MÜGE SARIGÖL

THE IMPACT OF WALKABILITY ON WELL-BEING

Bilkent University 2022

THE IMPACT OF WALKABILITY ON EUDAIMONIC AND HEDONIC WELL-BEING IN EQUAL EYE-LEVEL STREET GREENERY NEIGHBORHOODS

A Master's Thesis

by

MÜGE SARIGÖL

Department of
Interior Architecture and Environmental Design
İhsan Doğramaci Bilkent Univerity
Ankara

May 2022

To my parents,

Işılay & Semih

THE IMPACT OF WALKABILITY ON EUDAIMONIC AND HEDONIC WELL-BEING IN EQUAL EYE-LEVEL STREET GREENERY NEIGHBORHOODS

The Graduate School of Economics and Social Science

Of

İhsan Doğramacı Bilkent University

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MÜGE SARIGÖL

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By Müge Sarıgöl

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 Fine Arts in Interior Architecture and Environmental Design.

.. Yasemin Afaçan..

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 Fine Arts in Interior Architecture and Environmental Design.

Andre Santos Nouri

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 Fine Arts in Interior Architecture and Environmental Design.

İpek Gürsel Dino

Approval of the Graduate School of Economics and Social Sciences

Refet Soykan Gürkaynak

Director

ABSTRACT

THE IMPACT OF WALKABILITY ON EUDAIMONIC AND HEDONIC WELL-BEING IN EQUAL EYE-LEVEL STREET GREENERY NEIGHBORHOODS

Sarıgöl, Müge

MFA, Department of Interior Architecture and Environmental Design

Supervisor: Assoc. Prof. Dr. Yasemin Afacan

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This thesis analyzed the influence of objective and subjective walkability on momentary hedonic and eudaimonic well-being while walking in neighborhoods. For this purpose, two neighborhoods with different objective walkability, and equal eye-level street greenery levels were chosen. Consequently, a survey was conducted with two hundred and nine neighborhood residents in total. The residents were asked about their perceptions regarding their neighborhood's walkability levels, and momentary hedonic and eudaimonic well-being during walking in their neighborhoods. The results showed that objective walkability did not have a positive influence on perceived walkability, hedonic and eudaimonic well-being. However, the data analysis indicated a positive moderate correlation between perceived walkability and momentary hedonic and eudaimonic well-being. The outcomes of this thesis provided new insights to researchers for means to facilitate and support momentary subjective well-being through perceived walkability dimensions.

Keywords: Eudaimonic Well-Being, Hedonic Well-Being, Neighborhood, Objective Walkability, Subjective Walkability

ÖZET

SOKAK YEŞİLLİKLERİNİN EŞİT OLDUĞU MAHALLELERDE YÜRÜNEBİLİRLİĞİN ÖDOMONİK VE HEDONİK REFAH ÜZERİNDEKİ ETKİSİ

Sarıgöl, Müge

Yüksek Lisans, İç Mimarlık ve Çevre Tasarımı Bölümü

Tez Danışmanı: Doç. Dr. Yasemin Afacan

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Bu tez, mahallelerde yürürken nesnel ve öznel yürünebilirliğin anlık hedonik ve ödomonik refah üzerindeki etkisini analiz etmiştir. Bu amaçla, farklı hedef yürünebilirliğe ve göz hizasında eşit sokak yeşillik seviyelerine sahip iki mahalle seçilmiştir. Toplamda iki yüz elli dokuz mahalle sakini ile anket çalışması yapılmıştır. Mahalle sakinlerine, mahallelerinin yürünebilirlik düzeyleri ve mahallelerinde yürürken anlık hedonik ve ödomonik refah ile ilgili algıları sorulmuştur. Sonuçlar, nesnel yürünebilirliğin algılanan yürünebilirlik, hedonik ve ödomonik refah üzerinde olumlu bir etkisi olmadığını göstermiştir. Bununla birlikte, veri analizi, algılanan yürünebilirlik ile anlık hedonik ve ödomonik iyi oluş arasında pozitif orta düzeyde bir ilişki olduğunu göstermiştir. Bu tezin sonuçları, algılanan yürünebilirlik boyutları aracılığıyla anlık öznel iyi oluşu kolaylaştırmak ve desteklemek için araştırmacılara yeni anlayışlar sağlamıştır.

Anahtar kelimeler: Hedonik Refah, Mahalle, Objektif Yürünebilirlik, Ödomonik Refah, Öznel Yürünebilirlik

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LIST OF ABBREVIATIONS

3Ds	Density, diversity, and design
Chinese NEWS-A	Chinese Neighborhood Environment Walkability Scale
EMO	Emotional subjective well-being dimension
EVA	Evaluative subjective well-being dimension
GIS	Geographic Information System
GSV	Google Street View
GVI	Green View Index
HSV	Hue Saturation Value
IPAQ	International Physical Activity Questionnaire
LEED-ND	Leadership for Energy and Environmental Design for Neighborhood Development
LUM	Land-Use Mix
NDVI	Normalized Difference Vegetation Index
N-IPAQ	Neighbourhood-International Physical Activity Questionnaire
NGOs	Non-Governmental Organizations

NZ1	Neighborhood Zone 1
NZ2	Neighborhood Zone 2
STS	Satisfaction with Travel Scale
SVI	Street View Image
UN	United Nations
WHO	World Health Organization

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CHAPTER 1

INTRODUCTION

1.1. Problem Statement and Aim of the Study

Definition of human health, “according to World Health Organization (WHO), is a state of physical, mental and social well-being and not merely the absence of disease or infirmity" (Zuniga-Teran et al., 2017b: 5). Multiple disciplines such as politics, policy-making, economics, psychology, sociology, and geography turned their focus toward well-being (De Vos, Schwanen, Van Acker, & Witlox, 2013; Schwanen & Wang, 2014). There are two primary domains of well-being: objective and subjective well-being (Lucchesi, Larranaga, Ochoa, Samios, & Cybis, 2021). Objective perspective evaluates objective circumstances of people’s lives, whereas subjective perspective evaluates an individual’s perceptions and experiences (Nordbakke & Schwanen, 2014), but at the end of the day, subjective experiences are objective realities (Layard, 2010). Subjective well-being is usually categorized into hedonic and eudaimonic perspectives (Singleton, 2019a). The hedonic view defines well-being in terms of focusing on happiness, whereas the eudaimonic view defines well-being in terms of having a purposeful life

(Deci & Ryan, 2008; Gatrell, 2013). Many researchers indicated that to understand well-being better, both hedonic and eudaimonic well-being should be considered (De Vos et al., 2013; Ryan & Deci, 2001).

The built environment influences human health and well-being (Zuniga-Teran, 2017b; Lauwers et al., 2021). The main focus of user comfort research has been on indoor environments. With increasing migration toward urban areas, and the growth of cities, assessing outdoor environments has emerged as a challenging field (Antonini, Vodola, Gaspari, & Giglio, 2020). Moreover, where you live affects people’s lives in terms of social relations and physical activity; thus, a neighborhood is a determinant factor of human health and well-being (Gu, 2020). One neighborhood characteristic that influences one’s well-being is green spaces (Lu, 2019). Residential greenery in the vicinity of people's homes and access to natural environments increase both overall and momentary well-being (Huang et al., 2021; Lauwers et al., 2021; Schwanen & Wang, 2014; Wang, He, Webster, & Zhang, 2019). Another neighborhood characteristic that influences well-being and requires attention is its walkability.

Cities are constantly changing and expanding with continuous urban growth (Rakha, 2015). During this urban growth, planned cities and the spread of urbanization led to a decline in pedestrian access and the ability to walk in most cities (Edirisinghe & Hewawasam, 2020). Research shows that specific built environmental characteristics can function as facilitators or barriers to walking (Ribeiro & Hoffimann, 2018). As a result, researchers directed their attention to studying the relationship between the built environment and walking capability and experience, and this relationship is called walkability (Edirisinghe & Hewawasam, 2020). The definition of a neighborhood can be both a matter of subjective perception and a relatively objective administrative description (Sulaiman, 2020). Walking enhances physical and mental health, and well-being (Ferdman, 2019; Singleton, 2019a). Studies suggest that people who are living in places with high walkability experience greater personal well-being since it encourages walking trips (Lucchesi et al., 2021). While analyzing well-being in the context of one's neighborhood, long-term impacts are often considered, and the effect of momentary context-specific factors is overlooked, thereby needing an expansion in literature (Schwanen & Wang, 2014). Even though research shows the importance of neighborhood walkability for well-being, the link between them is somewhat unclear (Yu, Cheung, Lau, & Woo, 2017).

At this point, for the thesis, it was aimed to bring clarity to this relationship by assessing categories of subjective well-being during walking: hedonic and eudaimonic, and categories of walkability evaluation: subjective and objective. To measure the impact of walkability on well-being, since nature is a significant indicator of well-being, both in general and momentary timespans, neighborhoods with similar amounts of eye-level street greenery were chosen. Within this framework, the objectives of this thesis are as follows:

- Analyzing the effect of objective walkability measures of a neighborhood on residents' perceived walkability.
- Exploring the impact of walkability on hedonic and eudaimonic well-being during walking.

