WALKING PATTERNS IN SHOPPING MALLS:
THE CASE OF ANKAMALL

A Master's Thesis

by

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July 2013

To Prof. Dr. Şencan Özme

WALKING PATTERNS IN SHOPPING MALLS: THE CASE OF ANKAMALL

Graduate School of Economics and Social Sciences
of
İhsan Doğramacı Bilkent University

by

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In Partial Fulfilment of the Requirements for the Degree of
MASTER OF FINE ARTS

in

THE DEPARTMENT OF
INTERIOR ARCHITECTURE AND ENVIRONMENTAL DESIGN
IHSAN DOĞRAMACI BILKENT UNIVERSITY
ANKARA

July 2013

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Interior Architecture and Environmental Design.

Associate Prof. Dr. Feyzan Erkip
Supervisor

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Interior Architecture and Environmental Design.

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ABSTRACT

**WALKING PATTERNS IN SHOPPING MALLS:
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July 2013

This study examines the issue of walking patterns in shopping malls. Pedestrian activities are important for everybody in daily life. Analysis of pedestrian activities such as wayfinding and walking patterns gain more importance in complex buildings such as shopping malls. Referring to this, shopping mall which is a leisure space in addition to its main function is chosen. In shopping malls, the routes for pedestrians occupy an important part of the total area where walking is compulsory for the visitors. In this study, Ankamall is chosen for the field survey because it is the most heterogeneous shopping mall in Ankara and most accessible mall by a variety of transportation vehicles. The main purpose of this research is to investigate the relation between spatial characteristics or interior organization and the walking pattern. In this research some independent variables such as the weekend-weekday use, gender difference, the presence of children and the party size were analyzed. Direct observation and short interview methods were applied. The results show that there is an economy of movement (EOM) for all cases. Also, the trajectory may change according to weekend-weekday use. The velocity may change with the effect of gender, party size and presence of children in the party. Having a target and the level of familiarity were also found to be related to the walking pattern.

Keywords: walking pattern, shopping mall, trajectory, velocity, economy of movement

ÖZET

ALIŞVERİŞ MERKEZLERİNDEKİ YÜRÜME MODELLERİ: ANKAMALL ALAN ÇALIŞMASI

Paykoç, Eda
Yüksek Lisans, İç Mimarlık ve Çevre Tasarımı Bölümü
Tez Yöneticisi: Doç. Dr. Feyzan Erkip
Temmuz 2013

Bu çalışma, alışveriş merkezlerindeki yürüme modellerini ele almaktadır. Yaya hareketleri herkesin günlük hayatında önemli bir yere sahiptir. Yön bulma ve yürüme modelleri gibi yaya hareketlerinin incelenmesi, özellikle alışveriş merkezleri gibi karmaşık yapılarda daha da önem kazanmaktadır. Bu bilgiye dayanarak, araştırmanın yapılması için ana işlevi olan alışverişin yanı sıra, vakit geçirilecek bir mekân türü olan alışveriş merkezleri seçilmiştir. Alışveriş merkezlerinde yayalara ayrılan yürüyüş alanları tüm mekânın önemli bir bölümünü kaplamaktadır ve yürüyüş alışveriş merkezi ziyaretçileri için mecburi bir etkinliktir. Bu çalışmada alan çalışması mekânı olarak Ankara'nın hem ziyaretçi çeşitliliği, hem de mağaza çeşitliliği açısından en zengin alışveriş merkezi olan Ankamall seçilmiştir. Bunların yanı sıra, erişilebilirlik açısından ulaşım araçlarının çeşitliliği de bu seçimde etkili olmuştur. Bu araştırmanın temel amacı, mekânsal özellikler ve iç mekân düzenlemeleri ile yürüme modelleri arasındaki ilişkiyi incelemektir. Araştırmada hafta içi-hafta sonu kullanım farkı, cinsiyet farkı, gruptaki kişi ve çocuk sayısı gibi değişkenler analiz edilmiştir. Alan çalışması sırasında doğrudan gözlem ve görüşme yöntemleri uygulanmıştır. Sonuçlara göre, harekette tutumluluk her durumda bulunmuştur. Hafta içi-hafta sonu farkı rotayı değiştirmektedir. Hız ise cinsiyet farkı, çocuğun etkisi ve gruptaki değişen insan sayısı gibi değişkenlere göre farklılık göstermektedir. Belli bir amacın olup olmaması ve mekâna aşinalığın da ziyaretçilerin yürüme modelleri üzerinde etkili olduğu bulunmuştur.

Anahtar Kelimeler: yürüme modelleri, alışveriş merkezi, rota, hız, harekette tutumluluk

ACKNOWLEDGMENTS

Firstly, I would like to thank to my advisor Assoc. Prof. Dr. Feyzan Erkip for her invaluable support, endless patience, supervision and guidance throughout my graduate education and in this study. It has been a pleasure to work with her. I consider myself as privileged for being one of her students.

I would like to thank to my jury members Assist. Prof. Dr. Çağrı İmamoğlu and Assist. Prof. Dr. Güliz Muğan Akıncı for their contributions and feedbacks.

I would like to thank to my chairperson Assist. Prof. Dr. Nilgün Camgöz Olguntürk for her support. I consider myself as privileged for studying with her. Also, I would like to thank to Assist. Prof. Dr. Meltem Gürel who was my chairperson at my graduate education's first year for her invaluable support and encouragement throughout this work. It has been honor to study with her at my graduate education.

I would like to thank to Prof. Dr. Şencan Özme for her limitless support, guidance, encouragement and trust throughout my graduate education. I owe much for her to come this far.

I would like to thank to Prof. Dr. Fersun Paykoç for her guidance and support who has encouraged me to start my graduate education and to come this far.

I am grateful to all faculty members and staff of İhsan Doğramacı Bilkent University Department of Interior Architecture and Environmental Design and Department of Architecture.

I would like to thank to my friend Çetin Tünger for his invaluable help during the statistical analysis of that study. I am also grateful to him for his endless patience, encouragement and moral support throughout this study. I would like to thank to my officemates and all friends from my master education for their endless support and patience throughout this study. I am grateful to my dear friend Tuğba Çetin for her invaluable friendship, patience, trust and moral support. I would also thank to my dear friend Erdi Eralp Uğur for his invaluable support, trust and friendship. I am also grateful to all for whom I owe.

I am mostly grateful to my family. I am indebted to my mother Demet Paykoç for her endless love and trust throughout my life but especially the patience during this study. This thesis could not be as it is now without her invaluable support. I am also grateful to my grandfather Prof. Dr. Refik Paykoç for his invaluable support and endless love all through my life. I am also grateful to my grandmother Nevhis Paykoç for whom I miss much but always feel next to me.

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CHAPTER I

INTRODUCTION

1.1 The Aim of the Study

With rapid changes in the technology and rising new life styles as a result of these changes, people started to change their habits and their daily practices. Their physical and social activities keep up with these new life styles in various forms. Walking, as the basic physical activity of people becomes more important with these changes because people's physical activities are limited. People tend to use their private cars or other public transportation vehicles for going from some place to another rather than walking. Walking became people's last choice while changing places, in other words they walk where there is no other alternative and the place of walking in our lives decrease day by day.

In addition to these, the concept of socialization changed. Although the manner of socialization changed day by day, shopping stays as a favorite activity. Walking as a physical activity is an everyday activity. Shopping malls are the places which might combine physical and social aspects. According to Gottdiener (1995, p.97) why

visitors come to shopping malls have two main reasons behind. Firstly, they are carried away their consumption needs. In addition to this, shopping malls are the areas for socialization with others upon limited facilities for public relations. In other words, people mostly tend to socialize in shopping malls where they can satisfy almost their all needs and wants such as shopping, looking around, eating and joining some cultural activities. The activity of walking is also provided in shopping malls. In shopping malls, people have to walk because they have no other option. While doing this, their walking patterns change according to some individual and environmental factors.

The purpose of this study is to make an analysis about walking patterns of people within the context of shopping malls. The analysis needs to deal with the factors which compose the walking pattern: the trajectory and the velocity of the movement. The effects of the independent variables such as weekend-weekday, gender difference, party size and presence of children in the party are also analyzed. Some other variables such as having a target while walking or the familiarity level are also considered while interpreting the results.

The research was conducted in a shopping mall with both urban and suburban features namely Ankamall to understand the changing walking patterns according to some variables. While conducting the case study, direct observation and short interviews were used as instruments. The main concern of this research is the relationship between the indoor space, the design of the mall, some internal and external properties of individuals and the walking patterns. The purpose is to find out and come up with the design settings and suggestions referring to the results of

the case study in terms of interior organization for shopping malls preferably with universal walking properties for all. This study is important for being the first on the Turkish context following the Western approaches and proposing design ideas for the interior of the shopping malls combining the physical and social aspects of the pedestrian activities.

1.2 The Structure of the Thesis

The thesis is composed of five main chapters. Chapter 1 is introduction. It briefly mentions about the aim of the study and the significance of that issue. Afterwards, the methodological information about the case study is addressed. Then, it is concluded with the general structure and the general organization of the thesis.

Chapter 2 examines the issue of walking pattern in a built environment. The first section mentions the importance of walking activity for people. While discussing this topic, social aspects of the walking activity, the relation between the obesity and walking, and the optional usages of malls for sport activities especially for the adults and disabled are discussed. After discussing the importance of the walking activity, this chapter continues with investigating the factors that affect the walking activity including handedness and eye dominance as internal factors and reading and driving as external factors. The last section in Chapter 2 investigates the walking activity in different spaces such as exhibition halls, museums, galleries and some outdoor areas such as plazas, zoos, aquariums and streets.

Chapter 3 investigates the issue of walking pattern in shopping malls. The first section examines the relation between the wayfinding and the pedestrian activities. Secondly, Bitgood's and Duke's (2006) who are the pioneers of the walking pattern issue, approach to the walking activity in shopping malls and the models developed by them are analyzed. Some other further researches which referred to that model study are analyzed briefly by mentioning their methods and results. Lastly, the methods which help to measure the walking pattern in shopping malls are mentioned. These methods involved in the trajectory and the velocity of the walking pattern with its different variables and objectives as its subtitles.

Chapter 4 explains the case study of the research which is conducted at Ankamall. Firstly, the objectives of the research and the hypothesis are given. The variables that were used in the case were also noted down. Then, the analysis of the site is made. Afterwards, the methods of the case study are discussed which are observation and the interview. Lastly, the results of the case study discussed. As the first part of the results discussion, statistical analyses were made by using SPSS. Afterward, the results were interpreted both referring to the statistical analyses and some other information obtained from the observation chart. As a result of that chapter, the implications for the design are proposed.

Chapter 5 constitutes the conclusion of the study. It gives brief information on how the study was conducted. Then, the results were mentioned shortly. In addition to these, the limitations of that study were mentioned. Moreover, it includes some guides for future researches related to the walking pattern in shopping malls or some

other spaces such as galleries, museums, zoos and plazas with corridor like circulation areas.

CHAPTER II

THE ISSUE OF WALKING PATTERN IN A BUILT ENVIRONMENT

2.1 The Importance of the Pedestrian Activities

2.1.1 The Social Aspects and the Obesity

The activity of walking is regular and everyday practice for every people who have ability to move on foot. Trust for America's Health (2007) mentioned that compared to other types of activities, walking is recommended for individuals as regular physical activity because walking is accessible in a great extent, quickly embraced and it is the activity with the least injury risk (cited in Atkinson & Weigand, 2008). In addition to these, as a physical activity; walking is the most preferred exercise type because it can be easily incorporated into daily routines (Hong, Ory, Lee, Wang, Pulczinksi & Forjuoh, 2012).

People walk either for their leisure activities or transportation purposes for going from somewhere to another. With the coming of post-industrial era and the rapid developments in the technology, the level of walking activity in our lives decreases

day by day. Generally, people use their private cars or public transportation vehicles for their transportation purposes. For example, while going to work or school; the preference of walking compared to usage of automobiles or public transportation is very low. Walking and bicycling which are accepted as active transportation are mostly common in European countries than in the United States, Canada and Australia (Bassett, Pucher, Buehler, Thompson & Crouter, 2008). However, in today's conditions in where making use of the time well is very important, walking is thought as time consuming.

Apart from the daily and routine works to do, people need to spare some time for walking as leisure activity. When it is thought as leisure activity, people walk for their hobbies. It can be either in the indoor area such as fitness centers or in the outdoor area such as walking tracks or parks.

Either for leisure activities or for the transportation purposes, walking is a very beneficial activity from several aspects. Walking has potential to have a large public health impact due to its accessibility, its documented health benefits, and the fact that effective programs to promote walking already exist (Lee & Buchner, 2008). It has positive effects on public health in terms of mental, social and physical conditions of people. It also treats these all above circumstances if it is needed. In addition to these, if walking is a regular activity, it prevents the health problems to occur.

When effects of walking on mentality analyzed, it is obvious that walking as a physical activity improves the mental well-being of the general public with improved mood and self-perceptions (Fox, 1999). As Fox (1999) also states, walking as a

regular physical activity treats depression, prevents anxiety and enhances stress reactivity, has great impacts on well-being, emotion and mood, increases the cognitive performance, delays cognitive decline in adults, regulates and enhances the sleep quality, and change people's perceptions in a positive way.

Walking also strengthens people's social connections and makes them more social if it is done regularly. There is an obvious relation between the neighborhood design and social capital level. Theoretically, walking friendly neighborhoods with a mixed-use enhances the social capital of residents because these physical living conditions motivate them to interact more; either this interaction is intentional or accidental. It is shown through case studies that people who live in walkable and mixed-use neighborhoods know their neighbors more, they trust each other more and involve into the social life in a considerable way when compared to others (Leyden, 2003).

In spite of the fact that walking has positive impacts over mental health and social conditions of people, walking has its largest impact on physical health of individuals. There is strong evidence that a lack of physical activity including walking increases risk of premature mortality and many chronic diseases, including cardiovascular disease (CVD), thromboembolic stroke, hypertension, type 2 diabetes mellitus, osteoporosis, obesity, colon cancer, breast cancer, anxiety and depression (Lee & Buchner, 2008). However, if there is a regular walking or physical activity; it prevents cardiovascular disease, diabetes, cancer, hypertension, obesity, depression and osteoporosis. There is a linear relation between physical activity and health

status; a further increase in physical activity and fitness will lead to improvements in the health status (Warburton, Nicol & Bredin, 2006).

It is obvious that walking is beneficial for many kinds of physical illnesses. However, as it is stated by Swinburn & Egger (2002), the benefits of walking to prevent and reduce obesity and overweight have been well documented. With the changing habits of our daily routines such as eating more fast-food, moving less, using transportation vehicles rather than walking increases the obesity rate and it became a worldwide epidemic (Fogelholm, 2000). Besides, it causes some other diseases such as diabetes and some cancer types (Fox, 1999).

The main idea that should be understood for preventing the obesity or losing weight is the calculation of calories; the calories burned should be more than the calories that is taken. As Prentice & Jebb (1995) stated, the low activity levels are also the major cause of obesity. Referring to this, the main prevention of obesity can be a diet program which should be supported by the sport activity. As an activity, the most easiest and applicable sport for that goal is regular walking (Angley & Watkins; 2001). Also, walking is one of the safest forms of the activity (Gregg, Gerzoff, Caspersen, Williamson & Narayan, 2003). Walking is relevant when mentioning the obesity as an epidemic and it has the greatest role over the increasing caloric expenditure (Lee & Buchner, 2008). As it is mentioned by the US Dietary Guidelines (2005), if the caloric intake does not change and walking is done between 1000-2000 steps; in which 2000 steps daily which is accepted as the modest level of activity could prevent obesity (cited in Lee & Buchner, 2008). Although diet can not be the only implement to prevent obesity and to lose weight, the increases in physical

activity, which can be pedometer-based walking help dieters maintain lean muscle tissue diet-induced weight loss (Richardson, Newton, Abraham, Sen, Jimbo & Swartz, 2008). Manson, Greenland, LaCroix, Stefanick, Mouton, Oberman, Perri, Sheps, Pettinger & Siscovick (2002) also stated that both walking and physical activity are associated with substantial reductions in the level of obesity and helps losing weight.

To make walking as a part of the physical activity, it should be in our lives as a tool for active transportation. Countries with the highest level of active transportation; walking, bicycling and public transit generally have the lowest obesity rates (Bassett et al., 2008). According to the case studies (Bell, Ge & Popkin, 2002), physical activity that is generated by active transportation is helpful in weight control and obesity. When the obesity prevalence data are analyzed, the lowest rate of active transportation was seen at USA with the highest level of obesity. The interpretation of that data can be that the increased energy expenditure required by walking and cycling as active transportation helps to prevent obesity. In today's world where obesity became a worldwide epidemic, the level of obesity rate can be decreased by informing people about the benefits of the walking activity and encouraging them to walk more regularly, with a certain pace.

