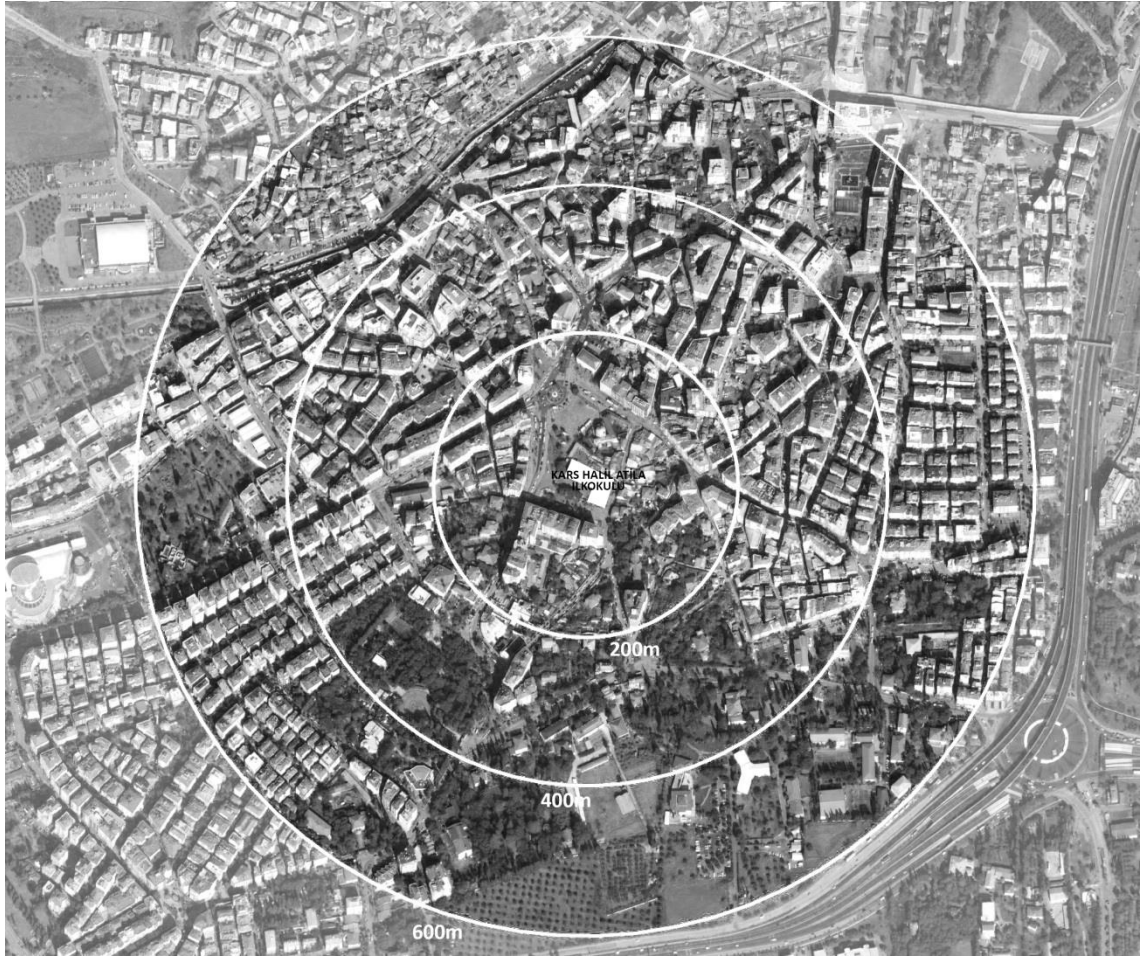


Figure C. 2. Map for Parents of Students in Kars Halil Atila Primary School

APPENDIX D

PHYSICAL ENVIRONMENT OBSERVATION CHECKLIST

Table D. 1. Physical Environment Observation Checklist

Measures (calculated for 6 streets in both of the schools within the area of 150m diameter circle)		Coding (1=features that increase the usage of the street, 0=decrease the usage of the street)	source
Sidewalk and Bike Way Features	Is it enough the width of pedestrian path or sidewalk?	Higher than min standard (1.5m)=1, less than=0	Field observation
	What is the condition of sidewalk?	Good=1, poor(need of repair)=0	Field observation
	Are there any features that obstruct the path?(sign, trash can, parked car, etc.)	Yes=0 No=1	Field observation
	Are there sidewalk amenities on the street?(bench, garbage bin, etc.	Yes=1 No=0	Field observation
	Are there signs for pedestrians on the street?	Yes=1 No=0	Field observation
	Is there bike way along the street?	Yes=1 No=0	Field observation
Traffic Environment Features	Is there a bus stop on the street?	Yes=1 No=0	Field observation
	What is the width of the street?	Higher than 2 lanes=0 equal or less than=1	Field observation
	Is the speed limit more than 30km/h?	Yes=0 No=1	Yandex vehicular traffic data
	Are there enough crosswalk along the street?	Yes=1 No=0	Field observation
	Is there high density traffic?	Yes=0 No=1	Field observation
	Are there measures on the street that slow down the traffic? (speed bump, curb extention, etc.)	Yes=1 No=0	Field observation
Safety Features	Are there ‘eyes on the street’? (windows at street level, active use on the street level, etc.)	Yes=1 No=0	Field observation
	Are there any security measures along the street? (camera, etc.)	Yes=1 No=0	Field observation
	Are there mixed-use buildings along the street?	Yes=1 No=0	Field observation
	Are there street lights along the street?	Yes=1 No=0	Field observation
Aesthetic Features	Are there trees and plants along the street?	Yes=1 No=0	Field observation
	Are there vacant lots or abandoned buildings along the street?	Yes=0 No=1	Field observation
	Are the buildings along the street well-maintained?	Yes=1 No=0	Field observation
	Are there a lot of litter on the sidewalks?	Yes=0 No=1	Field observation
Land Use and Population Density	Are there parks along the street?	Yes=1 No=0	GIS
	Are there commercial and mixed use areas along the street?	Yes=1 No=0	GIS
	Are there residential areas along the street?	Yes=1 No=0	GIS
	Is the street crowded?	Yes=1 No=0	Field observation