1.2. Structure of the Thesis

This thesis consists of six chapters. Multiple chapters cover various aspects of the thesis to obtain the thesis's objectives. The first chapter is the introduction; within this chapter problem statement, the aim of the study, and the structure of the thesis are presented. Chapter 2 presents the literature review on walkability, neighborhood walkability, neighborhood greenspaces and street greenery, well-being, well-being in built environments and neighborhoods, well-being in nature, and lastly, well-being and walking, respectively. In Chapter 3, the methodology of the thesis is introduced and explained. Within this chapter, first the research questions and hypotheses are presented. Next, the setting of the thesis is described to give information about the neighborhood zones from which the data was collected. Following this, information regarding to participants, procedure, instrumentation, and data collection methods are presented. In Chapter 4, the thesis's findings are addressed, and in Chapter 5, the results are discussed. Chapter 6 is the conclusion part; within this part, the main aspects of the thesis are summarized. This chapter concludes with limitations and future possibilities for research. The references and appendices come after the conclusion.

CHAPTER 2

LITERATURE REVIEW

2.1. What is Walkability?

Walking is the most common physical activity (Ribeiro & Hoffimann, 2018), and the oldest and smallest mode of human transportation (Edirisinghe & Hewawasam, 2020; Vasilikou & Nikolopoulou, 2013). Walking is done relatively smoothly for the vast majority of the population (Nagata et al., 2020). It requires no special equipment or clothing and can be done alone or in the company of others at any time (Zang et al., 2020). Additionally, walking enables people to seek out experiences, relate to others (Dean et al., 2020), and interact with the built environment and spaces more directly due to its slow speed (Chan, Schwanen, & Banister, 2021; Sulaiman, 2020). Therefore, it can have meaningful impacts on both people's mental and physical health (Dean et al., 2020; Forsyth & Southworth, 2008). However, walking is not just a matter of individual preference or capacity; it is a matter of opportunity and context as well (Gatrell, 2013) and is influenced by activities, people, and characteristics of the built environment

(Knapskog, Hagen, Tennøy, & Rynning, 2019). Specific built environmental characteristics can function as promoters or barriers to walking (Ribeiro & Hoffimann, 2018).

Continuous urban growth is affecting and changing urban landscapes and the built environment around people in several regions of the world, and cities are growing exponentially around the globe to accommodate this expansion (Rakha, 2015). According to United Nations (UN) (2018), the current human world will continue to be primarily urban. During this urban growth, planned cities and the spread of urbanization led to a decline in pedestrian access and the ability to walk in most cities (Edirisinghe & Hewawasam, 2020). The fine-grained pedestrian network was disrupted by high-speed traffic, and that erected barriers to unrestricted mobility on foot (Forsyth & Southworth, 2008). With the awareness of such auto-dependency, the term 'walkability' emerged.

The term "walkability" refers to a metric determining how friendly the built environment is to walk and the levels of human physical activity and active travel (Wang & Yang, 2019). It is a concept that examines the experience of walking, pedestrian movement, and accessibility (Edirisinghe & Hewawasam, 2020). Researchers and city planners increasingly value walkability for several reasons; “it is the underpinning characteristic of complete, sustainable, and healthy cities” (Lee & Dean, 2018: 310). Moreover, walkable urban spaces increase secure social interaction, physical fitness, and well-being, and promote accessible and sustainable urban experience (Seles & Afacan, 2019). In this connection, international organizations have called for changes and enhancements in the built environment to promote human health by enhancing walkability (Zuniga-Teran et al., 2017a). Hereby, researchers have studied the relationship between neighborhood-built environments and walking (Hanibuchi, Nakaya, & Inoue, 2019).

2.1.1. Neighborhood Walkability

The definition of a neighborhood can be both a matter of subjective perception and a relatively objective administrative description (Sulaiman, 2020). A neighborhood is defined as an area with similar or homogeneous distinguishing characteristics, such as ethnicity, housing, development type, and so on (Gupta, Kumar, Pathan, & Sharma, 2012). In addition to this definition, a neighborhood is defined as an area 5-10 minute walk away from one's dwelling (Sulaiman, 2020). A neighborhood constitutes and contains social relations and physical attributes of people's lives; thus, one's neighborhood impacts human health and well-being (Gu, 2020). Additionally, the built environment of one's neighborhood, such as neighborhood aesthetics, green space availability, and the condition of pedestrian infrastructure, affects walking behavior (Lauwers et al., 2021; Nagata et al., 2020).

There are different motivations for walking, and they require different elements/characteristics in neighborhood-built environments. To identify pedestrians' requirements from the built environment, different motivations for walking need to be distinguished (Zuniga-Teran et al., 2017b). Two primary motivations for walking are: walking for recreation/leisure and walking for transportation (Zuniga-Teran et al., 2017b). Walking for recreation/leisure refers to walking with the purpose of exercise or leisure, whereas walking for transportation refers to walking to reach a destination, a movement from one point to another (e.g., walking to work and walking to school) (Edirisinghe & Hewawasam, 2020; Zuniga-Teran et al., 2017a).

Evidence shows that physical environments can be associated with being more active; however, most of this evidence used to be derived from self-reported perceptions of environmental factors (Leslie et al., 2007). Later, public health and urban planning researchers highlighted the importance of objective identification and documentation of built environments. In order to understand the impacts of the built environment on physical activity, there is a need for relevant and reliable measurable characteristics (Agampatian, 2014; Leslie et al., 2007). In more than two hundred studies, the built environment has been identified and measured using D variables (Ewing, Hajrasouliha, Neckerman, Purciel-Hill, & Greene, 2016). The original 3Ds (density, diversity, and design) were named and introduced by Cervero and Kockelman in 1997 (Ewing & Cervero, 2010). Later Ewing and Cervero (2001) expanded their research by including destination accessibility and distance to transit dimensions (Ewing et al., 2016).

Following that, Handy, Boarnet, Ewing, and Killingsworth (2002) extended and re-identified six dimensions of the built environment: density and intensity, land-use mix (LUM), street connectivity, street scale, aesthetic qualities, and regional structure. From this point forward, several tools such as questionnaires and indices have been developed for measuring the built environment and its impact on physical activity and walkability (Zuniga-Teran, 2015). Walkability indices take measurable characteristics of a neighborhood into account in a composite manner and capture the effect of various environmental characteristics on walkability (Agampatian, 2014). Different indices take different elements into account. For instance, Frank et al. (2009) based their index on net residential density, retail floor area, LUM, and intersection density. Later in 2010, he modified his index by changing the retail floor area to commercial density (Frank et al., 2010). To better understand different indices or neighborhoods in general, density, diversity, design, experience, proximity, connectivity, traffic safety, surveillance, parking, community, and green space neighborhood characteristics are explained subsequently.

Density

Density is the measured variable of interest per unit of an area. The variable of interest can be population, housing, employment, etc. (Ewing & Cervero, 2010). According to the variable of interest, density may represent the population (number of people per unit area), housing (number of households per unit area), employment (number of employments per unit area), retail (number of retail locations in a given area), establishment density (number of establishments per unit area), and retail floor ratio (ratio of retail floor area to land area square footage) (Agampatian, 2014). However, population or housing density often represents density (Yin, 2017). “Population density is one of the most commonly cited measures in the literature” (Agampatian, 2014: 9). The number of housing units per unit of an area measures residential or housing density. High residential density, without overcrowding, is related to walkability and is essential to reduce urban sprawl and limit growth into natural landscapes (Zuniga-Teran, 2015). Jacobs (1961) recommends high density for walkability since many people living and working in the same area increase eyes on the street and safety from crime. Even though the scientific literature has not agreed upon an optimal residential density, “Jacobs (1961) recommends a density of 100 dwelling units per acre in urban neighborhoods, 10-20 units per acre in semi-suburban neighborhoods, and six to ten dwelling units per acre in suburban neighborhoods” (Zuniga-Teran, 2015: 62). Similar to Jacob’s recommendation, the Leadership for Energy and Environmental Design for Neighborhood Development (LEED-ND) requires a minimum density of 90 intersections per square (Zuniga-Teran, 2015).

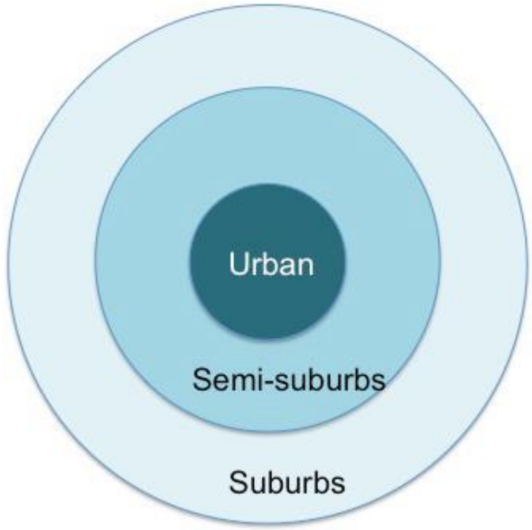

Figure 1: Different densities in neighborhoods. This figure shows the three types of neighborhoods with regard to the distance to the urban core, where darker colors represent higher densities following the approach proposed by Jacobs in 1961 (Zuniga-Teran, 2015: 63).