2.1.2 Mall Walking for Sport Activities

The main function of the shopping malls is to provide some goods and supplies to the shoppers and help them to satisfy their needs with its shops and other facilities

inside. They provide their customers with leisure and recreation opportunities which support socializing and browsing in a modern and well-kept environment. They also serve as a climate controlled environment for all seasons (Erkip, 2003). However, these functions serve for people within limited time duration from morning to the evening, generally 10:00 am to 10:00 pm which means that except these hours, the malls are not serving to any function in terms of shopping and consumption.

For making the malls being used all though the day beneficially and make it being serve to other purposes, some shopping malls are used as a space for sport activities, mainly the mall walking. Mall walking is an organized group exercise in shopping malls especially in the USA in which people do circuits of the complex before the shops open to trade with the public (Warin, Moore, Davies & Turner, 2008). It can also be defined as a low impact, aerobic workout in which participants walk for exercise in the climate-controlled, safe environment of the shopping mall before it is officially open to the public (Schacht & Unnithan, 1991). Moore (1989) described "the mall walking program as the genesis of local community's response to reduce the increasing rate of heart disease and cerebrovascular disease in its residents" (cited in Owens, 2007, p.384).

In addition to provide new function to the malls, "mall walking creates an additional social context for the mall as depot where consumption is being balanced by constraint and where engaging in social relations and shared activities take precedence overconsumption" (Warin et al., 2008, p.194). This exercise, mall walking, also emphasizes the constraining and enabling capacities of consumption, for consumption is implicated in the causative factors of obesity but simultaneously

positioned as a strategy to promote healthy lifestyles. With the inclusion of sport activities in the shopping malls, they become the places of contradictories because their main function is serving consumption with reasoning spending money and helping the increasing level of obesity besides working as a place for sport activities and healthy solutions to its main function. "Mall walkers have transformed the physical setting of the mall into one where, in conjunction with exercise, the quest for sociability can be somewhat satisfied" (Schacht & Unnithan, 1991, p.351).

Mall walking activity is functional and beneficial where the lack of sidewalks and adequate lighting can make walking difficult in some neighborhoods (Doyle-Baker, 2007). This type of walking is especially is posited by physicians as an excellent low impact form of exercise that is suitable for older people (Schacht and Unnithan, 1991). In a recent study, shopping malls were the 2nd most popular reported walking site for those 45 years or older, with more women than men likely to use the location (Culos-Reed, Stephenson, Doyle-Baker & Dickinson, 2010). These older adults who have problems while walking in their neighborhoods such as being vulnerable to traffic, curb heights and weather conditions prefer mall walking if there is existing programs in their neighborhoods (Doyle-Baker, 2007). Walking programs also have a potential to address several physical-activity barriers for the elderly, particularly safety concerns and social support needs. It is also an applicable form of physical activity and an optional health-promotion program for the aging population. It is one way to help older adults improve their functional mobility and independence (Culos-Reed et al., 2010). It is also suitable for people with heart problems referring to the safety conditions.

There are many reasons why mall walking is chosen as a sport activity; firstly that it is safe with its security properties. It is also geographically flat which makes walking much easier compared to walking outside because while walking in the mall, there is no threat of tripping over broken pavement. Although walking outside is much more healthier than walking in a closed space in terms of being at a fresh air and getting oxygen while walking, mall walking is more proper for the ones who have difficulties for walking outdoor such as disabled people or older people. Today's living conditions such as buildings everywhere or much exhaust in the air can make the mall walking preferable. There is also a security feeling as a result of walking with a group. There is a provision of warmth, constant temperature and controlled climate at inside which means that if the weather conditions are not proper for walking at the outside, you can still walk at the mall without being affected by the external factors such as snow, rain, cold or hot. The air is filtered inside which also makes asthma patients to make exercise possible too (Warin et al., 2008). As it was mentioned (Bland&Colby, 1999; Donovan, 2002), referring to these physical properties, walking in an enclosed mall has become a popular choice of many adults who enjoy the generally safe, inexpensive and accessible features of malls.

In addition to these physical factors, mall walking also provide a social network with other walkers and interaction with fellows. It is also an excellent way to meet new people and have a good time while making exercise which is spending time constructively. Also, mall walking helps people to fraternize with others who have similar characteristics with them (Duncan, Travis & McAuley, 1994).

It is also cheaper compared to other sport facilities which points to "how people in lower socio-economic geographies adapt to and use consumerism for their own means" (Warin et al., 2008, p.194). Walking individually can also be a problem for some people especially outside. However, mall walking which is made by regular groups provides a safe feeling (Doyle-Baker, 2007).

Even though mall walking has not yet started in Turkey referring to the literature review made, it is very common abroad. The shopping malls listed below are the examples of that facility: Briarwood Mall, Courtland Center, Eastland Mall, Fairlane Town Center, Fashion Square Mall, Genesse Valley Center, Great Lakes Crossing, Lakeside Mall, Laurel Park Place, Macomb Mall, Northland Mall, Oakland Mall, The Mall at Partridge Creek, Somerset Collection, Southland Mall, Twelve Oaks Mall, The Village of Rochester Hills and Westland Mall (Mall Walking Guide, 2013). Although the time durations, walking distances and regulations differ from one to another, their purpose is same. It can also be easily applied in the malls in Turkey with the participation of the neighborhood occupants. In addition to the participation of adults as it is in other countries, partially disabled people can also be encouraged to join mall walking programs with the help of experts in that field.

2.2 Factors Affecting Pedestrian Activities

The choice of pedestrians in terms of direction while walking is a complex one and it is decided by an interaction between intrinsic preferences and externally imposed task constraints (Lenoir, Overschelde, Rycke & Musch, 2005). As Cuqlock-Knopp

& Whitaker (1993) stated, it is both a perceptual and cognitive activity. They also added that pedestrian activities require an intricate integration of current and past stimuli. These features are common for all who walk. However, some differences occur at the decision point. As the reasons behind these differences, many can be counted such as the design of the space in which people walk, the size of that space, the directive elements which are used in that area, the color choice, the material usage, etc. It is obvious that all these factors are not related or arised from people, they are all mostly external factors which are originated from the physical factors of the space or the environment. The amount of these external physical factors are countless and hard to analyze. In this research, the factor that originates from human behavior is chosen as a focus. Human behavior may stem from either internal factors formed by genetic biases or external factors by environmental biases (Scharine & McBeath, 2002). In this case study in a T-maze task analyzing the human originated factors, Scharine & McBeath (2002) documented a review about pedestrian activities. Based on to the previous literature, they grouped possible factors of literality while walking into two: internal factors and external factors. They listed handedness and eye dominance as internal factors and reading direction and driving-side which are learned habits as external factors.

2.2.1 Internal Factors: Handedness and Eye Dominance

The main reason of discrepancies in navigational tendencies may be handedness. As Coren stated (1992), approximately 80-90 % of humans are right-handed, 60-80 % prefer to make use of their right foots and step forward their right foots first while

walking or playing games such as soccer, and 80 % of participants have a dominant hand and foot on the same side. Handedness affects people's interpretation of the world. As it is stated by Martin & Jones (1999), handedness has effects on memory in general and memory for the placement and orientation. For example, it is claimed that right handed people are more accurate in remembering the placement of the objects and places than left handed people (Martin & Jones, 1999). In addition to this, as it was mentioned by Karev (1999), handedness also influences in the orientation of people while drawing familiar and certain objects. For instance, right handed people draw handle of the glass in the right side which is his/her dominant hand. Besides, in terms of laterality, handedness is thought as an effective internal factor. Handedness affects how people perceive their surrounding and handedness is accepted as a possible factor that bias people to make them turn toward their dominant hand. In the case study that Scharine and McBeath (2002), the result is seen that the number of right turners are much higher than the number of left turners. It is deduced from the results that there is a direct proportion between the handedness and laterality. As opposed to this case study, it is shown that there is a relation between the handedness and the turning direction but with a low influence (Yang & Schwaninger, 2010). In addition to this, as Taylor, Strike & Dabnichki (2006) mentioned, handedness and footedness cannot be separately assessed. The 91 % of the right-handed people they conducted research on are also right-footed. They think that the handedness and footedness should be taken into consideration as a whole. As it is understood from the literature on the relation between handedness and laterality; handedness is an effective factor but there is no accurate account on its importance level.

The second factor which is thought to have an effect over literality is eye dominance. It is thought that there is a relation between the way people turn to and his dominant eye (Scharine & McBeath, 2002). For example, as it was stated by Robinson (1933), in museums it is possible that turning to the right may be related to the dominant right eye which has a better view of the gallery (cited in Scharine & McBeath, 2002). In the baseball game, eye dominance is also important to direct the bat and ball which is similar to laterality while walking. Having a dominant eye and hand in opposite sides make baseball players' greater (Adams, 1965; Portal & Romano, 1988; Coren, 1999). Also, there is a relation between the dominant eye and eye winking. Dominant eyes are the ones which are winked less (El-Mallakh, Wyatt & Looney, 1993). With this capacity, dominant eye obtain more information from the environment. Therefore, as a consequence, people tend to turn to the side of their dominant eye which provides a higher level of information. It is obvious that eye dominance might have a significant effect over the turning direction, but its level of effect is not well-known.

It is also obvious that internal factors; handedness and eye dominance are very effective over laterality. Their effect might change in different environments and settings or with the changing profile of people, but these two internal human related factors should be taken into consideration in related research.

2.2.2 External Factors: Reading and Driving

As an external human generated coefficient, reading direction is an important factor that might affect the laterality. For instance, pen strokes in writing and eye movements manipulate the reading direction in the written language. According to the results obtained from an experiment in which English, Arabic and Hebrew readers reproduce several shapes and during that reproduction, the direction of pen strokes are recorded. English readers show left-right directionality as English is read from left to right whereas Arabic and Hebrew readers show right to left tendencies since Arabic and Hebrew is read from right to left (Nachshon,1985). Referring to this experiment and its results, Abed (1991) conducted a new case study. In that study, he measured the visual scanning patterns of Western, Middle Eastern and East Asian readers. The results are not that much different in terms of location of fixations from the one that was conducted by Nachshon (1985). However, there is a significant difference in the direction of rebounds. Readers from the West tend to exhibit more saccades from left-to-right than the readers from the Middle East. As being very different from these two types of readers, readers from East Asia tend to have more saccadic movements in the vertical direction. This differentiation in the saccade direction shows that there is a reflection of changing adaptation of motor system of human to the requirements of reading. It is obvious that human's motor system can change with the effect of the external factors and it causes some laterality biases. The influence of reading direction can affect our lives and make people tend to move similar to their reading direction.

As the second external human generated factor, driving side is effective in the laterality while walking. As it was found by Robinson (1933), driving-side does not affect turning to the left but it is effective over turning to the right (cited in Scharine & McBeath, 2002). As Goodrich (1975) mentioned, pedestrians also tend to walk in the right side (cited by Scharine & McBeath, 2002). Although the deduction from these information cannot be certain, it can be deducted that pedestrians' behavior, walking at the right, can be a learned behavior and influenced by the driving side.

It can be seen that the internal human generated factors, handedness and eye dominance, and external factors, reading direction and driving side, are effective elements over laterality. The literature shows that the t reading direction has the least effect over the literality and navigational tasks. In contrast, both handedness and driving side produce significant effects. Although traffic rules and the driving side are learned issue, they have a significant effect on directional preference similar to the handedness (Scharine & McBeath, 2002).

2.3 Pedestrian Activities in Different Spaces

People move and walk through in the built environment and public spaces in foreseeable ways. Although walking in public spaces is a well-known activity and it is common for all, it is important to analyze this issue deeply because it will give architects and designers of those spaces a lead (Bitgood & Dukes, 2006). While analyzing the pedestrian activities in various public spaces, the issues that should be reviewed are visitor orientation and circulation which are the most neglected areas of

the visitor studies (Bitgood, 1988a). However, it is better to cover visitor studies from the perspective of environmental psychology to be able to use it for the design purposes.

In the field of visitor studies, experimental, correlational and observational researches are conducted. How the isolated variables influence the visitor behavior can be determined with laboratory and field experiments, simulations or quasi-experimental studies. The relationship between visitor studies and variations in a setting can be obtained through the correlational research. Observational research informs the researcher about how visitors respond to environmental stimuli. Direct observations or self report methods can be applied (Bitgood, 1988b).

Pedestrian activities were firstly analyzed in the exhibition areas such as museums and galleries form different point of views with different subtopics. Afterwards, this coverage expanded to the zoos, parks, aquariums, plazas during 80's and lastly to the shopping malls in 2000's (Patterson, 1989) (Bitgood, 1988a).

2.3.1 Indoor Spaces: Exhibition Halls, Museums and Galleries

Visitor studies contributed to environmental psychology in the beginning. Until 1960s; visitor studies did not draw attention of researchers. Shettel's article "An Evaluation of Existing Criteria for Judging the Quality of Science Exhibits" published in 1968 attracted the attention to visitor studies which was one of the first

studies in visitor behavior to relate visitor studies to environmental psychology (Patterson, 1989).

Exhibition areas cover the largest place in the literature of pedestrian activities because that in that areas majority of the space is composed of circulation areas and it provides researchers with the option to make better investigation. Because the exhibition areas were firstly searched by means of pedestrian activities and visitor studies, these spaces were the ones deeply analyzed. Also multiple numbers of researches were conducted in these subjects. There appeared some key terms and definitions related to the visitor studies and pedestrian activities. Although it can be thought that they can be used for all public spaces, these concepts and terms are all derived from the exhibition areas in which visitor studies emerged. After proving and strengthening all those exhibition areas and pedestrian activities related terms, concept and results; they became general features that are valid for all types of public spaces.

Considering the visitor orientation and circulation in the pedestrian activities, there are 3 major elements that are needed to be defined and to be well-known in any type of spaces. As Bitgood (1988a, p.156) defined:

1) "Conceptual orientation: An awareness and understanding of the themes and subject matter organization of the facility.
2) Wayfinding: Being able to find or locate places in facility.
3) Circulation: How visitors make their way through the facility."

Afterwards, these 3 elements were revised by Bitgood (2011) and one more key term was added. Orientation became the second item with 2 subtitles under it: Conceptual orientation and wayfinding (physical orientation).

"Orientation: Awareness of what is in the environment, what to see and do, how to organize the visit, where you are at any moment, how to find your way around and where to find public destinations" (Bitgood, 2011, p.317).

As it is seen, all these terms are tied to each other. In other words, all concepts affect the other and none of them can be thought without another for obtaining a reliable and valid result.

In addition to these, the behaviors that are related with the orientation and circulation are much based on one set of perspectives (Bitgood, 2011). Any area which deals with visitor studies, orientation and circulation should be analyzed in three different perspectives: visitor, setting and interaction of visitor-setting (Bitgood, 2006; Shettel, 2005). This approach in research is also at the core of the recent environmental psychology.

The visitor perspective has a focus on what visitors bring with them into the museum either physically or on their mind. Visitor perspective is generally based on the pre-visit time duration with the variables of visitor-agendas, pre-knowledge and skills, and interests. These variables of the visitor perspective are the ones which have most importance for analyzing of how the setting and the interaction between visitor-setting promote to the visitors' behaviors, thoughts and feelings (Bitgood, 2011). As

Falk (1993) also stated, visitors of the museums follow their own agendas, what visitors bring to museum instead of following the exact sequence of exhibition elements developed by developers or designers. For example, visitors leave the exhibition area by the first available and open door despite it is not an exit door suggested by the developers. As it is observed, there is an obvious interaction between the architecture and the decision mechanism. Referring to this, it can be said that interference is centered on the setting. In other words, pre-visit agendas do not make that much sense in that case. To sum up the perspective of the visitors, those events in the setting influence how people behave and visitor perspective cannot be analyzed individually (Bitgood, 2011). In addition to the concept of visitor perspective, gender and locality were also important variables in visitor's behaviors while going around at the museum. Although gender and locality had no great impact over the walking path, they had a great impact over the time spent while walking and going through at the setting (İmamoğlu & Yılmazsoy, 2009).

In the setting perspective, there is an exact focus on the properties of the environment and the surrounding. As the first approach to the setting perspective, Convay (1968) discussed that the exhibition can be made attractive if the setting is effective and well-designed (cited by Bitgood, 2011). Another example of the setting perspective approach is an architectural approach called space syntax (Hillier & Hanson, 1984). As Hillier & Tzortzi (2006, p.282) stated, "Space syntax is a theory of space and a set of analytical, quantitative and descriptive tools for analyzing the layout of space in building and cities." This approach gives the information that spatial features and general layout of the space can control the movement of pedestrians (Hillier & Hanson, 1984).

The interaction perspective focuses on the coactions between the visitor and the setting. According to that approach, visitor experience is influenced by pre-visit agendas, psychological and physiological processes, interests and prior knowledge. Setting is also effective for shaping the visitor experience. On this basis, the interaction approach investigates what the visitor come to museum with, how the exhibition and setting influence the visitors, and how visitor and setting factors work as a whole. For obtaining a reliable and a valid result, it is better to take the interaction approach into consideration. This is also the core concept in the transactional theory in environmental psychology (Gifford, 2007).

When the topic is specified to the pedestrian activities and walking patterns in the exhibition areas such as exhibition halls, museums and galleries, the most frequently mentioned issue is the right-turn bias. Although there are various circulation patterns obtained in the literature of the visitor studies, common point of walking patterns is "short-cutting" or "economy of movement" through which visitors has the fewest numbers of steps and by this way the minimum cost of circulation (Bitgood, 2006)

Literature suggests that there is a strong tendency to turn right at the intersections or at the choice points which is called "right turn bias" stated by Melton (1935) (cited in Bitgood, 2011). It is concluded from the cases at exhibition areas. Bitgood (1995) states that right turn principle or bias only arises from when there are no directional factors such as landmark attractors. As Bitgood (2006) indicates there is no right turn bias, but there is a strong right-turning walking pattern in some cases such as exhibition areas. As a result of traffic which generally flows at the right side, people also tend to walk at the right side of the street or the circulation area. Referring to

this, right turning bias can be the outcome of economy of movement, because when turning to the right, visitors take least number of steps. Pedestrians also tend to turn right or going straight ahead at intersections when they are at the right side (Bitgood & Dukes, 2006; Bitgood, Davey, Huang & Fung, 2012; Spilkova & Hochel, 2009). However, if they know that they will turn left, they tend to come at the left side of the path before coming to the choice point or intersection. In addition to this, the layout of the space, its relation with other spaces and the remarkable objects are the factors that should be considered while analyzing walking patterns. For instance, there is a strong tendency of visitors to approach the art piece or attractive object in museums (Bitgood and Dukes, 2006). Thus, for obtaining reliable results on movement pattern, there should not be attractive elements in the space. Apart from this, if visitors enter an exhibition hall or museum from a door on the right side, turning right will be the most eligible walking pattern because of the economy of movement. As Melton's (1935) study showed us that, 70-80 % people tend to turn right in art museum galleries in where the door was centered to force visitors turn right or left and with no art pieces in the middle (cited in Bitgood, 2011). In general, traffic flows at the right side and it might be effective on that percentage. Therefore, it resulted with the strong tendency to turn right for the economy of movement. Visitors also tend to exit at the first door that they see. As mentioned by Melton (1935), when it is thought from the visitors' perspective, it might be more economical to go around the entire exhibition with their eyes only rather than coming closer to the art piece (cited in Bitgood, 2011). At World's Fair in New York in 1942, Yoshioka (1942) made a case study. According to the results obtained, there was a right-turn bias in one exhibition hall (Hall of Man) but there was not that walking pattern in other one (Hall of Medicine) (cited in Bitgood & Dukes, 2006).

As a reason of not obtaining right-turn bias at Hall of Medicine, the effective object next to the entrance was given. However, as stated by Yoshioka (1942), in Hall of Man, exhibition was arranged in such a manner that it forces visitors to turn right (cited in Bitgood & Dukes, 2006). Weiss & Boutourline (1963) claimed that there is a right-turn bias in museums as well as a tendency to make visitors move in counter clock direction (cited in Bitgood & Dukes, 2006). It depends on the exhibition design and the spatial design. Attractive elements seems to change the walking pattern in exhibition areas and Parsons & Loomis (1973) also found that right-turn bias did not work in the situations where there was an attractive landmark similarly in the pharmacy exhibition at National Museum of History and Technology (cited in Bitgood & Dukes, 2006). They reported that 60 % of visitors did not turn to right. This percentage might also be related to the complexity level of the interior space. Parsons & Loomis's case (1973) was conducted in such a crowded duration of the exhibition so that this crowdedness might have forced people to a path of the least resistance rather than flowing with the crowd with a higher effort (cited in Bitgood & Dukes, 2006). In contrast, Shettel found a strong tendency of right-turn at the Field Museum of Natural History, "Man in His Environment". According to him, 73 % visitors entered to the exhibition form the right side of the "Sphere of Life" and then continued to look around the exhibition from the right side without looking to the exhibits on the left (called "one-sided viewing") (cited in Bitgood & Dukes, 2006). Lastly, Bitgood, Hines, Hamberger & Ford (1992) did not obtain a right-turn bias in any of the exhibitions at the Anniston Museum of Natural History. There were several exhibitions in same gallery, but in none of them there was neither right-turn bias nor counter clock turning. There were no more than 33 % right-turning tendencies in none of the exhibitions. In all those exhibitions, architectural

properties of the gallery and the general layout of the exhibit – salient art piece- manipulates the direction of the movement (Bitgood & Dukes, 2006).

General value principle is also effective in pedestrian activities especially in exhibition areas (Bitgood, 2006). It is calculated as a ratio between the benefits and costs (benefits divided by costs) (Bitgood, 2011). Benefits can be listed as happiness, admiration and satisfaction whereas costs can be listed as time, energy, effort and steps. For example, if a visitor likes an art piece although it is further than the one he does not like, he goes next to one which he likes more despite he has to walk more to his more preferred art piece which is called general value ratio. As it is understood, general value principle can also change the walking pattern in the exhibition areas.

As a summary, there are some implications for designers to obtain better areas in terms of walking patterns and pedestrian activities (Bitgood, 2006, p.472):

- "Develop exhibitions with these visitors circulation pattern in mind. Design so that visitors do not have to take extra steps.
- Minimize the number of steps by not requiring backtracking.
- Do not design with multiple choice points where visitors have to make choices or where they will exit the exhibition without giving attention to all of the exhibit elements.
- Avoid designing two-sided exhibitions where exhibits on one side compete with those on the other."

2.3.2 Outdoor Spaces: Plazas, Zoos and Others

In some other public places in addition to the exhibition areas such as zoos, aquariums, plazas and streets, this issue can be analyzed.

In zoos, which can be thought as a kind of exhibition areas, there is also a tendency for visitors to approach to attractive objects such as animals (Bitgood and Dukes, 2006). According to Whyte (1980), the same phenomenon happens in city plazas: "to overcome the economy of movement motivation, however, the perceived benefits of approaching an attractive object must outweigh the perceived cost of the effort" (Bitgood & Dukes, 2006).

In addition to the general value principle in other spaces, there is also right-turn bias or dominance of right side in zoos, plazas and others such as streets and aquariums. In 1988, Whyte summarized the issue of walking on the right side of the city sidewalks as "Skilled Pedestrian" when he studied people's behavior in plazas and streets. According to the results of this study, pedestrians usually walk on the right side. He also added that "deranged people and oddballs are more likely to go left, against the flow" (cited in Bitgood & Dukes, 2006, p.395). However, contrary to his ideas left side walkers may have a left-turn point of arrival. In addition to this, Taylor (1986) conducted a research at Steinhart Aquarium in San Francisco and observed the predominance in right-turn walking pattern and counter wise clock flow of pedestrians (cited in Bitgood & Dukes, 2006). Although it was not mentioned in that study, as general acceptance is that right-turn was the most economic movement pattern which was derived from the spatial layout of the aquarium. Since most

people tend to walk from the right side, when they come to a T shaped intersection (with the choice of right or left only); they turn right which requires the economy of movement. As another support for the economy of movement, visitors do not come backward to see all the exhibits; they only visited all exhibits with their eyes. Similarly; Deans, Martin, Neon, Nuesa & O'Reilly (1987) conducted a research at the Reid Park Zoo and reported that most common walking pattern was turning right with a 78 % (cited in Bitgood & Dukes, 2006).

As a general conclusion on walking patterns in the exhibition areas (exhibition halls, museums and galleries) and outdoor areas (plazas, zoos and streets), there are some important clues that should be noted to provide better orientation and circulation in public spaces (Bitgood; 2011, p.326):

- "Orientation and circulation is important to all museums, even the smaller ones.
- Redundancy and/are variety of orientation cues are, at the very least, helpful to visitors. Some visitors look for help in some places and not others, or they may miss important wayfinding information in one place and are able to use it in another.
- Both visitor input and the visitor studies literature should be used to assist in the design of an effective orientation-circulation system.
- Visitor guides with a map of the facility should be a fundamental part of any orientation system.
- The process of attention must be understood and applied in an effective orientation-circulation system.

- The value-ratio is an important key to understanding the choices visitors make in where they go, what they see and what they do during their visit. Orientation-circulation systems need to be designed with the value-ratio in mind.
- The location of orientation-circulation information is critical. It needs to be placed in locations where visitors are making choices, where visitors are attempting to understand what there is to see and do, and how to plan their visit.
- While all locations are important, information provided in the entrance is important since it have an impact on overall visitor satisfaction as well as how effectively people plan their visit."

CHAPTER III

THE WALKING PATTERNS IN SHOPPING MALLS

3.1 Wayfinding and the Pedestrian Activities in Shopping Malls

As it was described by Passini (1984, p.53), "Wayfinding is a spatial problem solving is to subsume a number of cognitive abilities responsible for information processing, decision making and also for the transformation of decisions into behavioral actions." Also, wayfinding is described by Passini (1996) as a spatial problem-solving activity and it is a complex and continuous process.

"According to Passini, wayfinding is composed of three different processes:

1) Cognitive mapping: It is the first stage of wayfinding in which people obtain information, shape them and add to their spatial knowledge. This process continues with composing a cognitive map such as the environmental knowledge stored in memory.
2) Decision making: It is the second stage of wayfinding in which people choose their route to continue between the possible ones.

3) Decision execution: It is the third and the last stage of wayfinding in which people operationalizes their decisions." (cited by Chebat, Chebat & Thherrien, 2005, p.1591)

Cognition is one of the most important processes of wayfinding. Spatial cognition is one of the processes in which individuals obtain information from the environment or from their surroundings. Considering spatial cognition, there are some important mechanisms to be discussed. Landmark knowledge is one of them as landmarks are noticeable, distinguishable and salient compared to this environment and surroundings. Route knowledge is another mechanism which is more useful than landmark knowledge because individuals can reach their goals more easily with route information with more specified knowledge. Survey knowledge, which is another mechanism, is similar to route knowledge but it is more appropriate for accomplishing certain tasks with individuals' total bird's eye map in his mind (Doğu Demirbaş, 2001).

As a result, there are two indications of different factors of wayfinding: cognitive mapping and legibility (Doğu Demirbaş, 2001). Cognitive mapping is one of the main components of wayfinding with acquiring, forming and maintaining spatial knowledge (Chebat, Chebat & Therrien, 2005). Legibility is the ease of understanding and recognizing the environment. It is clear that cognitive mapping and legibility shape wayfinding both through individual and physical environmental factors. Visual accessibility, building configuration, architectural definition and signage system can be listed as environmental factors (Doğu Demirbaş, 2001).

Except those, all other factors can be thought as individual factors such as age, gender, cultural background, disability, etc.

The wayfinding is a widely used action in our everyday lives and it exists in every stage of daily routines (Doğu & Erkip, 2000). It is also an action which guides and dominates pedestrian activities. As a general and common property of the wayfinding activity, there is always a purpose or target to reach at the end such as a shop to go, a building to reach, a street to go through, etc. (Chebat et al., 2005). However, such purposes or targets do not always exist in all of the pedestrian activities. Walking patterns can be analyzed through individuals with no target to reach. Even if there are individuals or groups who have target, focusing on the groups or individuals with no target to understand the environmental and individual factors that affect or change the walking patterns.

Wayfinding especially helps us to find our way in complex buildings such as hospitals, airports and shopping malls and avoid stress, anxiety and confusion (Doğu & Erkip, 2000). Although wayfinding in shopping malls looks like less important than wayfinding in hospitals, problems occurred while walking in shopping malls which is the area of leisure activities make visitors irritated and negatively affects the shopping activity (Doğu & Erkip, 2000; Chebat et al., 2005). Individuals who come to shopping malls expect comfort and safety while looking around. Referring to this, a shopping mall should give the feelings of security and pleasantness (Doğu & Erkip, 2000). The feeling of being secure is mostly related with the concept of not being lost in a setting. Therefore, wayfinding gains utmost importance for all types of settings. Elements that provide better wayfinding can change the walking pattern

and pedestrian activities. For example, a good signage system can reduce the number of steps while looking around or reaching a target. The time spent in shopping malls while looking around or reaching a target is also important for individuals because time efficiency was one of the main ideas of the first shopping malls referring to the shops located in the same building (Chebat, Chebat & Therrien, 2008). However, with the development of the shopping malls, they get bigger in size and time efficiency is not the main idea anymore. Yet, it is still important for the visitors while walking either with purpose or not.

In all pedestrian activities in shopping malls including wayfinding, there are some factors affecting the walking patterns. These factors are shopping values, gender and the familiarity to the environment (Chebat et al., 2008). Shopping values cause remarkable differences in route choices and time spent while walking. Utilitarian shoppers mainly walk around with a target and with the least number of steps. For providing these, they use wayfinding elements more. In contrast, hedonist shoppers walk through without targets. Thus, the number of steps and the time spent are not too important for them. They use landmarks and people around as wayfinding elements less, walk more than utilitarian shoppers and their cognition on the space is less than other shopper group. There are also differences in walking patterns referring to these. Gender difference proves to produce differences in pedestrian activities. It is claimed by Babin, Darden & Griffin (1994) and Babin, Boles & Griffin (2001) that women are more hedonist. Women see shopping activity as a fun whereas men usually shop with targets and named as utilitarian. For obtaining these, men use landmarks or signage for more accurate wayfinding but women use people more as information sources. It can also affect walking pattern both in terms of

trajectory and velocity. When the familiarity is considered in wayfinding process, the group who is more familiar to the environment uses their internal sources; their memories and cognitive maps. However, the group who is less familiar uses wayfinding maps more, they also ask people and despite all these; they make mistakes. The time spent might increase because of the feeling of unfamiliarity caused by the slow moving in terms of velocity. Also, the trajectory might be affected while trying to find routes or targets (Chebat et al., 2005; 2008).

Walking activities including wayfinding should be analyzed in a more detailed way from different perspectives and with the help of different factors that affect the pedestrian activities. Managers of the shopping malls should also be more attentive in this respect because the pedestrian activities affect the sales and the nonmonetary costs of shopping (Chebat et al., 2008). With the better wayfinding provision and supply of an environment for better and preferable pedestrian activities, the shopping malls can be used more efficiently with a higher number of people and more extensively.

3.2 Bitgood & Dukes' Approach to Walking Patterns in Shopping Malls

Stephen Bitgood (psychologist) can be named as the pioneer of the research on the relation between the visitor studies and environmental psychology. Most of his studies were conducted in exhibition areas in which pedestrian activities are analyzed. In these researches, he questions what can be done from the view of psychological principles for getting better feedbacks from the exhibitions and

increasing their impact over visitors. He summarized his area of interest as the following (Bitgood, 2013):

1) Understanding what visitors bring to the museum
   (e.g., interests, agendas, other past history)
2) How people make choices of what and how long to pay attention
3) Navigation (orientation, wayfinding and circulation),
4) Layout of exhibit elements
5) Design of interpretive messages
6) Social influences

Later, he studied the same topic, pedestrian activities and environment relation, in different spaces such as zoos, aquariums and the shopping malls (Bitgood & Dukes, 2006).

The research on pedestrian activities in shopping malls (Bitgood & Dukes, 2006), is the first research on the pedestrian activities in shopping malls in the literature. This study asserts the claim that pedestrian movements at the intersections in public areas reconcile with the economy of movement (EOM) principle. For validating this hypothesis, a case study was conducted in two different shopping malls with three major T-shaped intersections: one intersection from the first shopping mall and two intersections from the second shopping mall. The walking patterns were all noted in these three intersections as it is indicated in the figure below (Bitgood & Dukes, 2006).