Diversity

Diversity is often used as 'land-use' in literature. It refers to the spatial arrangement of land use and to the measurement of the diversity of land uses (e.g., residential, commercial, office) in a given area or within walking distance from one's dwelling (Agampatian, 2014; Ewing & Cervero, 2010; Zuniga-Teran et al., 2017a). The optimum distance a person will walk is less than 800 m or a ten-minute walk (Zuniga-Teran, 2015). Diversity shows how varied the neighborhood is regarding its land-use distribution (Ribeiro & Hoffimann, 2018). There are seven basic types of land-uses: residential, commercial, service, institutional, industrial, recreational, and others (Dygryn, Mitas, & Stelzer, 2010). An even distribution of all types of land-uses supports and encourages walking by offering numerous services near an area and making walking more attractive (Agampatian, 2014; Frank, Schmid, Sallis, Chapman, & Saelens, 2005). The size of the service also influences walkability; small services (e.g., small shops, restaurants, coffee shops, banks) increase walkability, while large services (e.g., car dealers, hospitals, large parking lots) discourage walkability by acting as barriers (Zuniga-Teran, 2015). Moreover, by offering a multifunctional environment, a mixed land-use is expected to reduce travel times between one point and destination (Agampatian, 2014). Besides, the diversity of services that have different schedules and are accessible at various times of the day and night will make it safer from crime (Zuniga-Teran, 2015). Also, the high accessibility of diverse locations with various functions is associated with lower car ownership and use (Song & Rodríguez, 2005). Furthermore, it was found that high density combined with mixed land use would encourage people to walk more (Mouada, Zemmouri, & Meziani, 2019). Some measures of diversity are LUM, mean entropy index, dissimilarity index, entropy index, and percentage of non-residential buildings (number of residential buildings in a given area divided by the total number of buildings in the area) (Agampatian, 2014).

Design

The last of the 3Ds, design, is more ambiguous. It usually refers to the street network characteristics and has been measured mainly through street intersection density or block size (Ewing et al., 2016; Yin, 2017). “Measures include average block size, the proportion of four-way intersections, and the number of intersections per square mile" (Ewing & Cervero, 2010: 267). However, design should also take micro-features of the street environment that impact the pedestrian experience into account, not only the D variables (Yin, 2017). Some researchers, whilst researching neighborhood walkability, even though using density and diversity characteristics among the 3D variables, prefer using experience rather than design.

Experience

The experience of walking down a street may be affected more by the street's microenvironment than the gross qualities such as average block size (Ewing et al., 2016). These micro and street-level features focus on the environmental psychological aspect of the built environment (Yin, 2017) and include sensory attributes such as streetscape, aesthetics, thermal comfort, way-finding, slope, fumes/noise, and dogs (Zuniga-Teran, 2015). These street-level features "are referred to as perceptual qualities of the urban environment about how individuals perceive and interact with the elements of the street environment" (Yin, 2017: 289). The *streetscape* feature is measured by the building height-to-width street ratio (Zuniga-Teran, 2015). The *aesthetic* measure includes street amenities, cleanliness, maintenance, architecture design, and trees (Yin, 2017). "The presence of grassed open spaces with trees and flowers or public art and another attractive natural, architectural or historical features can also increase peoples' interest in walking through neighborhoods with these characteristics” (Agampatian, 2014: 17). Trees also provide multiple benefits associated with *thermal comfort* by providing shade and decreasing solar radiation on the streets. Thermal comfort influences the use of outdoor spaces, therefore walkability (Zuniga-Teran, 2015). Some measures of environmental friendliness and experience are: sidewalk length, sidewalk width, average or median census block area, percentage of street segments with visible litter, graffiti or dumpsters, number of traffic lanes, sidewalk to road ratios, median housing rage, traffic speed limits, bus stops, subway station density, the proportion of commercial parcel with paid parking, street parking, crime rates, and street greenery (Agampatian, 2014; Li, Santi, Courtney, Verma, & Patti, 2018)

Proximity

Proximity is a function of density and diversity (Agampatian, 2014). It refers to the proximity of land-uses in a given area (Zuniga-Teran, 2015). When proximity is higher and directness occurs to public transit (Dean et al., 2020), greenery (Gupta et al., 2012), recreational facilities (Sallis et al., 2015), and retail establishments, the use and need for cars reduce, thus driving is more likely substituted by walking (Agampatian, 2014). Some measures of proximity are distance between the point of origin & closest destination, total distance between point of origin and all destinations, average distance between the point of origin and number of destinations, proportion of residents within walking distance of defined diverse uses, hectares of parks and playgrounds per/capita, proximity to schools, density of food outlets in a given area, proximity to food outlets, food stores per 10,000 people, number of supermarkets within 1000 meters, distance to the nearest transit stop, number of transit stops, retail points, service points, schools and jobs within walking distance to transit stops, and distance to closest recreational facility (Agampatian, 2014).

Connectivity

Connectivity measures the directness of the roads, sideways, pedestrian walkways, and trails between households, shops, and places of employment (Agampatian, 2014; Leslie et al., 2007). Enhancing street connectivity can positively impact the feasibility and attractiveness of walking by reducing physical and psychological barriers (Handy et al., 2002). The lack of obstacles enables direct travel, and where there are several options for travel routes (e.g., interconnecting streets laid out in a regular pattern), walking for transport is facilitated (Leslie et al., 2007). Different neighborhood layouts have different connectivity levels. The grid network provides higher connectivity by allowing more intersections, whilst fenced/gated communities and cul-de-sacs provide lower connectivity (Figure 2).

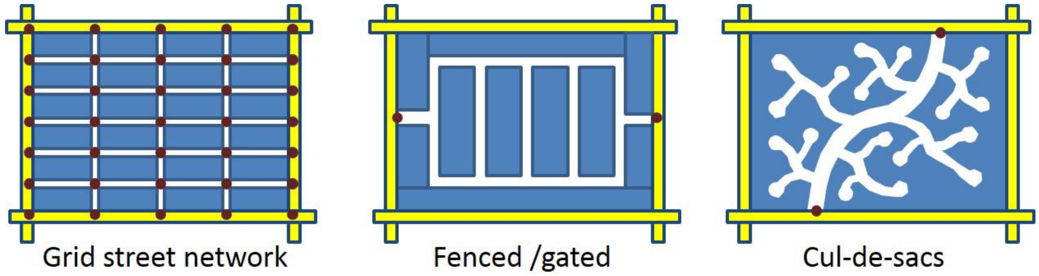

Figure 2: Different neighborhood layouts. Intersections are shown as red dots. (Zuniga-Teran, 2015: 51).

Many measures of connectivity and walking are positively associated. Some of these are types of streets (categorization of streets by type in a given area), intersection count or density, four-way intersections per unit land area, connectivity index (total number of street segments divided by the total number of street nodes), and gamma index (ratio of the number of links in the network to the maximum possible number of links between nodes) (Agampatian, 2014; Frank et al., 2005). Most of these factors are measured within a neighborhood, but when designing connected neighborhoods, rest of the city must be considered as well. Connectivity with the adjacent neighborhoods must be ensured for neighborhoods to function as interconnected parts of the urban continuum (Zuniga-Teran, 2015).

These were some of the most measured qualities of a neighborhood in the literature. Zuniga-Teran (2015) organized relevant walkability research findings from multiple disciplines and made the Walkability Framework with additional factors for assessing design elements in the neighborhood-built environment. It contains previously mentioned qualities such as density, diversity (land-use), and experience. Additionally, there are traffic safety, community, parking, surveillance, and greenspace (Figure 3) (Zuniga-Teran, 2015).

Figure 3: The Walkability Framework shows the neighborhood design elements related to walking (Zuniga-Teran et al., 2017a: 64).

Traffic safety highlights the infrastructure needed to facilitate pedestrian safety in the presence of traffic (Zuniga-Teran et al., 2017a). *Surveillance* refers to how well those traveling on the street can be seen from the surrounding homes and businesses (Jacobs, 1961). Building designs that allow people inside the buildings to observe the street and the presence of first-floor windows visible from the street encourage people to walk by improving their sense of safety (Alfonzo, 2005; Zuniga-Teran et al., 2017a). *Parking* refers to the measure of parking availability; built environments with less parking availability are considered more walkable. There are two significant reasons for this: first, walking through a parking lot is undesirable; if there is a need for parking spaces in the built environment, placing them behind the buildings or away from the streets will enhance the street's aesthetic and walkability, second when there are no parking options available, people will be encouraged to prefer passive modes of transportation such as walking as an alternative to cars (Agampatian, 2014; Zuniga-Teran et al., 2017a). *Community* refers to the measurement of the presence of spaces that facilitate social interaction and encourage participation in community affairs (e.g., community centers, plazas) (Zuniga-Teran et al., 2017a). Finally, *greenspace* refers to the measurement of the availability of spaces dominated by vegetation; the size, proximity, and ease of access to the green spaces are all considered in this category (Zuniga-Teran et al., 2017a). Availability and accessibility of green spaces are associated with increased walking behavior (Bozovic, Hinckson, & Smith, 2020; Dean et al., 2020), better physical and mental health (He et al., 2020), and increased walking durations (Ferreira, Johansson, Sternudd, & Fornara, 2016).

There is another indicator of walkability other than the objective features of a neighborhood: subjective perceptions of a neighborhood's physical environment. Objective measures may not capture individual interpretations and perceptions of a neighborhood environment and walkability (Edirisinghe & Hewawasam, 2020; Lee & Dean, 2018; Yin, 2017). Predominantly, objective measures have been used to measure walkability; now, increasing research considers subjective or both (Lee & Dean, 2018). Research shows that perceived walkability is positively associated with walking time, being physically active, and walking behavior (Bartshe, Coughenour, & Pharr, 2018; Nagata et al., 2020; Yu et al., 2017). Perceived neighborhood walkability indicators include LUM, land-use access, street connectivity, infrastructure and safety for walking, aesthetics, traffic safety, and safety from crime (Yu et al., 2017). When studying walking, both objective and subjective measures of neighborhood walkability should be included (Yin, 2017).

2.1.2. Neighborhood Greenspaces, Street Greenery, and Walkability

Green spaces comprise green streets, parks, open green fields, or urban public areas with a considerable number of green elements (Lu, Sarkar, & Xiao, 2018). Several pieces of research support the health benefits of urban green spaces since they promote walking and physical activity (He, Lin, Yang, & Lu, 2020; Zang et al., 2020) and have impacts on human mental well-being (Qin, Zhu, Wang, & Peng, 2021). Likewise, recent studies have demonstrated that residents of neighborhoods with a higher number of urban green spaces tend to have better physical and mental health outcomes (He et al., 2020). Benefits of exposure to green spaces vary, such as decreased negative emotions, reduced long-term stress, a lower risk of chronic disease, and a speeding-up of the recovery from stress and attention fatigue (He et al., 2020; Qin et al., 2021).

Furthermore, green spaces in neighborhoods contribute to increased walking behavior (Dean et al., 2020; He et al., 2020). Especially walking for recreation purposes strongly correlates to the availability of green spaces, among other design elements of neighborhoods (Zuniga-Teran et al., 2017a). Additionally, physical activity that takes place in a natural environment such as green streets or parks has physiological and psychological health benefits above the benefits of physical activity in synthetic environments such as indoor or outdoor built environments (Lu, 2019; Sabbion, 2018). There is also increasing evidence that urban green spaces have potential emotional well-being benefits on adults (Mavoa et al., 2019; Qin et al., 2021). Most studies that examine the impact of green space on walking have focused on parks and open green spaces, even though streets are the most popular settings for walking (Lu et al., 2018).

Streetscapes influence social interactions, physical activities, and social well-being (Li et al., 2018). The streetscape is defined by the street elements such as roads, surrounding buildings, micro-environmental features, greenery, etc. (Edirisinghe & Hewawasam, 2020). Street greenery, by providing a welcoming environment (Li et al., 2015) affects walking behavior at least as strongly as parks (Zang et al., 2020). Moreover, street greenery is a potentially superior predictor of walkability than parks (Lu et al., 2018); and is more relevant to people's daily activities than other types of accessed greenery (Zang et al., 2020). Street greenery can come in different shapes, sizes, and forms; it includes various vegetation, such as street trees, shrubs, lawns, green walls, or front gardens next to streets (Lu et al., 2018). The opportunity of daily walking along green streets increases life expectancy (Sabbion, 2018), and walking through a street with greenery is associated with a higher sense of security, increased social interactions with neighbors, and better social health (Zuniga-Teran et al., 2017b). Therefore, it is crucial to understand how the streetscape environment can influence physical activities (Li et al., 2018). However, there is a gap in the literature since almost all empirical research has focused on parks and open green spaces, with very few studies on street-level greenery and even fewer studies on street greenery-walking (Zang et al., 2020). This is primarily due to methodological limitations. There are different methods for measuring street greenery: questionnaires, field audits, Geographic Information System (GIS) (Lu et al., 2018), and Normalized Difference Vegetation Index (NDVI) (Lu, 2019). Despite measuring the perceived greenery of the pedestrians, questionnaires are not entirely objective. Even though being objective and time-efficient, the NDVI and GIS measures street greenery from an overhead view (Lu et al., 2018; Lu, 2019). The overhead-view street greenery differs from the proportion of green vegetation in a pedestrian's field of view (Dong, Zhang, and Zhao, 2018; Lu et al., 2018). Even after the importance of eye-level street greenery is pointed out, it is not considered in urban studies since measuring street greenery taken at eye-level is time-consuming and challenging to achieve (Ye et al., 2019).

Viewing street greenery contributes to the attractiveness and walkability of residential streets (Li et al., 2015). Visible street greenery encourages people to spend more time outdoors, consecutively decreasing personal stress levels and improving the quality of people's experiences in urban areas (Ye et al., 2019). It is also significantly related to self-reported physical and psychological well-being (Lu, 2019). There is a need for a more detailed understanding of how urban environments influence well-being (Lauwers et al., 2021).

2.2. What is Well-Being?

Definition of human health, according to WHO, is "a state of physical, mental and social well-being and not merely the absence of disease or infirmity" (Zuniga-Teran et al., 2017b). With the increase in mental illness worldwide (Lauwers et al., 2021), multiple disciplines such as politics, policy-making, economics, psychology, sociology, and geography turned their focus toward well-being (De Vos et al., 2013; Schwanen and Wang, 2014). Well-being has a long history in philosophy (De Vos et al., 2013), and it is a broad concept that is difficult to define (Gatrell, 2013; Lucchesi et al., 2021). It refers to people's capacity to live comfortable, healthy, and fulfilling lives (Lucchesi et al., 2021). Its measures include self-reported health, physical health, mental health, mortality, and subjective well-being (Mouratidis, 2020). Factors of a good life are somewhat similar for everyone (Singleton, 2019a). Some factors that impact personal well-being are personality traits, working status, age, household composition, social interactions, health, marital status, neighborhood, and city (Ettema & Schekkerman, 2016; Singleton, 2019a).

There are two primary domains of well-being; objective and subjective well-being (Lucchesi et al., 2021). The objective perspective evaluates objective circumstances of people's lives, whereas the subjective perspective evaluates an individual's perceptions and experiences (Nordbakke & Schwanen, 2014), but at the end of the day, subjective experiences are objective realities (Layard, 2010). Subjective well-being is usually categorized into hedonic and eudaimonic perspectives (Singleton, 2019a). The hedonic view defines well-being in terms of focusing on happiness, whereas the eudaimonic view defines well-being in terms of having a purposeful life (Deci & Ryan, 2008; Gatrell, 2013).

Hedonic well-being is linked with the satisfaction of one's mood, feelings, happiness, and pleasures and preferences of both mind and body (Nordbakke & Schwanen, 2014; Zumelzu & Herrmann-Lunecke, 2021). Diener (2009) defines the hedonic view of well-being as "a person feeling and thinking his or her life is desirable regardless of how others see it" (Das et al., 2020: 2). Feeling refers to the emotional/affective dimension (EMO), where there is higher positive affect (pleasure experienced), and lower negative affect (displeasure avoided) (Das et al., 2020; Ryan & Deci, 2001; Schwanen & Wang, 2014). Thinking refers to the evaluative/cognitive dimension (EVA), where individuals evaluate their lives greater in terms of life satisfaction (Das et al., 2020; Ryan & Deci, 2001). Positive and negative moods affect a person in the present moment at a particular point in time, whereas life satisfaction affects a person in life in general or in a domain (Nordbakke & Schwanen, 2014; Zumelzu & Herrmann-Lunecke, 2021). To evaluate hedonic well-being more accurately, both EVA and EMO should be incorporated (Das et al., 2020). There are different measures of both EVA and EMO. The most commonly used measures are the Satisfaction with Life Scale for EVA, and the Positive and Negative Affect Schedule for EMO (Das et al., 2020).

Eudaimonic well-being is a more complex and higher-level notion with implicit and less easily reportable components than hedonic well-being (Singleton & Clifton, 2021). For eudaimonic thinkers, well-being is more than experienced pleasure or simple preference satisfaction (De Vos et al., 2013; Nordbakke & Schwanen, 2014). Contemporary eudaimonic understanding of well-being is based on the philosophy of Aristotle (Nordbakke & Schwanen, 2014). He emphasized purpose in and meaning of life, goal-directed activities, personal growth, and realization of one's true potential as the route towards well-being (De Vos et al., 2013; Gatrell, 2013), and that there needs to be an individual action for reaching these goals and thus well-being (Nordbakke & Schwanen, 2014). Carol Ryff (1989) formed a theoretical model of eudaimonic well-being with six dimensions: personal growth (self-realization), autonomy (self-determination, independence, regulation of behavior within), self-acceptance (acceptance of personal qualities), purpose in life (creating meaning and direction in life), environmental mastery (creating a surrounding according to one's needs and capacities), and positive relationship with others (Nordbakke & Schwanen, 2014). Not every study agrees with Ryff's theoretical model. Ingersoll-Dayton, Saengtienchai, Kespichayawattana, and Aungsuroch (2004) formed a list that combines interpersonal and intrapersonal components (harmony, interdependence, respect, acceptance, and enjoyment) and is thus less individualistic (De Vos et al., 2013).