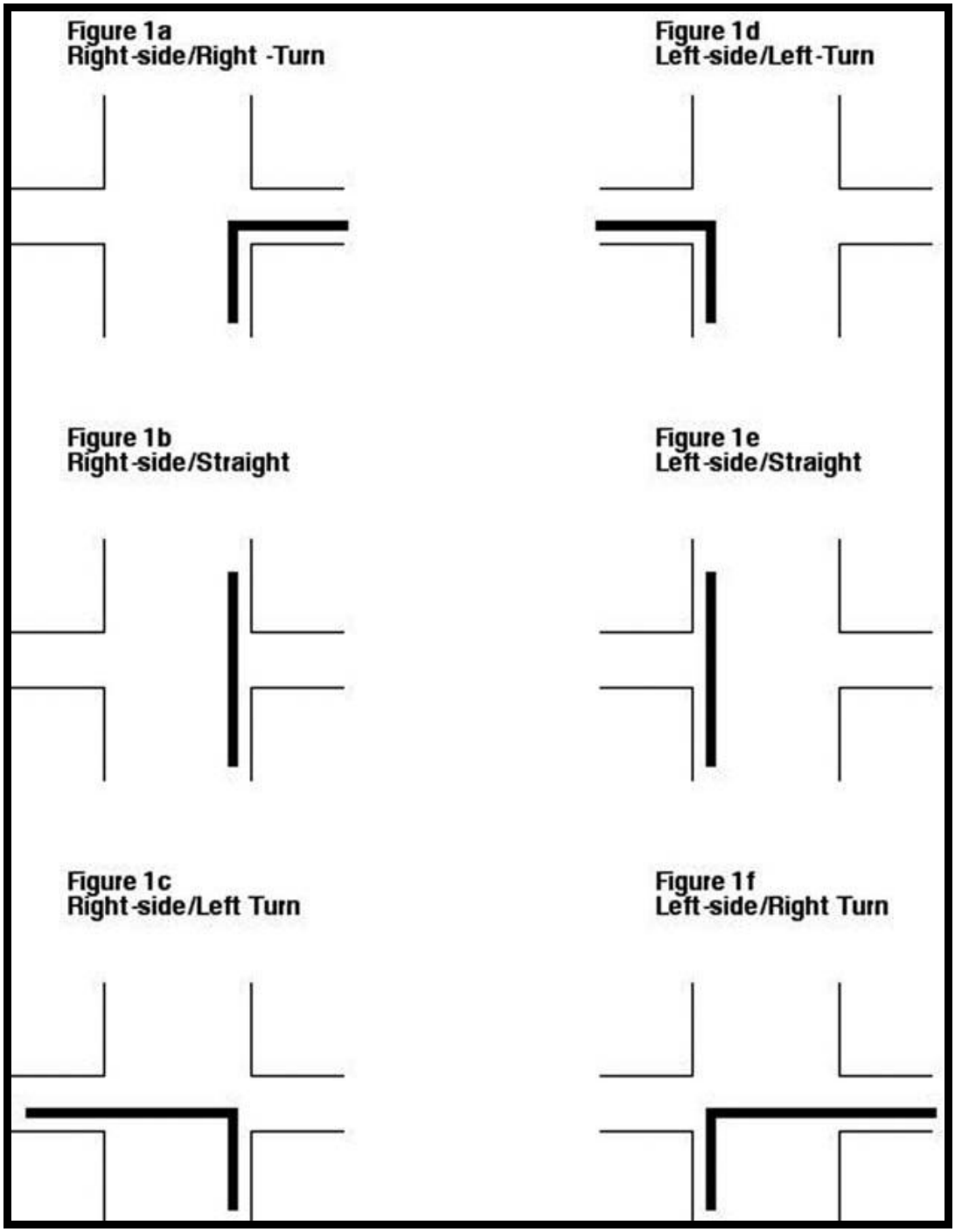


Figure 1: Walking and Turning Patterns (Bitgood & Dukes, 2006)

The reason behind the selection of these three intersections was that there was a large pedestrian flow there. In addition to this, there was a chance for pedestrians to

choose directions from each direction with a significant number of destinations. At each single choice point of possible movement patterns; six potential patterns were examined for walking on the right side or at the left side of the path and turning right, left or continuing straight ahead. Differently from other studies, walking side was also taken into consideration for obtaining a more comprehensive result.

There were five groups of samples between 100 and 105 groups. Sample 1 was at the Mall 1 with 100 groups coming from the south. Sample 2 was at the Mall 2with 100 groups again coming from the west direction. Sample 3 was at the Mall 2 with 105 groups coming from the east. Sample 4 and 5 were also at the Mall 2 with groups of 100 and 103 coming from the west direction. These samples of 4 and 5 were observed separately and only served as a reliability check for the previous records.

In all these samples, pedestrian flow came from one direction. While selecting a group to observe, it was selected as it reached to an imaginary line on the floor nearly 20 feet before from the intersection. "If visitors were moving from one side of the corridor to the other across these 20 feet, they were counted as walking on the latter side as long as the move was complete before they reached the intersection (as measured by the end of the last retail store). Once the group passed, the pattern was coded as one of the six possible in Figure 1. Once a group was recorded, the next group to pass the imaginary line was selected, until a minimum of 100 groups had been recorded" (Bitgood & Dukes, 2006, p.400).

The hypothesis they came up with was that there would be an economy of movement (EOM) at movement patterns with the fewest number of steps including:

1) Coming from the right side of the corridor and turning to the right
2) Coming from the right side of the corridor and going straight ahead
3) Coming from the left side of the corridor and turning to the left
4) Coming from the left side of the corridor and going straight ahead

In addition to these, there are two more possible walking patterns that were taken into consideration although they are not economic in terms of step numbers:

5) Coming from the right side of the corridor and turning to left
6) Coming from the left side of the corridor and turning to right

According to all these six possibilities, walking patterns were recorded with naturalistic observation.

This research indicated that there was an economy of movement in walking patterns in which pedestrians minimized their cost in terms of time and effort while maximizing their experience in the space. The higher percentage of the all samples also tends to walk at the right side and turned to the right. However, this pattern should not be understood as the right turning bias, but it can be interpreted as economy of movement for people who are walking at the right side of the path.

Afterwards, this study became a guide for other researches in the same area (see for example Spilkova & Hochel, 2009 & Jazwinski & Walcheski, 2011).

Spilkova & Hochel (2009) replicated the study of Bitgood & Dukes (2006) systematically and the same methodology was applied to the newly emerged shopping malls in Czech Republic and Slovakia with five cases. Economy of movement was again examined with the same sampling method and both the walking side and the turning directions were recorded. In that study, T-shaped cross sections were also examined and the possibilities were listed in terms of turning directions. Jazwinski & Walcheski (2011) also investigated the same issue. Their research examined the hypothesis of Bitgood & Dukes (2006) on economy of movement (EOM) by minimizing the distance for maximizing their experience in malls with five Samples with three different T-shaped intersections. Moreover, they also examined the effect of the group size and the presence of children in a group on the walking patterns. Finnis & Walton (2008) suggested that walking speed (velocity) is as important as the trajectory of the walking pattern and it should also be considered in the research. It is not known whether groups are effective in the walking pattern because the model (Bitgood & Dukes, 2006) study did not include that comparison. Finnis & Walton (2008) tested that the effect of group size over EOM was firstly searched in that study. The investigations on T-shaped choice points were made to replicate the findings of Bitgood & Dukes (2006).

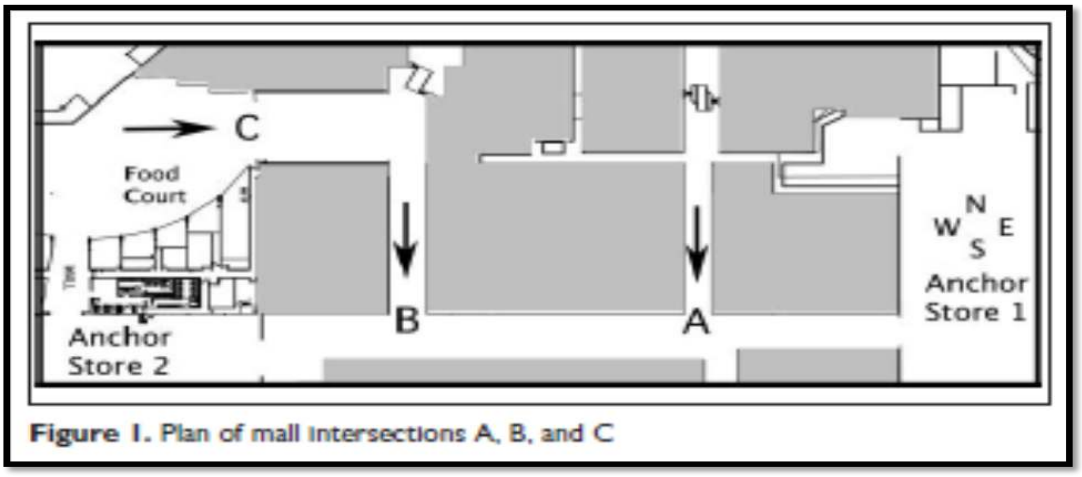


Figure 2: Plan of the Mall Intersections (Spilkova & Hochel, 2009)

In their study, it was ensued that group size and the presence of children did not affect the trajectory but they affected the velocity. Thus, the role of velocity was introduced to the literature on walking pattern.

Bitgood et al. (2012) conducted a newer research on walking patterns in shopping malls. This study replicated the method of the earlier study (Bitgood & Dukes, 2006) using unobtrusive observation. Two samples were examined in China. The first group was with five intersections within the highest pedestrian flow and with five random samples in 100 groups each. The second group was in five different shopping malls in China with nine random samples with 250 groups each. In addition to these in the US, two intersections were observed which was close to the car park and three direction possibilities: right, left and direct with three samples. According to the results, it was seen that there was an economy of movement where there was choice of movement with fewest steps in every case. In addition to this, the argument of right-turn bias was refuted. Although most groups tend to turn right, it was explained not by the right-turn bias, but economy of movement. Different

from the studies until this, it is found by Bitgood et. al. (2012) that there was a direct relation between the sides that pedestrian walk on the path and the driving traditions (traffic rules and driving).

The method developed by Bitgood & Dukes (2006) became a reference for the further researches related to the same issue. Although same variables can change such as group size or presence of children, the method remained unchanged and extensively used by the researchers in that field.

3.3 Methods to Measure Walking Patterns in Shopping Malls

When the literature on walking patterns in shopping malls is analyzed, it can be seen that there are some criteria or variables used for measuring the case study results. In pedestrian activities, two dependent variables can be used: trajectory and velocity of the movement (Finnis & Walton, 2008). The literature suggests some subtitles for these two dependent variables (trajectory and velocity) can be shaped by referring to the relevant literature.

3.3.1 Trajectory

Basically, trajectory can be defined as the path of the walking activity. More scientifically and academically, trajectory is the path that a moving object follows through space as a function of time. In other words, it is the geometry of the path or the position of the object over time (Trajectory, Wikipedia). In another source,

trajectory is defined also as the curve that a body describes in space (Trajectory, Merriem-Webster).

While analyzing the trajectory of the movement pattern, there are four variables to address. The first one is the first turning pattern which is the certain and unchangeable variable of the trajectory of movement. The other three variables are the presence of the target, the number of group members and the presence of children. These three can change accordingly to the focus of the case.

3.3.1.1 The First Turning Pattern

For analyzing the trajectory of the walking pattern, first turning pattern in a decided choice-point is the unchanged variable. It is covered in all of the walking pattern researches. Referring to the widely accepted sample method (Bitgood & Dukes, 2006), the point in which first turning pattern is analyzed is at T-shaped intersections (Spilkova & Hochel, 2008; Jazwinski & Walcheski, 2011; Bitgood et. al., 2012). The common point of these intersection points is having a significant number of destinations for each direction: right, left or direct. When there is a multiple number of destinations for each direction and the pedestrian decide between these three, it provides more reliable results. In addition to this common feature of the T-shaped intersections, the choice point is mostly preferred in a location in which pedestrian flow is dense for being able to observe the highest number of groups.

Analyzing the first turning pattern also gives researcher the chance to investigate the economy of movement. However, for analyzing the economy of movement (fewest number of steps while directing), there should be additional information on the walking side of the pedestrian until reaching to the choice point.

It is better to record the observation results of the first turning pattern of the movement with the walking side until reaching to the decision point. Also, it can be better to make an unobtrusive observation for not affecting the decision of the pedestrian.

3.3.1.2 The Presence of the Target

The presence of a target can also be an effective variable in the walking pattern. As stated by Newby (1993), there is a significant difference between shopping as a leisure activity and shopping as a functional targeted activity. Although the difference between these is very obvious, the economy of movement is provided in each situation. In spite of the fact that EOM is valid for shopping as leisure activity or targeted activity, the trajectory can be changed. For example if the target of the pedestrian is on the left side, he will tend to turn left at the choice point. However, without having a target, he may tend to turn right or tend to go straight ahead. Therefore, while searching on the trajectory of the walking pattern in shopping malls, pedestrians' should be asked either they have a target or not with a short interview after the observation of the first turning pattern to obtain more reliable results.

3.3.1.3 The Number of Group Members

The trajectory of the movement pattern can also be affected from the changing number of group members. While searching on how the increasing number of group members affects the trajectory, it is expected that more people in a group makes the trajectory less efficient. There are researches on dyads and triads but not on larger groups, so the effect of the number of group members should be investigated in future works (Jazwinski & Walcheski, 2011). The reason behind the lack of research on large groups is that the highest percentage of groups in shopping malls is composed of dyads and triads (Jazwinski & Walcheski, 2011).

Compared to individuals, groups should take common decision at the intersection point so the number of group members is effective over trajectory. The difference between individuals and more crowded groups in terms of trajectory was only noticed by Willis, Gjersoe, Havard, Kerridge & Kukla (2004) in an open area resulted with different trajectories. It was observed that there was no significant difference between the trajectory of individuals and more crowded groups, but this issue still needs to be searched.

3.3.1.4 The Presence of Children

The presence of children in a group can be an effective factor over changing the trajectory of the movement pattern which should be reviewed. In groups, with or without children; there is an obvious economy of movement chosen at the choice

point (Jazwinski et al., 2011). It can be envisioned that children who can walk and talk might change the walking pattern with their insistence if they want to go to a different direction than their parents want to go. However, there are very few researches on the presence of children in a group and its effects over the changing trajectory. As the number of group members and its effect over the trajectory of movement pattern, the presence of children also deserves to be analyzed in a more detailed way.

3.3.2 Velocity

As another dependent variable of the pedestrian activity, velocity can be defined as the rate at which the position changes. In other words, it is the position change per time ratio (Describing Motion with Words-The Physics Classroom, 2013). Although the velocity is too close to the speed in terms of its definition and content, there is a slight difference between these two concepts. For making this difference clear, it is better to define these from the same perspective. Speed gives us the information that how fast an object is moving. However, velocity gives us the information that both how fast and in what direction the object is moving. In short;

- Speed = Distance / Time
- Velocity = Displacement / Time (Velocity, Wikipedia)

When the velocity of the movement pattern is discussed, there are three variables that needed to be considered. The first one is the destination time relation. This variable is unchangeable and certain. The other three variables are the presence of children in

a group, the changing number of group members and the effect of gender over the velocity of the movement pattern. These last three variables are uncertain and can change from one case to another based on.

3.3.2.1 The Destination/Time Relation

Since the velocity of the walking pattern is about the displacement and time, both the time that pedestrians spent and the placement they changed should be observed together. There are two possible ways to analyze the changing velocity referred as the destination time relation. Firstly, there should be certain time duration and than in that time duration, observed displacement or changing place can be noted. Secondly, there can be a certain distance and then in that distance, observed duration can be noted. The changing relation between destination and time directly affects the velocity of the walking pattern. As it is easily understood, this relation is an irreplaceable part of the velocity which it should be investigated in all cases related to the pedestrian activities.

3.3.2.2 The Presence of Children

The presence of children can be an effective factor in the velocity of the movement pattern. Either with baby carriage or a child who can walk by himself increases the walking time in pedestrians (Jazwinski & Walcheski, 2011). The presence of children may increase the time spent for taking decision at the choice point or decreasing the speed of the group while walking. In each ways, it is obvious that

children have an impact over the velocity of the walking pattern. Referring to this, the number and the age of children should be taken into consideration for interpreting the results of the research in a correct way.

3.3.2.3 The Number of Group Members

As the presence of children in a group, changing number of members in a group can be an effective factor in the velocity of the movement pattern. The increasing number of people in group increases the walking time in pedestrians (Jazwinski & Walcheski, 2011). When the number of people increases, there can be a psychological attitude come arise and people slow down for not being separated from the group while walking. In addition to this, coming up with a common walking pattern while trying to make decision at the choice point increases the time spent in the velocity. However, it is easier for individuals to make decision and walking in their own speed. Thus, it is clear that changing number of people in a group have impact over the velocity of the walking pattern.