Hedonic well-being is mainly associated with greater immediate well-being. On the contrary, eudaimonic well-being is associated with greater long-term well-being (Huta, 2017). Still, there is evidence that, in relation to the built environment, eudaimonia also derives from the interaction between the individual and the environment, and it is both time and place-specific (De Vos et al., 2013; Zumelzu & Herrmann-Lunecke, 2021). Many researchers indicated that to understand well-being better, both hedonic and eudaimonic well-being should be considered (De Vos et al., 2013; Ryan & Deci, 2001).

2.2.1. Well-being in Built Environments and Neighborhoods

The built environment influences human health and well-being (Lauwers et al., 2021; Zuniga-Teran, 2017b). The components of the built environment involve urban design, land-use, and transportation routes (Handy et al., 2002). The main focus of user comfort research has been on indoor environments. With increasing migration toward urban areas, and the growth of cities, assessing outdoor environments has emerged as a challenging field (Antonini et al., 2020). While studying the link between the built environment and human behavior, most research focused on the physical health of the community instead of the personal health of its residents (Handy et al., 2002). Recently, urban studies and planning professions focused on planning for health (Qin et al., 2021). Built environments can incite positive well-being with high aesthetic values, trees, and public spaces. On the other hand, they can cause negative well-being when unsafe, isolated, and extremely noisy (Zumelzu & Herrmann-Lunecke, 2021). Built environments have been studied on different scales: the international level, the suburban and urban level, and the neighborhood scale (Schwanen & Wang, 2014).

Where they live affects people's lives in terms of social relations and physical activity; thus, a neighborhood is a determinant factor of human health and well-being (Gu, 2020). Previous studies regarding neighborhood effects have focused on mental illness rather than mental well-being (Lauwers et al., 2021). Detailed studies on well-being are relatively few in number and unanimous in their conclusions (Ala-Mantila, Heinonen, Junnila, & Saarsalmi, 2018). One's satisfaction with the economic, physical, and social features of a neighborhood impacts neighborhood satisfaction, thus, life satisfaction and well-being indirectly (Sirgy & Cornwell, 2002). Nevertheless, there are also studies suggesting that neighborhood environment and characteristics directly impact life satisfaction and well-being (Ettema & Schekkerman, 2016). In addition, neighborhood characteristics may hold different meanings and values for other individuals, or people who are happier, in general, may feel more positive about different neighborhood characteristics, and these will impact their well-being (Ettema & Schekkerman, 2016; Mouratidis, 2020). Objective and perceived neighborhood characteristics linked to well-being include local amenities, transport accessibility, density, walkability, noise, spatial design, social interaction, and green spaces (Mouratidis, 2020; Zumelzu & Herrmann-Lunecke, 2021).

2.2.2. Well-Being in Nature

Human evolution took place in natural environments, and they still have a positive connection with it and within it (Nisbet & Zelenski, 2011). Exposure to nature leads to many desirable outcomes (Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009) and positively correlates with mental health and well-being (Wang, He, Webster, & Zhang, 2019). Research has shown that green space's direct health benefits include recovery from stress and attention fatigue, encouragement to exercise, facilitating social contact, encouraging optimal development in children, and providing opportunities for personal growth and a sense of purpose, even a possibility of reducing mortality risks (Mayer et al., 2009; Nisbet & Zelenski, 2011). Aside from its direct health benefits, greenspaces provide settings for physical activity, foster social contact and a sense of community, provide air quality, and indirectly promote health (Lu et al., 2018). Mayer et al. (2009) suggest that since exposure to nature influences hedonic well-being through mood and cognitive processing in positive ways, it also may influence eudaimonic well-being dimensions, such as self-realization through reflecting on a life problem.

Residential greenery in the vicinity of people's homes and access to natural environments increase well-being by providing a resource for stress reduction and psychological restoration (Huang et al., 2021; Lauwers et al., 2021; Wang et al., 2019). Residential greenery can be in the form of landscaped streets, parks, open green fields, or any urban public areas with substantial green elements (Lu et al., 2018). Long-term exposure to greenery is conducive to residents' better self-perceived health, lower stress and depression, reduced probability of being overweight/obese, decreased risk of cardiovascular morbidity and mortality, and improved physical function (Huang et al., 2021). It should be noted that greenery and a built environment matter to both overall well-being and momentary well-being (Schwanen & Wang, 2014). As mentioned before, short-term exposure to nature in a green street or park during walking influenced better self-reported states of mind than a walk performed in indoor or outdoor built spaces (Sabbion, 2018).

2.3. Well-Being and Walking

Walking improves physical and mental health (Gatrell, 2013) and has social benefits (Sulaiman, 2020). As a physical activity, walking has an immediate impact on the body. It changes blood pressure and oxygen intake; this consecutively enhances cognition and neurotransmitter activity and decreases stress hormones in the brain (Ferdman, 2019). Moreover, walking permits an engagement with environments and allows one to read urban spaces uniquely (Bairner, 2012; Gatrell, 2013). While walking, one develops certain feelings and thoughts about their environment (Sulaiman, 2020). In addition to this, walking creates a time for exercising and developing human capacities, in which new ideas and thoughts can grow and develop (Ferdman, 2019). Recent research shows walking enhances cognition, ideation, creativity, physical and mental health, confidence, and well-being (Ferdman, 2019; Singleton, 2019a).

Walking outdoors, specifically in natural environments, produces better moods than walking indoors (Nisbet & Zelenski, 2011). Studies suggest that people who are living in places with high walkability, experience greater personal well-being since it encourages walking trips (Lucchesi et al., 2021). Even though research shows the importance of neighborhood walkability for well-being, the link between them is somewhat unclear (Yu et al., 2017). While analyzing well-being in the context of one's neighborhood, long-term impacts are considered most of the time, and the impact of momentary context-specific factors is overlooked and needs an expansion in literature (Schwanen & Wang, 2014). Recently studies have been oriented toward evaluating the effects of built environments on physical activity in the context of short-term well-being (Zumelzu & Herrmann-Lunecke, 2021) while considering both eudaimonic and hedonic well-being (Singleton, 2019a).

Well-being has begun to be analyzed more in transportation and mobility studies (Singleton, 2019a). Nordbakke & Schwanen (2014) categorized stages of well-being in terms of mobility into three phases: potential movement, actual movement, and accessing destinations. In terms of hedonic well-being, potential movement enhances one's ability and opportunities to be happy or happier; accessing destinations provides access to activities that can influence happiness; and actual movement and experiences during movement can affect happiness, feelings, and satisfaction (Nordbakke & Schwanen, 2014; Zumelzu & Herrmann-Lunecke, 2021). As mentioned before, hedonic well-being has two dimensions: EMO and EVA (Das et al., 2020). While measuring hedonic well-being in mobility studies, EMO is evaluated according to how one feels in terms of distress, fear, attentiveness, and enjoyment; and EVA is assessed according to how satisfied one is during travel (Singleton, 2019a). However, most studies focused on hedonic well-being and paid little attention to eudaimonic well-being (De Vos et al., 2013; Singleton, 2019a). Since eudaimonic well-being items concentrate on life in general, it is hard to translate them to momentary context-specific measurement scales (Singleton, 2019a). In terms of eudaimonic well-being, potential movement enhances one's ability and self-realization; accessing destinations provides access to activities that can influence one's dimensions of self-realization; and lastly, actual movement and experiences during movement can impact one's autonomy, confidence, security, and health dimensions of eudaimonic well-being (Nordbakke & Schwanen, 2014; Singleton, 2019a). It is important to consider both eudaimonic and hedonic well-being in future research to understand better overall well-being (De Vos et al., 2013).

To sum up, most momentary hedonic and eudaimonic well-being and walking studies, examined walking in the context of walking for transportation purposes and compared it to other types of transportation models (De Vos et al., 2013; Martin, Goryakin, & Suhrcke, 2014) but did not consider walking for leisure (Singleton; 2019a), or context-specific measures of the walked area, and its impact on well-being. Although studies have analyzed the influence of the built environment on well-being and walkability (Lucchesi et al., 2021), more subjective and objective measures of walkability could be involved and studied (Bartshe et al., 2018). Understanding the impact of subjective and objective walkability measures on the momentary hedonic and eudaimonic well-being of people may help in planning cities and neighborhoods that responds to all peoples' emotional needs, feelings, and behaviors.

CHAPTER 3

METHODOLOGY

3.1. Research Questions and Hypotheses

In this thesis, there are three main and four sub research questions:

RQ1: What is the relationship between objective walkability and perceived walkability?

RQ2: Does objective walkability influence well-being while walking?

sub-RQ2a: Does objective walkability influence momentary perceived hedonic well-being while walking?

sub-RQ2b: Does objective walkability influence momentary perceived eudaimonic well-being while walking?

RQ3: Does perceived walkability influence well-being while walking?

sub-RQ3a: Does perceived walkability influence momentary perceived hedonic well-being while walking?

sub-RQ3b-: Does perceived walkability influence momentary perceived eudaimonic well-being while walking?

To achieve the objectives of the thesis, the following hypotheses are tested:

H1: Residents of neighborhoods with higher objective walkability have a higher overall mean of perceived walkability.

H2: Residents of neighborhoods with higher objective walkability have a higher overall mean of momentary perceived hedonic well-being while walking.

H3: Residents of neighborhoods with higher objective walkability have a higher overall mean of momentary perceived eudaimonic well-being while walking.

H4: There is a statistically significant correlation between overall perceived walkability and overall momentary perceived hedonic well-being while walking.

H5: There is a statistically significant correlation between overall perceived walkability and overall momentary perceived eudaimonic well-being while walking.

H6: There is a statistically significant correlation between overall momentary perceived hedonic well-being and overall momentary perceived eudaimonic well-being while walking.

3.2. Setting

To understand the impact of walkability on well-being during walking, the data was collected from residents of the two different residential areas in Ankara, Turkey, between March 1st and April 1st, 2022. Ankara was chosen as the city setting since it is the capital of Turkey. Ankara is in the Central Anatolia region of Turkey. According to the archeological data, settlements in this region date back to 4000 B.C. (Sarı & Bozo Özen, 2020). Ankara has been inhabited by Hittites, Phrygians, Galatians, Romans, Byzantines, and Ottoman Empire (Günay, 2012). The city gained its current character during the Republic period of Turkey (Sarı & Bozo Özen, 2020), since it was mainly planned and built as the capital of modern Turkey in this period (UN-Habitat, 2018a). Before the declaration of Ankara as the capital in 1923 (Sarı & Bozo Özen, 2020), its population was only 25.000 (Öncü Yıldız, 2017). Following its declaration, the city population consistently rose with incoming migrants (Batuman, 2013). Before the declaration of the Republic, Ankara was one of the cities with the most planning activities in Turkey. However, since resources were limited at the time, urban planning and infrastructure did not gain enough attention and resource. So, currently, Ankara has planning and growth problems due to a lack of holistic planning and planning in general (Barış, Erdoğan, Dilaver, & Arslan, 2010). First examples of planned urbanization in Ankara are Lörcher's (1924) and Jansen's (1932) Plans (Öncü Yıldız, 2017).

Today the city serves about six million inhabitants (Sarı & Bozo Özen 2020). “70.8% of the Ankara population is between the ages of 15 and 64, and 20.3% of the population has at least a college degree” (Sarı & Bozo Özen, 2020: 3). Central zone of Ankara is formed by Altındağ, Çankaya, Etimesgut, Gölbaşı, Keçiören, Mamak, Pursaklar, Sincan and Yenimahalle, and hosts around 89% of the Ankara population (UN-Habitat, 2018b). It is a large city where most of the inner-city journeys are made by motor vehicles (Öncü Yıldız, 2017). The main types of public transport in Ankara are private and public urban buses (with an extensive and dense network as the most used public transport), privately-operated minibusses known as Dolmuş (as the second most widespread and used public transport), the Metro, and light rail system (Ankaray) and the suburban rail (Ankara Banliyö Treni) (UN-Habitat, 2018a). Even though Ankara has a well-developed network of highways and public transportation, the city's urban expansion, fueled by fast growth in recent decades, has made traffic congestion one of the city's primary concerns (UN-Habitat, 2018a).

Inside Ankara, the Çankaya district was chosen to select residential neighborhoods, since Çankaya district has the most significant proportion of Ankara, with 919,119 inhabitants (UN-Habitat, 2018b). Moreover, Çankaya has the highest level of education among all Ankara districts (Şahin, 2014). Within Çankaya, 52% of the population is women, 48% is men, and 55% are below the age of 39, making the population dynamic and young (UN-Habitat, 2018b). “One major issue in Çankaya (Ankara and Turkey in general) are highly neglected pedestrian zones” (UN-Habitat,2018b: 6).

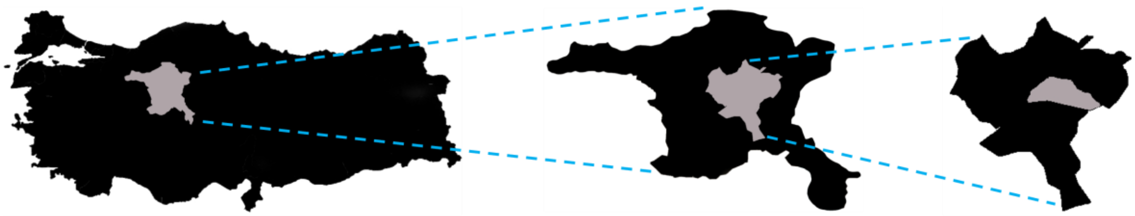

Figure 4: (a) Map of Turkey. Ankara is shown in grey. (b) Map of Ankara. The central zone of Ankara is shown in grey. (c) The central zone of Ankara. Çankaya district is shown in grey (Drawn by the author, 2022).

In the Çankaya district, there are 123 neighborhoods (Çankaya Belediyesi, n.d.). To choose two residential neighborhood areas, a city planner expert from the Çankaya Municipality was consulted. During the consultation, it was stated that two urban residential neighborhoods with similar demographics and similar greenery levels were needed for the thesis. So, first, suburban and rural neighborhoods of the Çankaya district were eliminated. Secondly, more commercial and industrial heavy neighborhoods were eliminated. The remaining neighborhoods that did not have the necessary data for street greenery assessment were eliminated. After the consultation and a brainstorming session, two residential areas were selected: the first area comprised Bahçelievler, Yukarı Bahçelievler, and Emek neighborhoods (Figure 5), and the second area comprised Sancak, Yıldızevler, and Hilal neighborhoods (Figure 6). Bahçelievler has a population of 10470, Yukarı Bahçelievler has 15359, Emek has 47931, Sancak has 11263, Yıldızevler has 12687, and Hilal has 30599 (Tüik, 2021). After deciding the areas, 800 m radius buffers were created within the areas for walkability and street greenery assessments since a participant's neighborhood was defined as a "circular buffer zone within 800 m or 10-minute walking distance from the centroid of a participant's housing estate" (He et al., 2020: 3). Figure 7 shows the Neighborhood Zone 1 (NZ1) within the Bahçelievler, Yukarı Bahçelievler, and Emek neighborhoods and the Neighborhood Zone 2 (NZ2) within the Sancak, Yıldızevler, and Hilal neighborhoods.

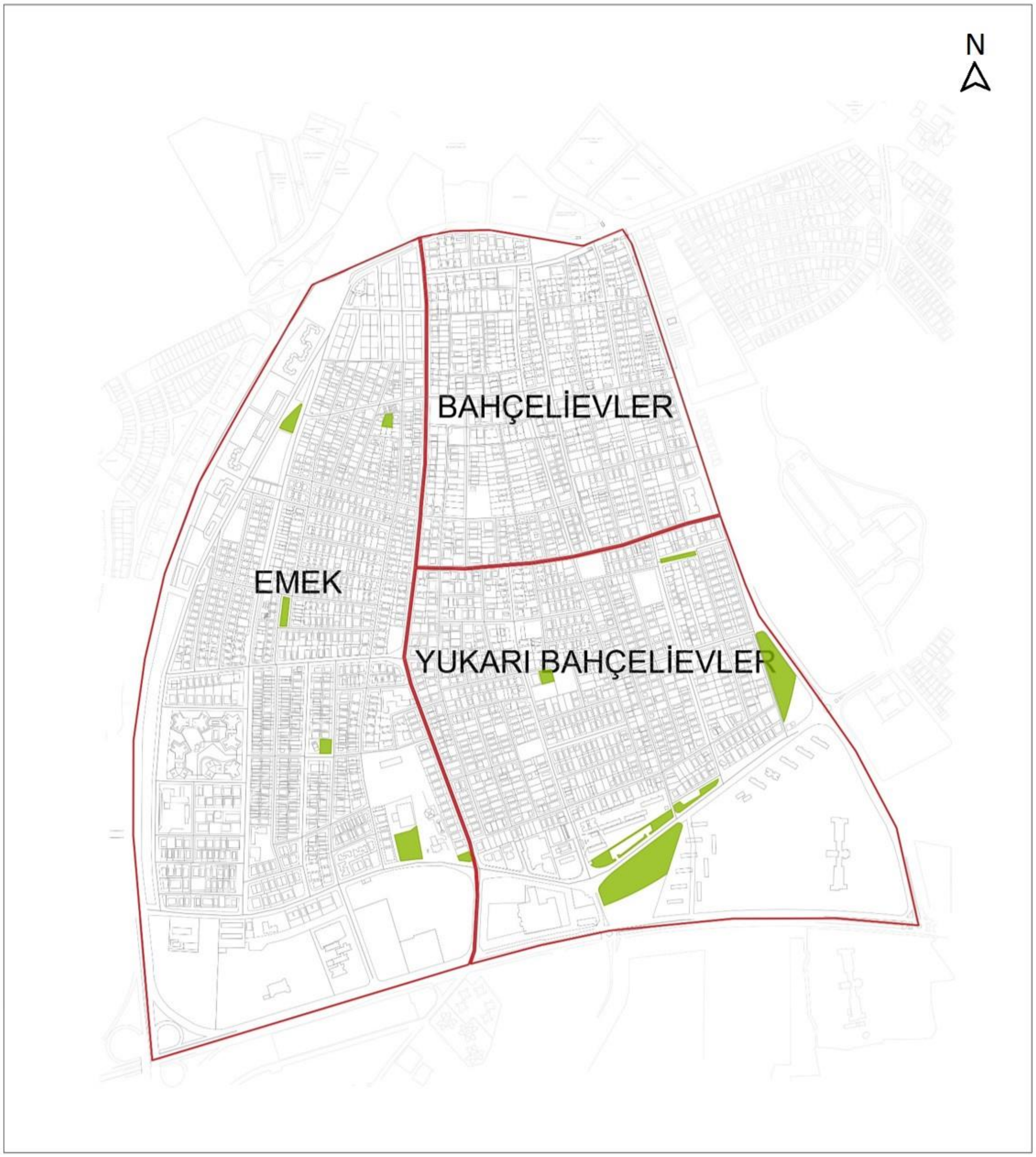

Figure 5: Emek, Bahçelievler and Yukarı Bahçelievler neighborhoods (Drawn by the author, 2022).