3.3.2.4 The Effect of Gender

Although the effect of gender on the velocity of walking pattern is not much searched, referring to the researches conducted on wayfinding; it is possible that there can be a gender difference in the velocity. According to the wayfinding literature, with or without target; women's speed are less than men's speed while walking (Chebat et al., 2005; 2008). The reason behind this speed difference is that

women are more hedonists and tend to look around more, which directly affect the velocity of the walking pattern. This issue can be further analyzed in terms of velocity for obtaining further results in the changing velocity of walking pattern.

For concluding, there are some unchangeable variables of the walking pattern such as first turning pattern in the trajectory and the destination time relation in the velocity of the movement. The other variables such as number of group members, presence of children, having a target and effect of gender compose the changeable variables of the walking pattern. They are not that much compulsory but better to be incorporated to the research. These cannot be final state of the variables but with the future researches some other variables and its impact over the walking pattern can come up.

CHAPTER IV

CASE STUDY: ANKAMALL

The subject of pedestrian activities has a wide range of research from wayfinding to walking patterns. These issues are analyzed through the relation between the space or spatial elements and the individuals using these spaces. Literature supports that the behaviors of individuals change according to the space characteristics (Gifford, 2007). Wayfinding is a well-known and widely investigated whereas the issue of walking patterns starts to draw attention of the researchers recently. This research is the first time that walking patterns in shopping malls will be searched in the Turkish context. In addition to this, although the research on walking patterns of individuals seems to be important, it is deeply analyzed from the perspective of environmental psychology. Besides, its variables or criteria are not well defined. This study was conducted considering these gaps in the literature.

4.1 Objectives of the Research And Hypothesis

With the rapid change of the technology in today's world, we become less mobile and move less. In the past, people walked from some place to another even the distance was long. However, nowadays, we tend to use automobiles or other transportation vehicles for reaching somewhere. Referring to this, we can conclude that people do not prefer to walk from one place to another, but they walk when it is compulsory. In addition to the mandatory situations, they walk while socializing in some spaces such as in shopping malls. Walking will become more important in the future as a physical activity and important to be analyzed.

With the increasing value of time in our lives because of having a limited period of leisure time except working hours, people tend to use shopping malls more to satisfy their needs in a shorter time. Also, people use shopping malls to meet someone and socialize. In other words, shopping malls become the environment in which people socialize as pedestrians.

The aim of this study is to investigate the walking patterns in a shopping mall to understand the walking habits of individuals. For doing this, this research analyzes walking patterns in relation to the spatial qualities or features of the environment, the individual and group differences, the presence of children in a group and gender differences. The walking patterns of the individuals' have been searched with a case study by observations in a real setting, Ankamall. Short interviews were also utilized to reach more comprehensive results. The results were analyzed through statistical tests (Chi-square, T-tests and ANOVA) and interpreted accordingly.

There are four research questions for investigating the relation between walking patterns of individuals in shopping malls:

1) How do people move in shopping malls?
2) Does the walking pattern of individuals change with:
    2.1 the effect of gender?
    2.2 the party size?
    2.3 the presence of children in a party?

To answer questions, five hypotheses were developed:

1) Pedestrians firstly choose the most economic pattern to minimize their movement, time and energy spent and to maximize their experience.
2) The gender differences do not affect the trajectory of the walking pattern, but affect the velocity.
3) The number of people in the party does not affect the trajectory of the walking pattern, but increases the velocity.
4) The presence of children in the party does not affect the trajectory of the walking pattern, but increases the velocity.

4.2 Analysis of the Site: Ankamall

Migros AVM was opened in 1999 in Ankara with the claim of being Turkey's biggest shopping mall by the time it was built (Muğan, 2005). It is located in the intersection of the Istanbul and Konya highways which have heavy traffic in every hour of the day (see Figure 3 below).

Figure 3: Location of Ankamall (aerial view)

(http://wowturkey.com/t.php?p=/tr46/Resim_049.jpg, 2007 from Kömürcü, 2007)

Migros AVM can be described as an outer city shopping mall because of its location. However, due to the variety of mass transportation vehicles subway, public buses and mini bus, it is quite accessible. It can be considered as inner city shopping mall as well. It is also located very close to a subway hub, Akköprü station, and this relation between the subway and the building makes that shopping mall more preferable by most of the citizens (see Figure 4 below).

Figure 4: Site Plan of Ankamall

(http://burc.ankara-bel.gov.tr from Muğan, 2005)

Easy access with the mass transportation makes that shopping mall appear to people from various social statuses. As a result of this, it can also be named as the most heterogeneous shopping mall in Ankara.

Migros AVM occupies 126.600 m² as the building in the total area of 176.600 m² (Muğan, 2005). The area except the building is used as a car-parking area, both open and closed, and greenery. It is a four storey building with numerous shops, a multi-purpose hall for the cultural activities, a cinema and a food court. The basement floor is mainly reserved for the shops that are related to the technology and stationery. At the entrance floor, there are various shops that range from clothing to

home stores. Also, there is one Migros at the entrance floor which gives shopping mall to its name. The first floor is also composed from variety of shops, but there are some cafes and restaurants located in that floor. The second floor is consisted of the food court, a cinema, a multi-purpose hall and a few stores (see Appendix A for the floor plans).

There is an additional shopping mall constructed next to Migros AVM. This new structure was constructed in the Gimat land in which Migros AVM is located. It was linked up with Migros AVM and started to be named as Ankamall when it was opened in 2006 (see Figure 5 and 6 below). With this new structure, the mall came closer to Istanbul highway. The area kept out of the structure is being used as car parking lot. With this addition, the total area of the structure reaches to 176.000 m². The number of stores reached to nearly 300, and the capacity of the car parking area became larger (Muğan, 2005).

Figure 5: General Exterior View of Ankamall (1)

(http://www.torunlargyo.com.tr/ankamall.html)

Figure 6: General Exterior View of Ankamall (2)

(http://www.avmgezgini.com/avmler/ankara/ankamall-avm-47.html)

Ankamall is chosen as a case because it is the most heterogeneous shopping mall in Ankara both by its variety of users and the variety of stores. Also, it can be seen both as an inner city shopping mall due to its ease of access and outer city shopping mall due to its location. In addition to these, it is significant in urban public life with its location, diversity of users and variety of leisure activities. It is located at the hubs of mass transportation such as public buses, mini buses and the subway. The car parking area with 6000 cars capacity also let private vehicles to access here easily. As Sözer (2002) stated, there is a consistent and easy going relation between Ankamall and the transportation system of the city of Ankara.

For conducting the case study and analyzing individuals' walking patterns, a specific route is chosen instead of making an analysis of the whole setting. The chosen route is at the ground floor of Ankamall as it is the most frequently used level of entrance referring to the previous observations conducted for that case study. This entrance is

used by the ones who come here with mass transportation vehicles and mass transportation users who constitute the majority of Ankamall visitors.

The most frequently used entrance is accepted as the starting point of the route referring to the analyses made beforehand for choosing the best entrance which gives the most reliable information. The end of the route is the T-shaped intersection in the opposite side of that entrance. While choosing that intersection, it is referred to Bitgood & Dukes' study (2006). As suggested by them, T-shaped intersection is chosen with the highest pedestrian flow and the one which enables pedestrians to choose the direction with the highest number of turning alternatives: left, right or going straight (see Figure 7 below for the chosen route) The route was started with the selected entrance with a security at first. Then, visitors have to walk a path for reaching the corridor and choosing a direction for turning towards. At the opposite side of the entrance which is the going straight option at the intersection, there is Migros which gave its name to the mall. At the right side of the intersection, there is a store called Mudo which has a wide range of stuff to sell from home accessories to clothing. At the left side of the intersection, there is a jewellery shop. In addition to these, there is also a moving staircase located in the left side of the intersection.

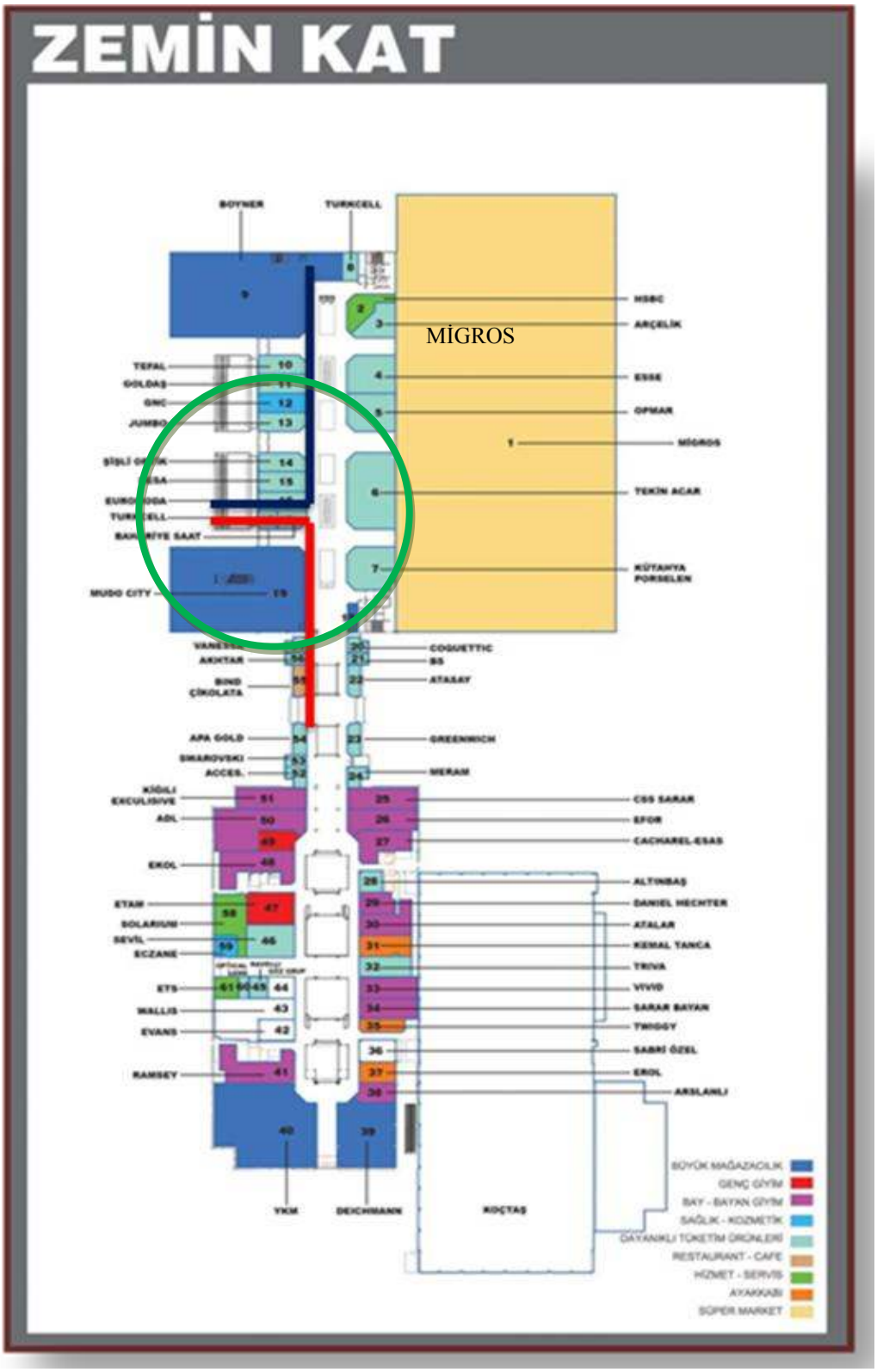


Figure 7: The selected route for the case study

(Kömürcü, 2007)

4.3 The Methods of the Case Study

While conducting the case study, two different methods were used. The first one is observation in which the walking patterns of parties were followed. The second one was the short interview applied to the observed parties for validating the results and analysis obtained from the observations.

4.3.1 Observation

Observations were conducted in front of the T-shaped intersection without being seen by the visitors. By this way, an unobtrusive and direct observation was provided. In total, 100 parties were observed. In this research, the term "party" was used in substitution for the term "group". The term "group" does not include the individuals but the term "party" includes people from individuals to 4 and more. Children were also included under the party term. People under nearly age of 12 were grouped as children. The details about children in the party such as the presence of baby carriage or children's effect over the walking pattern such as wanting to go to the toy shop were also noted down in a detailed way. One set of sample was observed during weekdays which consist of 50 parties and other set of sample was observed during weekends which consist of the remaining parties. The observation was applied between 17:30 and 18:30 which is the most crowded time period both on weekdays and weekends. The observation continued both in weekdays and weekends until the target number of observations was achieved. Random sampling method was applied and observation started with the first party who entered from the specified door starting 17.30. After the completion of the first

observation, the next party that entered from the door was observed. This process took place until 18:30. There was an observation chart to take notes about the following items: (see Appendix B for the observation charts)

- Time:
- Party size: 1/ 2 / 3 / 4 & 4+
- 1st turning pattern: Left / Right / Direct / Upstairs
- Children: + / - (If yes, number of children in the party:)
- Number of females in the party:
- Number of males in the party:
- Distance vs. time:
- Walking side until reaching the intersection:

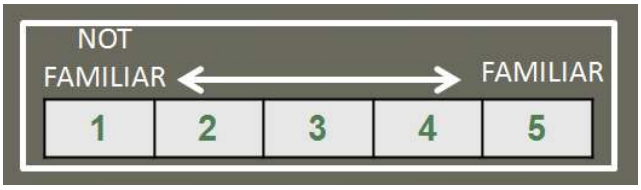
The time was noted both as the date and the hour of the observation for each party. Party size was also noted down under four categories. First turning pattern of the party was watched and written on the observation sheet for understanding the trajectory of the walking pattern. This first turning pattern was noted down at the T-shaped intersection which was beforehand decided. Party entered from the door and when came to the choice point, it was noted as left, right, direct or upstairs. The presence of children in the party was also noted. If there was children in the party, number of them were also noted down. Number of females and males were also written down separately. For analyzing the velocity of parties' walking patterns, distance time relation was also noted in a detailed way. The path which was analyzed was same for all the parties starting from the selected door entrance to the T-intersection. Since the distance was the same for all the parties, only the time they spent for coming from the entrance which was opposite to the intersection to the T-

shaped intersection was noted down as seconds or minutes. For the analyses of the velocity after obtaining the time records, same value was given for the distance in all the parties and proportion was made between the distance and time referring to the velocity rule. In addition to this, the walking side of the parties' until reaching the intersection point was noted.

4.3.2 Interview

The short interviews were all conducted after the observations. The main purpose is to support the results obtained from the observations. The parties that were observed were interviewed after the observation completed. They were asked to answer the close-ended questions for not taking much of their time. There were three main questions:

- Age:
- Familiarity to Ankamall:



- Purpose of being there: Meeting someone / Looking around / Shopping / other:

The age of the individuals in the party was noted as the way they mentioned. The degree of familiarity to Ankamall was asked them as: "What degree do you think you are familiar to Ankamall if 1 is not familiar and 5 is familiar?" Therefore, this

question was about the individuals' own ideas about their familiarity to the environment and the setting. Last question was their purpose of coming to Ankamall with four choices: meeting someone, looking around, shopping and other. The difference between looking around and shopping was described as having a target. While looking around there was no target, but while shopping there was a target. Because having a target may affect the walking pattern of the individuals, being informed about this aspect was important for the results of the research.

4.4 Results and Discussions of the Findings

While analyzing the results obtained from the case study, statistical analyses were done to test the hypotheses. Quantitative results were supported by the interviews for interpreting the outcomes in a more comprehensive way.

4.4.1 The Statistical Analyses

SPSS program was used for statistical analysis. T-tests, Chi-square tests and ANOVA were used to test the hypothesis. There are three different statistical tests were used because the numeric results can only be analyzed with T-test such as the time spent while non-numeric results can only be analyzed with Chi-square tests such as the directions. In addition to these, ANOVA was used to analyze numeric results with more than two variables such as party size velocity relation. There were four main questions analyzed for the trajectory and velocity of the walking pattern:

weekend-weekday difference, gender differences, the effect of the party size and the presence of children in the party.