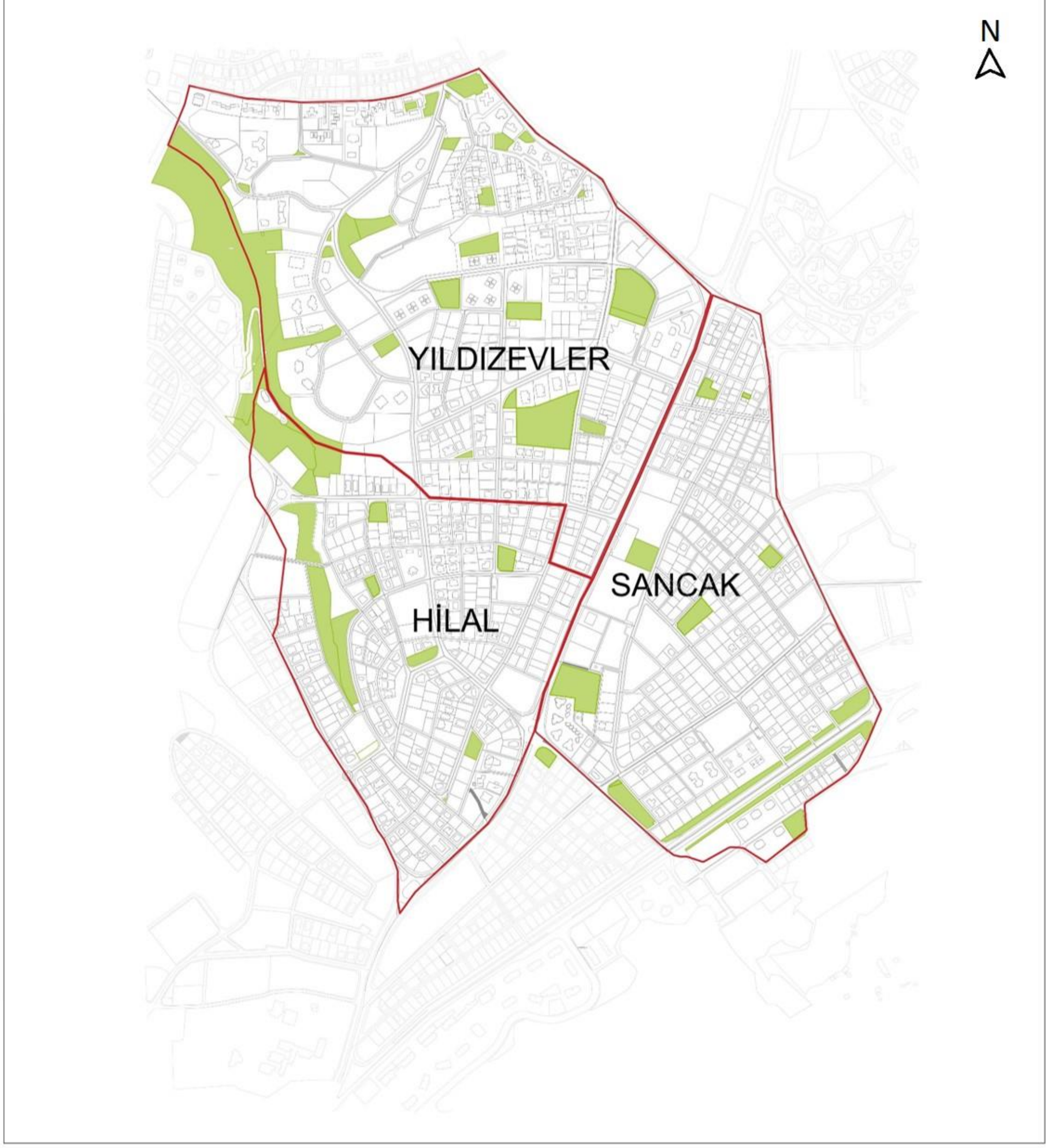

Figure 6: Sancak, Yıldızevler, Hilal neighborhoods (Drawn by the author, 2022).

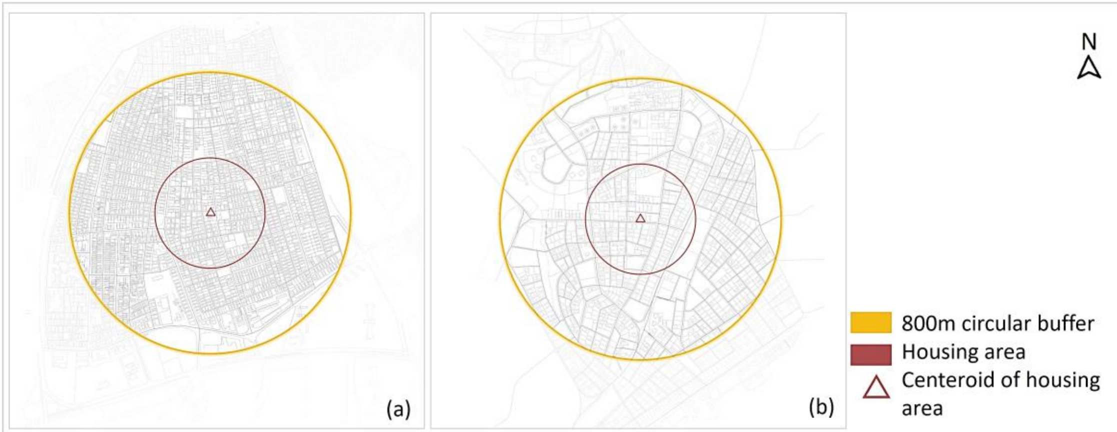

Figure 7: (a) Map of NZ1 within the Bahçelievler, Yukarı Bahçelievler, and Emek neighborhoods, (b) map of NZ2 within the Sancak, Yıldızevler, and Hilal neighborhoods (Drawn by the author, 2022).

3.3. Participants

Before starting the experiment, the approval of the ethics committee at Bilkent University was sought to work with the residents of NZ1 (Bahçelievler, Yukarı Bahçelievler, Emek) and NZ2 (Sancak, Yıldızevler, and Hilal) residents (see Appendix A). A document covering the thesis aims and methodology, including participants, procedure, instruments, and resident consent form, were submitted to the committee. The consent form includes information about the purpose, procedure, benefits, and confidentiality issues associated with the thesis. G*Power analyses were made to determine the minimum needed participant number. It was found that minimum participant number is 105 in both neighborhood groups, making a total of 208 participants. The survey study enrolled a total of 126 participants from Bahçelievler, Yukarı Bahçelievler, Emek neighborhood residents, and 133 participants from Sancak, Yıldızevler, and Hilal neighborhood residents. Random sampling and snowball sampling methods were used for choosing the respondents.

Two hundred and fifty-nine (259) people participated in the survey voluntarily (122 participants in NZ1 and 137 participants in NZ2). Among these participants, seventeen (17) people were eliminated due to their period of residence being less than 1 year (Lucchesi et al., 2021). Participants enrolled in the survey via an online survey system (Google Forums). The same questions were asked for both of the neighborhood zone residents. The participation selection is operationalized with the help of neighborhood mukhtars (The head of local government of a neighborhood or a village in Turkey), the Provost Office of Bilkent University, and online social media channels of non-governmental organizations (NGOs) (e.g., Ankara Apartmanları, Eski Ankara Fotoğrafları, 365 Gün Ankara, Antoloji Ankara, Ankara'da Ne Yapsak, etc.). The participants enrolled in the survey after they saw the informed consent form.

3.4. Procedure

The thesis was composed of two sessions: Session I (neighborhood assessment) and Session II (survey process). Each session is comprised of several stages within itself. Session I is the pre-study of the two neighborhood zones. It is composed of seven stages. The first stage is the literature review on neighborhood walkability and street greenery. In the second stage, a detailed analysis was done to develop suitable instruments and assessment scales for street greenery and neighborhood walkability measures. The third stage was the consultation with a city planner expert working in Çankaya Municipality to select neighborhoods in Ankara. Having the aim of the thesis explained in a detailed manner, the city planner expert proposed several neighborhood options. The fourth stage was studying the possibilities in Google Street View (GSV) software. The options that did not have GSV images were eliminated. The fifth stage was the decision of the neighborhoods Bahçelievler, Yukarı Bahçelievler, and Emek as the first zone, and Sancak, Yıldızevler, and Hilal neighborhoods as the second zone upon street greenery assessment. The sixth stage is the calculation of the street greenery of the zones. In this stage, all streets in the created 800 m circular buffers of two neighborhood zones were sampled to measure the street greenery of one's neighborhood. The street view images (SVIs) were taken from GSV from sampling points at uniform distances of 200 m. Four SVIs were taken at every sampling point: north, east, south, and west. Greenery within the images was extracted and calculated with photoshop (Zang et al., 2020). The level of urban street greenery was measured with the Green View Index (GVI) (the ratio of green pixels in the four images) in both neighborhood zones. The seventh stage was the calculation of walkability levels of the neighborhood zones by calculating LUM, intersection, and population density.