The first analysis is the difference between the weekdays and weekend in terms of trajectory of the walking pattern. 50 parties were analyzed for weekdays and 50 parties were analyzed for weekend. Depending on results of the Chi-square test that was applied (χ=3.335, df=3, p=0.343), trajectory appeared to be independent from the days of the week, either being weekday or weekend (see Table 1 below) (see Appendix C – C1).

Table 1: The Distribution of Trajectory According to Weekdays-Weekend

	WEEKDAYS		WEEKEND	
	NO.OF PARTIES	%	NO. OF PARTIES	%
RIGHT	15	30 %	13	26 %
LEFT	15	30 %	10	20 %
DIRECT	9	18 %	8	16 %
UPSTAIRS	11	22 %	19	38 %

The second analysis is the difference between females and males in terms of trajectory of the walking pattern. The parties with children were not dismissed but the parties that were only composed of the same genders were analyzed. Parties that were only composed of females (38 parties) and parties that were only composed of males (32 parties) were compared. Chi-square test was applied for that analysis and

according to the results (χ=4.057, df=3, p=0.255), trajectory was independent from the gender difference (see Table 2 below) (see Appendix C – C2).

Table 2: The Distribution of Trajectory According to Gender

	FEMALES		MALES	
	NO. OF PARTIES	%	NO. OF PARTIES	%
RIGHT	13	38.2 %	5	15.6 %
LEFT	9	26.4 %	7	21.8 %
DIRECT	5	14.7 %	8	25 %
UPSTAIRS	11	32.3 %	12	37.5 %

Presence of children in a party is the third analysis for understanding whether children existence in a party changes the trajectory. Parties in which children exist (26 parties) and parties in which children do not exist (74 parties) were analyzed by Chi-square test. Referring to the results (χ=3.643, df=3, p=0.303), trajectory was independent from the presence of children in the party (see Table 3 below) (see Appendix C – C3).

Table 3: The Distribution of Trajectory According to Presence of Children

	CHILDREN (+)		CHILDREN (-)	
	NO. OF PARTIES	%	NO. OF PARTIES	%
RIGHT	6	23 %	22	29.7 %
LEFT	9	34.6 %	16	21.6 %
DIRECT	2	7.69 %	15	20.2 %
UPSTAIRS	9	34.6 %	21	28.3 %

The last analysis was made for analyzing the trajectory of the walking pattern in relation to party size. Regardless of eliminating the parties with or without children, or gender differences, all parties were analyzed referring to their party sizes. Parties composed of singles (34 parties), duals (33 parties), triads (14 parties) and four and more (19 parties) were examined. Based on the results obtained from the Chi-square (χ=4.840 df=9 p=0.848), trajectory of the walking pattern was independent from the changing party size (see Table 4 below) (see Appendix C – C4).

Table 4: The Distribution of Trajectory According to Party Size

	INDIVIDUALS		DUALS		TRIALS		FOUR & MORE	
	NO. OF PARTIES	%	NO. OF PARTIES	%	NO. OF PARTIES	%	NO. OF PARTIES	%
RIGHT	6	17.6 %	11	33.3 %	4	28.5 %	6	31.5 %
LEFT	9	26.9 %	7	21.2 %	4	28.5 %	6	31.5 %
DIRECT	8	23.5 %	6	18.1 %	1	7.14 %	2	10.5 %
UPSTAIRS	11	32.3 %	9	27.2 %	5	35.7 %	5	26.3 %

After analyzing the trajectory of the walking pattern, the velocity of the walking pattern was also analyzed with the same variables.

The first analysis was the difference between the weekdays and the weekend in terms of velocity. While examining this relation, T-test was used. According to the results (T-critical=1.6606, T-sample=0.15, df=98, p=0.05), there was not a significant difference between the weekdays (M=12, SD=9.835) and the weekend (M=10.10, SD=4.946) in terms of parties velocity in their walking pattern (see Appendix C – C5).

The second analysis was the difference between females and males in terms of their velocity while walking. Referring to the results which obtained from the applied T-test (T-critical=1.6679, T-sample=2.26, df=67, p=0.05), there was a significant difference between females (M=10.62, SD=6.825) and males (M=8.72, SD=4.623) in terms of velocity (see Appendix C – C6). While walking the same distance, females spent more time than males.

The relation between the children in the party and the velocity of the walking pattern was the third analysis. According to the results obtained from the statistical tests (T-critical=1.6606, T-sample=-2.86, df=98, p=0.05), there was a significant difference between the parties with children (M=14.77, SD=11.941) and without children (M=9.74, SD=5.206) (see Appendix C –C7). To express it in other words, in the same distance; the parties with children spent more time than the parties without children.

The last analysis related to the velocity of the walking pattern was examining the relation between the party size and the velocity. Different from the other analyze, ANOVA was used for that examination, because four different party sizes were used. Referring to the results (df=3, p=0.009), there was a significant difference between the singles (M=7.45, SD=2.895), duals (M=12.03, SD=9.898), triads (M=13.93, SD=9.426) and four and mores (M=13.42, SD=6.194) (see Appendix C – C8). In other words, it can be said from that statistical analysis that at least one of these four parties behave differently than other in terms of their velocity.

In addition to the statistical analyses, having a target or not in the parties were also analyzed with percentages. 47 parties in total did not have a target (47%) and 53 parties had a target (53%). Because analyzing parties without target gave us more detailed information about how the interior design and other variables affect the walking pattern, it would be better to analyze them accordingly. Parties which did not have a target (47 parties) were grouped into three as 23 parties turning to the right (48,93 %), 9 parties turning to left (19,14 %) and 15 parties going upstairs (31,91 %). As it is obvious that nearly 50% parties had no target and 50% of these tended to turn right by justifying the theory of right-turn-bias.

4.4.2 The Analysis of Results

The analysis of the results was made used to complete the statistical analyses. Also, some additional information was obtained from the short interviews which gave extra information than statistical results. As stated earlier, walking pattern has two main unchanged factors: trajectory and velocity. It will be better to analyze the results more deeply to refer to these factors with different variables with their percentages. The size of the party was the first variable to analyze. Parties of 1 composed the 34%, parties of 2 composed 33%, parties of 3 composed 14% and parties of 4 and more composed 19% of all. The presence of children was the second variable. 26% of all parties had children and 74% parties had no children. Gender was the second variable. Parties could include both females and males but 32% of parties were composed of only males and 38% of parties were composed of only females. These three were the variables that results are analyzed accordingly. In addition to these,

there were two other dependents that were used while making analyses to give more detailed information. Familiarity was the first dependent. 97% of parties described themselves as familiar to Ankamall whereas only 3% of parties described themselves as unfamiliar to Ankamall. Having a target was the second dependent in that research. 47% of parties had no target to reach while 53% of parties had target to reach.

The trajectory of the walking pattern changes according to the weekdays or weekend. Since the majority of people come to the shopping malls after work hours, there is a limited time for the satisfaction of their needs in these spaces. In this limited time, instead of looking around freely, they are usually directed to their target, which affects their trajectory of their walking pattern. They directly go to their target from the shortest path chosen. Referring to the economy of movement, they minimize their effort in terms of their step and maximize their activity. However, in weekends people generally come to shopping malls as a place in which they can socialize. Therefore, they freely look around and go through without a target. It can be said that the main reasons behind the trajectory difference between the weekend and the weekdays are the limited time duration and target decision.

As the trajectory of the walking pattern do not differ according to the weekdays or weekend, gender difference also does not influence the trajectory. Both females and males tend to choose the direction or path which minimizes their effort (economy of movement). Legitimizing the related hypothesis, the party size has no impact over the trajectory. As a part of a more crowded party, people reach on a consensus. This

consensus has generally some logic as singles: the economy of movement while walking.

The reason behind the presence of children in a party and the trajectory relation is the same with the party size. Children do not affect the trajectory of the party because adults decide where to go. Although sometimes children do not want to go through that direction which their family forces them to, adults make the final decision. Therefore, children have no impact over the trajectory.

The familiarity to the environment of the case study also has an impact over the trajectory. Almost all parties who are familiar with Ankamall tend to turn right or tend to go straight if they have no target. If they have a target to reach, they choose the shortest path. However, the parties who turn left are mostly composed of the ones who are unfamiliar to Ankamall. It can be said that without having a target and without being familiar to Ankamall, people tend to turn left as a result of being affected by the interior design and organization of the shopping mall.

Having a purpose or a target to reach also changes the trajectory of the walking pattern. As it was hypothesized in that research and mentioned in the literature, there was a tendency to choose the shortest path. Parties tend to choose the shortest path either with or without a target. Parties having a target (53 parties in 100 parties) generally tended directly to choose the shortest path that guides them to their purpose which was called Economy of Movement (EOM). Parties without having a target (47 parties in 100 parties) or parties who were less familiar to the environment generally tended to choose the shortest path referring to their personal characteristics

such as driving side, reading side and handedness in Turkey which were all at the right side. Therefore, in that case also, there was a right-turn-bias referring to these variables in parties who had no target with a percentage of nearly 50% (23 parties in 47 parties) (See Appendix B). Thus, for examining how the interior organization affects the trajectory of the walking pattern, it is better to analyze the parties without targets.

As the trajectory of the walking pattern, velocity is also being affected from these same variables in different ways. Although being in a weekday or a weekend changes the trajectory of the walking pattern, it has no great impact over the velocity. Parties go through the same destination within the same time duration both at weekdays and weekends.

When velocity is analyzed from the perspective of the gender difference, as opposite to the trajectory, it has a great impact over the velocity of the walking pattern as it was hypothesized. Towards the same destination, females tend to walk slower than males in the situations which they both have no targets. Females like to look around more than males which makes them walk slower that males are more targets oriented (Chebat et al., 2005).

In contrast to the party size's effect on the trajectory, it changes the velocity of the walking pattern with a great impact which justifies the hypothesis. Individuals are the ones who walk considerably faster than all parties who are more than one. Referring to the observations, triads are the parties who tend to walk slowest. The duals and the four and more people are between the individuals and the trials in terms

of their velocity. The reason behind that situation is that in trials, there is one person who has to make the last decision except the couple inside the party. Maybe it makes the duration of choice longer. Also, parties having more than one person tend to move slower than individuals to avoid diverging from each other.

As it was hypothesized at the beginning, presence of children in a party also makes the whole party walk slower. Either being in a baby carriage or able to walk on his own feet, the presence of children makes the party slower while walking. With baby carriage, it slows down the adults in the party while pushing that vehicle. In addition to this, children who can walk on his own makes the party slower because of his physical features, walking slower than the adults. In the decision process, children can also increase the time spent with alternative directions which attract them more. From both perspectives, children increase the time spent and change the velocity of the movement.

Familiarity level also changes the velocity as changing the trajectory of the walking pattern. The values of 4 and 5 were accepted as very familiar, 3 as familiar and 1 and 2 were accepted as not familiar. Parties who are unfamiliar to Ankamall (3%) have difficulties in decision making process which cause the velocity to be changed accordingly. In spite of the fact that the degree of familiarity changes the velocity with increasing the time spent during the decision making, it has no impact over the trajectory of the walking pattern. Parties who named themselves as unfamiliar to Ankamall tended to use wayfinding elements such as visual maps or you-are-here maps to choose the shortest path if they had target to reach. If they had no target and

unfamiliar to the surrounding at the same time, the trajectory of their walking pattern was also changed and the rule of EOM did not work.

Although all other variables such as weekend-weekday difference, gender difference, party size, presence of children in the party and the degree of familiarity to the environment affect the velocity of the walking pattern, the only variable which does not change the velocity of the walking pattern is the existence of the target. Having a target or a purpose change the trajectory in a considerable way, but it does not affect the velocity of the walking pattern.

According to the statistical analyses and additional interpretations, it can be said that different variables affect the trajectory and the velocity of the walking patterns. It would be better to take these into consideration in the design process of shopping malls for satisfying the visitors while walking.

4.4.3 Implications for Design

Referring to the results obtained from the case study, some implications for the design of shopping malls can be proposed.

The issue of walking patterns is closely related to the issue of wayfinding. The only difference between them is that in wayfinding, there is a target that pedestrians want to reach whereas walking patterns are more involved pedestrians without a target. However, wayfinding elements guide people in their relation to the physical interior

environment. For example wayfinding elements can be located in the T-shaped intersections in which the pedestrian flow is the highest or they can be located in the paths in which pedestrians mostly used for placing these wayfinding elements or choosing the type of wayfinding elements that are used. The results of this study can be taken into consideration. Trajectory of the walking patterns can be informative while making decisions on the wayfinding on setting.

In addition to this, store locations in the shopping mall can also be done by referring to the results of this study. Although selected variables do not make much difference in terms of trajectory of the walking pattern, velocity can lead to some differences in the design of the shopping mall. According to the gender difference in velocity, it is obvious that females tend to walk slower and look around more where males tend to be faster while walking and are more target oriented. Hence, shops related to females can be located further away from the entrance and enable females to look around more. For not making males get bored while walking the same distance with females, the stores related to males can be located next to the entrance. With this design application, the pedestrian flow can decrease because males tend to accomplish their goals without looking around the entire mall and leave the environment without being a part of the pedestrian flow.

In addition to this, related to the velocity of the walking patterns, the length and the width of the paths or corridors can be lined off for being between the optimum interval for all such as children, adults, elderly people and disabled. The length of the corridors might be made shorter for optimizing the velocity and the width might be wider makes it possible to be walked by everyone. A central organization can be

proposed and all corridors can be at the same length for providing all the stores the same possibility to be visited by the pedestrians. For example, the corridors designed in Ankamall can be divided by more T-shaped intersections for making possible it to be turned in preferred direction. The corridors can also be wider when compared to present situation of Ankamall. This increasing width gives the crowded parties to walk next to each other and they can reach the speed of individuals. This rearrangement can also help for reducing the pedestrian flow not in terms of the number of people in the mall but the perception of the crowd.

These implications for design can also be proposed for some other places with a high ratio of circulation areas like corridors or walking paths compared to the total area of the environment. Museums and galleries can be example of these types of places as well as shopping malls.

CHAPTER V

CONCLUSION

This study examines the walking patterns in shopping malls. In today's life style, the amount of walking decreased. With the impact of rapidly changing technological world, people have to complete affairs and duties in a limited amount of time. For this reason, people choose to use private cars or mass transportation vehicles instead of walking for going somewhere to another. People also prefer to use complex buildings such as shopping malls which enable them to satisfy all their needs within the same environment. While making this, individuals also want to socialize. Shopping malls provide that opportunity for their visitors. Visitors of the malls can both tend their affairs and socialize at the same context. In addition to these, shopping malls are the spaces making their visitors to walk compulsorily. Pedestrians do not choose to walk in their everyday routines but they have to walk when they are under obligation such as shopping malls. This is important from several perspectives. Referring to this, the issue of walking pattern was analyzed in this research to understand it and to develop some design proposals. Adapting Bitgood & Dukes' method (2006) and referring to the variables related to the

pedestrian activities, this study was conducted in Ankamall. The case was conducted within a T-shaped intersection both making observation and making short interviews between 100 parties of visitors. How people move in shopping malls, does the walking pattern of individuals change due to the effect of gender, party size or the presence of children in a party were searched. It was hypothesized that not relevantly to the direction; pedestrians choose the most economic movement pattern regardless of the direction. In addition to this, it were also hypothesized that the gender differences, the number of people in the party and the presence of children do not affect the trajectory but they affect the velocity of the movement.

According to the results obtained, either being a weekday or weekend, the gender differences, the presence of children and the party size, the trajectory of the walking pattern do not change. However, in velocity of the walking pattern; the gender difference, the presence of children and the changing party size have impact over it. Although these three variables could change the velocity of the walking pattern, the velocity does not change referring to either being in a weekday or weekend. In addition to these four variables, familiarity to the shopping and the presence of target also affect the walking pattern of the visitors in shopping malls. The rule of EOM is valid in most cases which there is the existence of target. The right-turn-bias is also mostly valid in cases which there are no target to reach with the idea of driving side, reading direction, handedness and eye dominance behind. Besides that all these variables affect different points of the walking pattern, the common reason behind all these is the attempt for choosing the shortest walking pattern with the tendency for minimizing the effort with maximizing the goals.

There are some limitations in that research. The first limitation is the length of the path which is from the door entrance to the T-shaped intersection. The length of the observed path was nearly 3 meters which might be short to make deductions. Although the path is short to make generalizations from the results obtained for all shopping malls, it is even so an indicator about the results which will be obtained from the longer paths. The wide range of children age is another limitation for that research. In this study, people under 12 were named as children but it can be better to divide them into smaller groups with narrower ranges. This division into smaller age ranged groups can help researchers to obtain better results such as children who cannot walk and walk with different paces. Their impact over the walking pattern can be easily analyzed within these aspects. Although all parties were analyzed that entered from the selected entrance, the absence of disabled people in that research is another limitation. If there were disabled people with different disabilities such as visually impaired, hearing impaired and walking disabled in the parties that were observed, their difficulties while walking, the trajectory they chose to move and their velocity can be analyzed. Afterwards, the analyses made and the implications made for design of the shopping malls can be more universal by addressing to all. The sample size can also be another limitation of that study. As the length of the path, the sample size is small to make generalizations on the walking patterns in shopping malls but it is anyway an indicator about how people generally walk in terms of their trajectory and velocity in shopping malls. If the sample size was larger, the results can be more easily generalized for all shopping malls as guidelines. In addition to these limitations, crowding level at the time of the case study conducted is another limitation for that study. All the observations, in weekdays and weekends, were conducted at the same crowding level. This same level of crowding can be a

limitation for analyzing the walking patterns of visitors under different circumstances. For another studies, it can be better to conduct studies under different crowding levels for analyzing either the walking patterns change referring to being solitary or crowded. Moreover, Ankamall was chosen as the only case study area for that research. Because of that, the results of that research could only be the indicators from a specific shopping mall which could also limit the results. For gathering more detailed and comprehensive results about the walking patterns in shopping malls, it can be better to choose more than one shopping malls for conducting the case. By this way, the results that will be obtained from the shopping malls can be compared to justify the results obtained from the other ones. The last limitation of that study was that the walking patterns were analyzed from the perspective of visitors and the results gathered from that analyses were interpreted as how the interior organization and the store location could be changed accordingly. In other words, while interpreting the results from the visitors' perspective; management's perspective was dismissed. Although the focus of this research is limited with visitors' perspective, it is expected to provide helpful clues for the managers as well as the designers of the malls.

Referring to these results, some arrangement can be done in the shopping malls such as in the wayfinding elements or in the interior design of the environment. These arrangements can also be applied also to the public spaces such as exhibition areas which have much walking areas in total area. It is obvious that economy of movement is valid in every type of public spaces. Referring to this, designer should take it into consideration and propose spatial features to the space accordingly.

For further studies, some new variables can be analyzed such as the effect of age over the walking pattern in the shopping malls. Also, disabled people can be specifically studied in terms of their circulation or their walking patterns to enhance the interior for all of us. Instead of looking on one T-shaped intersection, more intersections can be analyzed in Ankamall and it will be compared to this studies' result for validating them.

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APPENDICES

APPENDIX A – FLOOR PLANS OF ANKAMALL

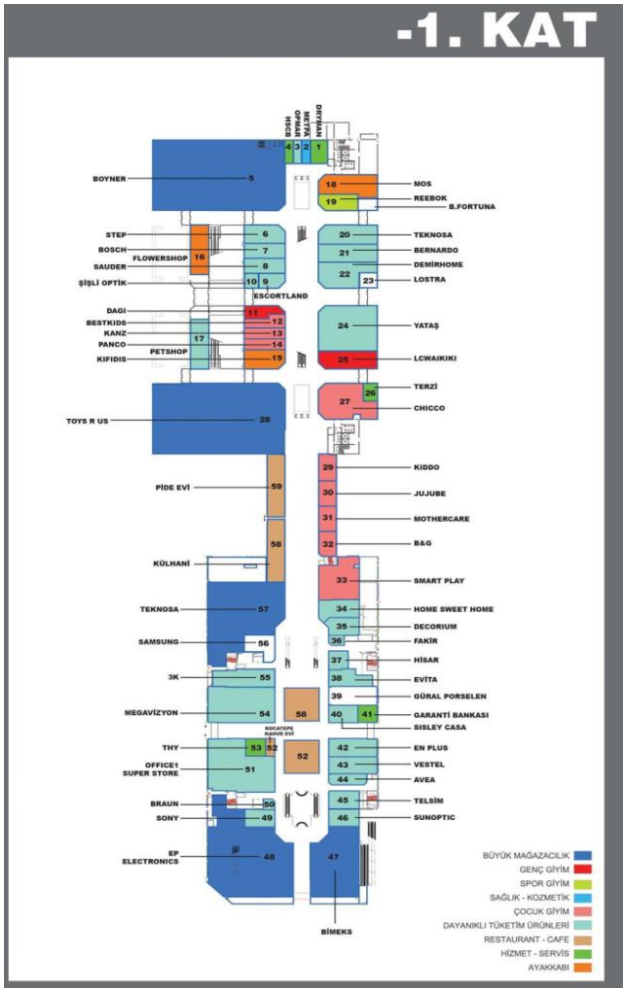

Fig. 8a-8b. Floor plan and directory of Ankamall for the basement

(Kömürcü, 2007)

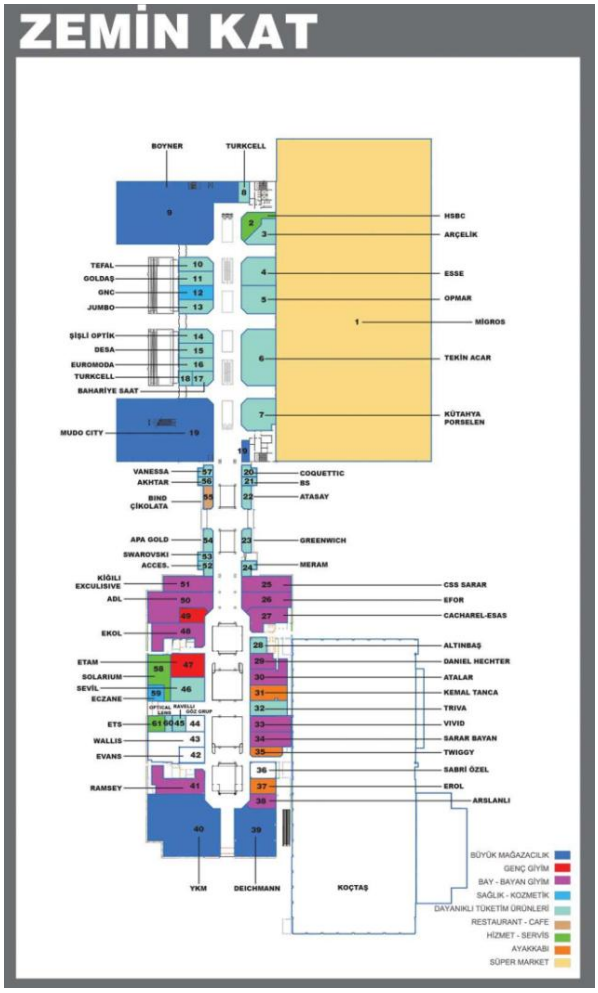

Fig. 9a-9b. Floor plan and directory of Ankamall for the ground floor (Kömürcü, 2007)

Fig. 10a-10b. Floor plan and directory of Ankamall for the first floor

(Kömürcü, 2007)

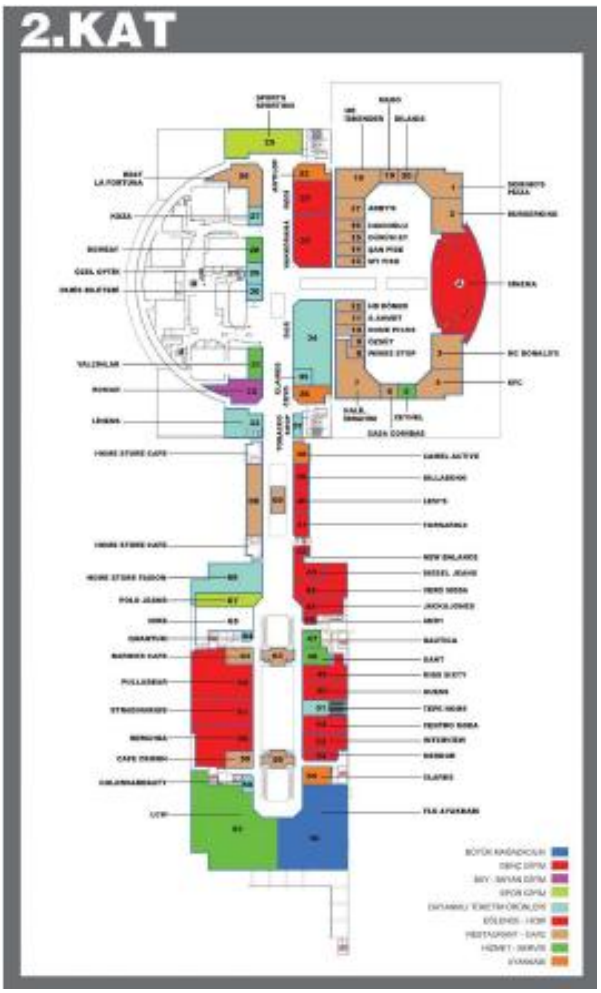

Fig. 11a-11b. Floor plan and directory of Ankamall for the second floor

(Kömürcü, 2007)

APPENDIX B – OBSERVATION CHARTS OF THE CASE STUDY

WEEKDAYS

GROUP NO.	TIME	GROUP SIZE	1ST TURNING PATTERN	CHILD	NO. OF FEMALE	NO. OF MALE	DISTANCE VS. TIME	AGE	FAMILIARITY TO ANKAMALL	PURPOSE OF BEING HERE	WALKING SIDE	OTHER NOTES
1	17.50	2	RIGHT THAN DIRECT	NO	1	1	16 SN.	20-25	5	SHOPPING	RIGHT	
2	17.55	2	DIRECT	NO	2	NO	6 SN.	30-35	5	SHOPPING	RIGHT	PURPOSE (MISRIS)
3	17.56	2	LEFT THAN UPSTAIRS	NO	NO	2	10 SN.	25-30	5	SHOPPING	RIGHT THAN LEFT BEFORE COMING T	
4	18.00	1	DIRECT THAN RIGHT	NO	1	NO	8 SN.	25-30	4	MEETING SOMEONE	RIGHT	
5	18.03	1	DIRECT THAN RIGHT	NO	NO	1	5 SN.	25-30	3	SHOPPING	RIGHT	
6	18.04	3	RIGHT	YES (1/0-5)	1	1	8 SN.	30-35	4	LOOKING AROUND	RIGHT	
7	18.05	4	LEFT THAN UPSTAIRS	YES (2/5-10)	3	NO	12 SN.	20/30+(2)	2	LOOKING AROUND	RIGHT THAN LEFT BEFORE COMING T	
8	18.06	5	LEFT THAN DIRECT	YES (1/0-5)	1	3	12 SN.	25-30	4	SHOPING	RIGHT THAN LEFT BEFORE COMING T	CHILD WANTED TO GO UPSTAIRS BUT THEY MOVED DIRECTLY
9	18.08	2	RIGHT	NO	1	1	20 SN.	35-40	3	LOOKING AROUND	LEFT THAN RIGHT	
10	18.10	3	DIRECT THAN UPSTAIRS	YES(2/0-5/5-10)	1	NO	40 SN.	35-40	5	LOOKING AROUND	RIGHT	CHILD SLOWED THE PARTY BY WANTING TO GO CHOCOLATE SHOP
11	18.13	3	Right	NO	NO	3	25 SN.	20-25	4	LOOKING AROUND	LEFT	
12	18.13	2	UPSTAIRS	YES (1/0-5)	1	1	60 SN.	30-35	5	SHOPPING	RIGHT THAN LEFT BEFORE COMING T	CHILD WANTED TO TURN TO RIGHT BUT THEY WENT UPSTAIRS
13	18.15	2	UPSTAIRS	NO	2	NO	10 SN.	20-25	4	LOOKING AROUND	RIGHT THAN LEFT BEFORE COMING T	
14	18.18	1	DIRECT	NO	1	NO	8 SN.	35-40	5	SHOPPING	RIGHT	PURPOSE (MISRIS)
15	18.20	1	DIRECT	NO	NO	1	6 SN.	20-25	5	MEETING SOMEONE	RIGHT THAN LEFT BEFORE COMING T	PURPOSE (MISRIS)
16	18.21	2	LEFT THAN UPSTAIRS	NO	2	NO	10 SN.	30-35	5	SHOPPING	RIGHT THAN LEFT BEFORE COMING T	PURPOSE =
17	18.23	3	RIGHT	NO	2	NO	8 SN.	30-35/40	5	LOOKING AROUND	RIGHT	
18	18.25	2	RIGHT	NO	1	1	8 SN.	35-40	5	LOOKING AROUND	RIGHT	
19	18.26	4	RIGHT	YES (2/10-15)	1	1	30 SN.	35-40	5	SHOPPING	RIGHT	PURPOSE =
20	18.30	1	UPSTAIRS	NO	1	NO	6 SN.	25-30	5	WORKING HERE	RIGHT THAN LEFT BEFORE COMING T	
21	17.45	3	UPSTAIRS	YES (1/5-10)	1	1	13 SN.	35-40	5	SHOPPING	LEFT	PURPOSE =
22	17.46	3	RIGHT THAN UPSTAIRS	NO	1	2	20 SN.	20-25	4	MEETING SOMEONE	RIGHT THAN LEFT BEFORE COMING T	
23	17.48	2	LEFT	NO	NO	2	5 SN.	30-35	5	SHOPPING	LEFT	PURPOSE =
24	17.48	1	UPSTAIRS	NO	1	NO	8 SN.	20-25	5	MEETING SOMEONE	LEFT THAN UPSTAIRS	PURPOSE (FOOD COURT)
25	17.49	1	RIGHT	NO	NO	1	5 SN.	20-25	5	WORKING HERE	RIGHT	

Fig. 12a. Results of the observations and interviews in weekdays

WEEKDAYS

GROUP NO.	TIME	GROUP SIZE	1ST TURNING PATTERN	CHILD	NO. OF FEMALE	NO. OF MALE	DISTANCE VS. TIME	AGE	FAMILIARITY TO ANKAMALL	PURPOSE OF BEING HERE	WALKING SIDE	OTHER NOTES
26	17.50	2	LEFT	NO	1	1	10 SN.	20-25	3	LOOKING AROUND	LEFT	
27	17.51	3	LEFT THAN RIGHT	YES (1/0-5)	1	1	13 SN.	35-40	4	LOOKING AROUND	RIGHT	BABY CARRIAGE +
28	17.52	3	UPSTAIRS	NO	NO	3	17 SN.	25-30	5	LOOKING AROUND	RIGHT THAN LEFT BEFORE COMING T	
29	17.55	1	DIRECT	NO	NO	1	10 SN.	35-40	4	MEETING SOMEONE	RIGHT	
30	17.57	1	UPSTAIRS	NO	1	NO	4 SN.	30-35	5	MEETING SOMEONE	RIGHT THAN LEFT BEFORE COMING T	PURPOSE +
31	17.58	2	RIGHT	YES (1/5-10)	1	NO	13 SN.	30-35	5	SHOPPING	RIGHT	FEMALE WANTED TO GO DIRECTLY BUT CHILD DIRECTED HER TO THE RIGHT SIDE
32	18.00	2	RIGHT THAN LEFT	NO	1	1	8 SN.	20-25	5	LOOKING AROUND	RIGHT	
33	18.01	2	DIRECT	NO	NO	2	10 SN.	30-35	5	SHOPPING	RIGHT	PURPOSE +
34	18.03	1	LEFT	NO	1	NO	14 SN.	25-30	3	LOOKING AROUND	LEFT	
35	18.04	2	RIGHT	NO	2	NO	8 SN.	25-30	5	LOOKING AROUND	RIGHT	
36	18.04	4	LEFT THAN DOWNSTAIRS	NO	2	2	7 SN.	50+	5	SHOPPING	LEFT THAN RIGHT	PURPOSE +
37	18.05	2	UPSTAIRS	NO	NO	2	5 SN.	25-30	5	SHOPPING	RIGHT THAN LEFT BEFORE COMING T	PURPOSE +
38	18.06	4	RIGHT	NO	NO	4	8 SN.	30-35	5	MEETING SOMEONE	RIGHT	
39	18.07	4	LEFT	YES (2/0-5)	1	1	12 SN.	30-35	4	LOOKING AROUND	LEFT THAN RIGHT	CHILD WANTED TO TURN TO RIGHT
40	18.07	4	LEFT	YES (2/5-10)	NO	2	12 SN.	35-40	3	LOOKING AROUND	LEFT THAN RIGHT	
41	17.45	1	RIGHT	NO	1	NO	5 SN.	25-30	5	SHOPPING	RIGHT	
42	17.46	1	LEFT	NO	NO	1	5 SN.	40-45	5	SHOPPING	LEFT THAN RIGHT	
43	17.46	1	DIRECT THAN RIGHT	NO	NO	1	8 SN.	25-30	3	LOOKING AROUND	RIGHT	
44	17.47	2	UPSTAIRS	NO	1	1	22 SN.	30-35	2	LOOKING AROUND	RIGHT THAN LEFT BEFORE COMING T	
45	17.48	1	LEFT THAN UPSTAIRS	NO	1	NO	6 SN.	25-30	4	MEETING SOMEONE	RIGHT THAN LEFT BEFORE COMING T	PURPOSE (FOODCOURT)
46	17.49	1	RIGHT	NO	NO	1	5 SN.	50+	5	LOOKING AROUND	RIGHT	
47	17.50	1	UPSTAIRS	NO	1	NO	12 SN.	20-25	5	MEETING SOMEONE	RIGHT THAN LEFT BEFORE COMING T	PURPOSE +
48	17.52	4	LEFT THAN DOWNSTAIRS	YES (2/0-5)	1	1	17 SN.	35-40	5	CHILDREN PLAYING	LEFT THAN RIGHT	
49	17.53	1	UPSTAIRS	NO	NO	1	5 SN.	30-35	5	LOOKING AROUND	RIGHT	
50	17.54	1	LEFT	NO	1	NO	5 SN.	25-30	5	SHOPPING	LEFT THAN RIGHT	PURPOSE (BOYNER)

Fig. 12a. Results of the observations and interviews in weekdays (continues)

WEEKENDS

GROUP NO.	TIME	GROUP SIZE	1ST TURNING PATTERN	CHILD	NO. OF FEMALE	NO. OF MALE	DISTANCE VS. TIME	AGE	FAMILIARITY TO ANKAMALL	PURPOSE OF BEING HERE	WALKING SIDE	OTHER NOTES
1	17.40	2	UPSTAIRS	NO	NO	2	8 SN.	30-35	5	MEETING SOMEONE	RIGHT THAN LEFT	
2	17.42	1	UPSTAIRS	NO	NO	1	7 SN.	25-30	4	LOOKING AROUND	RIGHT THAN LEFT	
3	17.43	6	DIRECT THAN RIGHT	YES (2E/2K-5-10)	1	1	10 SN.	30-35	2	LOOKING AROUND	RIGHT	
4	17.44	4	RIGHT	NO	4	NO	10 SN.	20-25	5	LOOKING AROUND	RIGHT	
5	17.45	2	UPSTAIRS	NO	1	1	12 SN.	25-30	5	LOOKING AROUND	RIGHT THAN LEFT	
6	17.46	1	UPSTAIRS	NO	NO	1	5 SN.	20-25	5	ANOTHER	RIGHT THAN LEFT	WORKING HERE
7	17.47	1	RIGHT	NO	1	NO	8 SN.	45-50	4	LOOKING AROUND	RIGHT	
8	17.48	2	UPSTAIRS	NO	2	NO	25 SN.	25-30/50+	5	SHOPPING	RIGHT THAN LEFT	PURPOSE +
9	17.49	2	DIRECT THAN RIGHT	NO	1	1	8 SN.	50+	5	SHOPPING	RIGHT	PURPOSE +
10	17.50	2	RIGHT	NO	NO	2	15 SN.	30-35	5	LOOKING AROUND	RIGHT	PURPOSE (MUDO)
11	17.51	2	RIGHT	NO	2	NO	10 SN.	40-45	4	LOOKING AROUND	RIGHT	
12	17.52	1	DIRECT THAN RIGHT	NO	NO	1	5 SN.	50+	5	MEETING SOMEONE	RIGHT	
13	17.53	4	UPSTAIRS	YES (3 E/ 2S| 0-5/3| 5-10)	1	NO	23 SN.	30-35	5	LOOKING AROUND	RIGHT	CHILD INCREASES THE DECISION TIME
14	17.54	2	DIRECT	NO	1	1	5 SN.	50+	5	SHOPPING	RIGHT	PURPOSE (MİGROS)
15	17.55	2	RIGHT	NO	2	NO	5 SN.	35-40	5	LOOKING AROUND	RIGHT	PURPOSE (MUDO)
16	17.57	1	LEFT	NO	NO	1	10 SN.	20-25	4	MEETING SOMEONE	LEFT	
17	17.58	2	RIGHT THAN UPSTAIRS	NO	2	NO	18 SN.	20-25/50+	3	LOOKING AROUND	RIGHT	
18	17.58	2	RIGHT & LEFT	NO	2	NO	13 SN.	25-30	4	LOOKING AROUND	RIGHT	
19	18.00	3	UPSTAIRS THAN RIGHT	YES (1E/10-15)	1	1	12 SN.	30-35	5	LOOKING AROUND	RIGHT	
20	18.01	1	UPSTAIRS	NO	NO	1	8 SN.	50+	5	SHOPPING	RIGHT THAN LEFT	PURPOSE +
21	18.02	1	UPSTAIRS	NO	NO	1	8 SN.	25-30	5	MEETING SOMEONE	RIGHT THAN LEFT	
22	18.02	1	LEFT	NO	1	NO	8 SN.	35-40	5	MEETING SOMEONE	LEFT THAN RIGHT	
23	18.03	1	UPSTAIRS	NO	NO	1	15 SN.	35-40	4	MEETING SOMEONE	RIGHT THAN LEFT	
24	18.04	2	LEFT THAN DOWNSTAIRS	YES (1K/0-5)	NO	1	8 SN.	50+	4	ANOTHER	LEFT THAN RIGHT	PURPOSE (GAME AREA)
25	18.05	4	UPSTAIRS	YES (2E/5-10)	1	1	8 SN.	35-40	5	SHOPPING	RIGHT THAN LEFT	

Fig. 12b. Results of the observations and interviews in weekends

WEEKENDS

GROUP NO.	TIME	GROUP SIZE	1ST TURNING PATTERN	CHILD	NO. OF FEMALE	NO. OF MALE	DISTANCE VS. TIME	AGE	FAMILIARITY TO ANKAMALL	PURPOSE OF BEING HERE	WALKING SIDE	OTHER NOTES
26	17.45	2	UPSTAIRS	NO	NO	2	5 SN.	35-40	4	LOOKING AROUND	RIGHT THAN LEFT	
27	17.46	4	RIGHT	NO	2	2	14 SN.	70+	3	LOOKING AROUND	LEFT	
28	17.46	4	UPSTAIRS	YES(1E/1K-5-10)	1	1	12 SN.	35-40	5	LOOKING AROUND	RIGHT THAN LEFT	
29	17.48	1	DIRECT	NO	NO	1	5 SN.	25-30	5	SHOPPING	RIGHT	PURPOSE (MİGROS)
30	17.49	3	LEFT THAN DOWNSTAIRS	YES (1K/5-10)	1	1	13 SN.	35-40	5	SHOPPING	LEFT	
31	17.50	1	RIGHT	NO	1	NO	5 SN.	30-35	4	LOOKING AROUND	RIGHT	
32	17.50	2	DIRECT THAN RIGHT	NO	NO	2	15 SN.	50+	3	LOOKING AROUND	RIGHT	
33	17.51	3	RIGHT	YES (1K/5-10)	1	1	5 SN.	35-40	5	LOOKING AROUND	RIGHT	
34	17.53	7	DIRECT THAN RIGHT	NO	4	3	25 SN.	15-20	5	LOOKING AROUND	RIGHT THAN LEFT	
35	17.54	2	DIRECT	NO	2	NO	12 SN.	35-40	5	SHOPPING	RIGHT THAN LEFT	PURPOSE (MİGROS)
36	17.56	4	RIGHT	YES (1K-1E/0-5)	2	NO	10 SN.	30-35	5	LOOKING AROUND	RIGHT	
37	17.56	3	LEFT	YES (1K-1E/0-5)	1	NO	8 SN.	30-35	5	LOOKING AROUND	RIGHT THAN LEFT	CHILDREN WANTED TO LOOK AT THE SHOP AT THE LEFT SIDE
38	17.57	2	LEFT	NO	1	1	12 SN.	25-30	5	LOOKING AROUND	RIGHT THAN LEFT	
39	17.58	3	UPSTAIRS	YES (1K/5-10//1E/0-5)	1	NO	5 SN.	30-35	5	ANOTHER	RIGHT THAN LEFT	PURPOSE (FOOD COURT)
40	17.59	2	LEFT	NO	1	1	5 SN.	25-30	4	SHOPPING	RIGHT THAN LEFT	
41	18.00	1	LEFT	NO	1	NO	5 SN.	30-35	5	MEETING SOMEONE	LEFT	
42	18.00	3	UPSTAIRS	YES (1K/5-10)	1	1	8 SN.	35-40	4	ANOTHER	RIGHT THAN LEFT	PURPOSE (FOOD COURT)
43	18.02	4	RIGHT	YES (1E/1K-5-10)	1	1	8 SN.	35-40	4	LOOKING AROUND	RIGHT	
44	18.03	4	UPSTAIRS	NO	4	NO	13 SN.	20-25/2//40-45/2	5	LOOKING AROUND	RIGHT THAN LEFT	
45	18.04	1	LEFT THAN RIGHT	NO	NO	1	12 SN.	25-30	4	MEETING SOMEONE	RIGHT	
46	18.05	1	LEFT	NO	1	NO	12 SN.	40-45	4	LOOKING AROUND	RIGHT THAN LEFT	
47	18.07	6	UPSTAIRS	YES (4K/5-10)	2	NO	12 SN.	30-35	4	LOOKING AROUND	RIGHT THAN LEFT	
48	18.08	2	UPSTAIRS	NO	NO	2	5 SN.	25-30	5	ANOTHER	RIGHT THAN LEFT	WORKING HERE
49	18.09	1	RIGHT	NO	1	NO	8 SN.	35-40	4	MEETING SOMEONE	RIGHT	
50	18.10	2	UPSTAIRS	NO	NO	2	7 SN.	30-35	4	LOOKING AROUND	RIGHT THAN LEFT	

Fig. 12b. Results of the observations and interviews in weekends (continues)

APPENDIX C – STATISTICAL ANALYSIS RESULTS

C1 - WEEKEND - WEEKDAY & TRAJECTORY RELATION (Chi-square)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Raws * Columns	100	100,0%	0	,0%	100	100,0%

Raws * Columns Crosstabulation

		Trajectory				
		1	2	3	4	Total
Raws	Weekday	15,0	15,0	9,0	11,0	50,0
	Weekend	13,0	10,0	8,0	19,0	50,0
Total		28,0	25,0	17,0	30,0	100,0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3,335[a]	3	,343
Likelihood Ratio	3,368	3	,338
Linear-by-Linear Association	2,029	1	,154
N of Valid Cases	100		

a. 0 cells (,0%) have expected count less than 5. The minimum expected count is 8,50.

p= 0.343 $\propto$= 0.05 (%95 confidence level)

Result:

p>$\propto$, so ACCEPT H0 (not Ha). Trajectory is **independent** from the days of week.

C2 - GENDER DIFFERENCE & TRAJECTORY RELATION (Chi-square)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Raws * Columns	70	100,0%	0	,0%	70	100,0%

Raws * Columns Crosstabulation

			Trajectory				Total
			1	2	3	4	
Raws	Male	Count	5	7	8	12	32
		Expected Count	8,2	7,3	5,9	10,5	32,0
	Female	Count	13	9	5	11	38
		Expected Count	9,8	8,7	7,1	12,5	38,0
Total		Count	18	16	13	23	70
		Expected Count	18,0	16,0	13,0	23,0	70,0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4,057[a]	3	,255
Likelihood Ratio	4,161	3	,245
Linear-by-Linear Association	2,736	1	,098
N of Valid Cases	70		

a. 0 cells (,0%) have expected count less than 5. The minimum expected count is 5,94.

p= 0.255 $\propto$= 0.05 (%95 confidence level)

Result:

p>$\propto$, so ACCEPT H0 (not Ha). Trajectory is **independent** from the gender difference.

C3 – PRESENCE OF CHILDREN IN THE PARTY & TRAJECTORY RELATION (Chi-square)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Raws * Columns	100	100,0%	0	,0%	100	100,0%

Raws * Columns Crosstabulation

			Trajectory				Total
			1	2	3	4	
Raws	With children	Count	6	9	2	9	26
		Expected Count	7,3	6,5	4,4	7,8	26,0
	Without children	Count	22	16	15	21	74
		Expected Count	20,7	18,5	12,6	22,2	74,0
Total		Count	28	25	17	30	100
		Expected Count	28,0	25,0	17,0	30,0	100,0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3,643[a]	3	,303
Likelihood Ratio	3,877	3	,275
Linear-by-Linear Association	,058	1	,810
N of Valid Cases	100		

a. 1 cells (12,5%) have expected count less than 5. The minimum expected count is 4,42.

p= 0.303 $\propto$= 0.05 (%95 confidence level)

Result:

p>$\propto$, so ACCEPT H0 (not Ha). Trajectory is **independent** from the presence of children in the party.

C4 - PARTY SIZE & TRAJECTORY RELATION (Chi-square)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Raws * Columns	100	100,0%	0	,0%	100	100,0%

Raws * Columns Crosstabulation

			Trajectory				Total
			1	2	3	4	
Raws	1	Count	6	9	8	11	34
		Expected Count	9,2	8,8	5,8	10,2	34,0
	2	Count	11	7	6	9	33
		Expected Count	8,9	8,6	5,6	9,9	33,0
	3	Count	4	4	1	5	14
		Expected Count	3,8	3,6	2,4	4,2	14,0
	4 and more	Count	6	6	2	5	19
		Expected Count	5,1	4,9	3,2	5,7	19,0
Total		Count	27	26	17	30	100

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Expected Count	27,0	26,0	17,0	30,0	100,0	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4,840[a]	9	,848
Likelihood Ratio	5,160	9	,820
Linear-by-Linear Association	1,156	1	,282
N of Valid Cases	100		

a. 6 cells (37,5%) have expected count less than 5. The minimum expected count is 2,38.

p= 0.848 $\propto$= 0.05 (%95 confidence level)

Result:

p>$\propto$, so ACCEPT H0 (not Ha). Trajectory is **independent** from the changing party size.

C5 - WEEKEND - WEEKDAY & VELOCITY RELATION (T-test)

Descriptive Statistics

	N	Mean	Std. Deviation
weekday	50	12,00	9,835
Valid N (listwise)	50		

Descriptive Statistics

	N	Mean	Std. Deviation
weekend	50	10,10	4,946
Valid N (listwise)	50		

1. H0: M1 = M2

Ha: M1(weekday) ≠ M2(weekend)

2. ∝= 0.05, df:(N1+N2)-2=98, t critical: 1,6606

3. t sample: 0,15

-1,66 < 0,15 > 1,66

Result: DO NOT REJECT. There is **NOT a significant difference** between weekday and weekend in terms of velocity.

C6 - GENDER DIFFERENCE & VELOCITY RELATION (T-test)

Descriptive Statistics

	N	Mean	Std. Deviation
female	38	10,62	6,825
Valid N (listwise)	38		

Descriptive Statistics

	N	Mean	Std. Deviation
male	32	8,72	4,623
Valid N (listwise)	32		

1. H0: M1 = M2

Ha: M1(female)>M2(male)

2. $\propto = 0.05$, df:(N1+N2)-2=68, t critical: 1,6679

3. t sample: 2,26

2,26 > 1,66

Result: REJECT. There is **a significant difference** between genders in terms of velocity.

C7 – PRESENCE OF CHILDREN IN THE PARTY & VELOCITY RELATION (T-test)

Descriptive Statistics

	N	Mean	Std. Deviation
Without children	74	9,74	5,206
Valid N (listwise)	74		

Descriptive Statistics

	N	Mean	Std. Deviation
With children	26	14,77	11,941
Valid N (listwise)	26		

1. H0: M1 = M2

Ha: M1(without children)<M2(with children)

2. $\propto = 0.05$, df:(N1+N2)-2=98, t critical: 1,6606

3. t sample: -2, 86

-2,86 < -1,66

Result: REJECT. There **is a significant difference** between parties with children and parties without children in terms of velocity.

C8 - PARTY SIZE & VELOCITY RELATION (ANOVA)

Statistics

		one	three	two	fourandmore
N	Valid	33	14	34	19
	Missing	1	20	0	15
Mean		7,45	13,93	12,03	13,42
Std. Deviation		2,895	9,426	9,898	6,194

ANOVA

variables

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	682,037	3	227,346	4,082	,009
Within Groups	5346,713	96	55,695		
Total	6028,750	99			

F sample: 4,082, p<4,082

Result: REJECT. There **is a significant difference** between changing party sizes in terms of velocity.