Session II is the survey process. It is composed of five stages. The first stage is the literature review on hedonic and eudaimonic well-being, and walking well-being. In the second stage, a detailed analysis was done to develop suitable instruments and assessment scales for well-being. In the third stage, the questionnaire was developed. The fourth stage is the collection of data through the survey process (see Appendix B). Participants filled out the online survey via e-mail, neighboring municipalities, and snowball sampling. After this, as the fifth stage, gathered data were analyzed and evaluated. This procedure is shown in the flow chart in Figure 8.

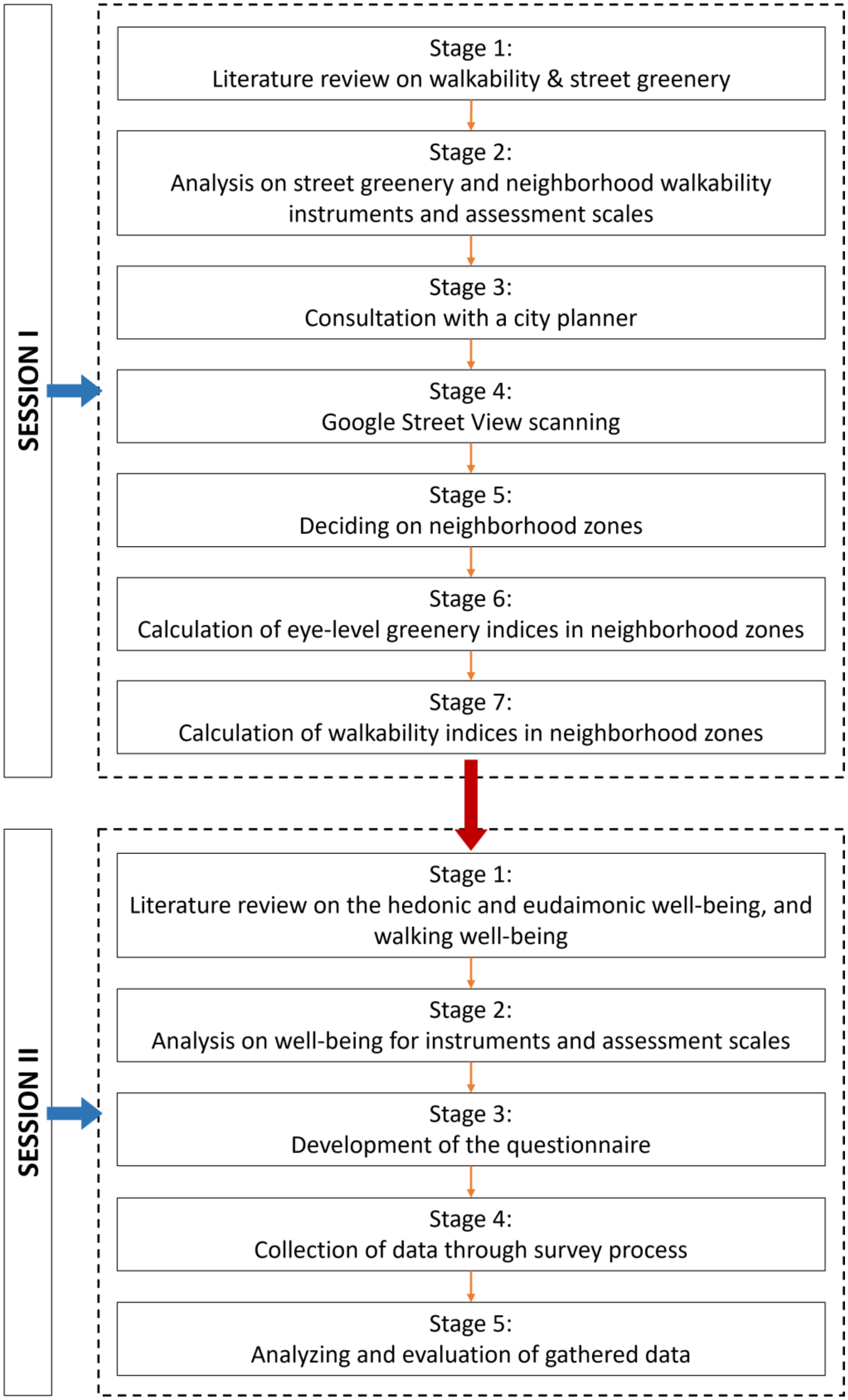

Figure 8: Process chart (Drawn by the author, 2022).

3.5. Instruments and Data Collection

3.5.1. Neighborhood Zone Assessment

3.5.1.1. Neighborhood Characteristics and Walkability Assessment

For walkability assessment the neighborhood zones' density, diversity, and connectivity were calculated in this analysis stage. The required data, their sources, and collection methods for each neighborhood variable are shown in Table 1. Neighborhood characteristics that were not measured/analyzed were design, experience, proximity, traffic safety, surveillance, parking, community, and green space. These characteristics were excluded since for the calculation of walkability, Frank et al.'s (2005) methodology was used. Moreover, measuring all neighborhood dimensions is time-consuming and requires comprehensive analyzes, and the acquirement of several measurement instruments.

Table 1: Neighborhood variables, data types, and data sources.

Neighborhood Variables	**Metric**	**Data**	**Data Source**
Density	Population Density	2D drawings of neighborhoods	Çankaya Municipality
		Neighborhood population	Web
Diversity	Entropy Index	Land-use areas	Çankaya Municipality
Connectivity	Intersection Density	2D drawings of neighborhoods	Çankaya Municipality

Density was assessed with population density, defined as the residential population per land area (Lu et al., 2018). Diversity or LUM was calculated by measuring the number and areas of different land-use types (Tucker et al., 2009). Connectivity was calculated with street intersection density by calculating the number of intersections, defined as the number of intersections with more than three legs per unit of land area (Frank, Andresen, & Schmid, 2004; Lu et al., 2018). The metrics and the equations that were used to calculate the variables are shown in Table 2**.**

Table 2: Equations for the neighborhood variable analysis.

Neighborhood Variables	**Metric**	**Equation**
Density	Population Density	Person/km^2
Diversity	Entropy Index	$$LUM = -\frac{\sum_U (p_i \ln p_{u)}}{\ln n}$$ u= land-use classification p= the proportion of land area dedicated to a particular land-use n= total number of land-use classifications* (Tucker et al., 2009)
Connectivity	Intersection Density	Number of intersections/ km^2

***LUM scores range from 0 to 1; 0 represents a single land-use (e.g., all residential), while a score of 1 represents an even distribution of all six land-use classifications.

Density, diversity, and connectivity were taken into consideration to evaluate walkability at the neighborhood scale. The values resulting from the variable's calculations were brought together in an excel file. Z-scores were calculated for neighborhood variables since the units of the values were different from each other. Frank et al. (2005) methodology was used to calculate the walkability index. Dissimilar to Frank et al. (2005), to measure density, the population density was calculated instead of residential density, and the combined variables were weighted as equal.

$$Walkability\ index = z(population\ density) + z(LUM) + z(intersection\ density)$$

3.5.1.2. Eye-Level Street Greenery Assessment

Measuring urban greenery objectively may be more efficient and accurate (Li et al., 2015). For measuring objective greenery, usually, three approaches are utilized: using NDVI or GIS to assess park or greenspace, using satellite imagery to evaluate total plant coverage, or using SVIs to assess street greenery (He et al., 2020). Each method has its advantages and disadvantages. Green indices produced from remotely sensed data (GIS, NDVI, satellite imagery) may be useful for measuring urban greenery. Still, they are ineffective for evaluating profile views of urban vegetation at the street level (Li et al., 2015) and may fail in identifying green walls, shrubs, or covered lawns (Lu, 2019). SVIs from Google have emerged as a new source for assessing eye-level urban vegetation in recent studies (He et al., 2020). Considering GSV photographs were acquired along streets with a similar view angle to pedestrians, the built environment measurements generated from GSV images serve to depict the streetscape more objectively (Li et al., 2018). Thereby, this thesis uses GSV images to assess eye-level street greenery to address the beforementioned methodological limits. The required data, its source, and collection method for eye-level greenery are shown in Table 3.

Table 3: Eye-level greenery metric, data, and data source.

Neighborhood Variable	**Metric**	**Data**	**Data Source**
Eye-level Greenery	Greenery Index	Street View Images	Google Street View

In line with previous studies, a participant's neighborhood was defined as a circular buffer zone within 800 m distance (or a 10-minute walk) from the centroid of a participant's housing estate (He et al., 2020). Buffers were created by taking the centroid of the three neighborhoods as its center point. All streets in these buffers were sampled to measure eye-level street greenery in a neighborhood zone. Images were obtained from GSV to capture eye-level SVIs in NZ1 and NZ2. The sampling points for retrieving images were added along streets with an interval of 50 m. From sampling points, four SVIs were retrieved facing north, east, south, and west (Zang et al., 2020). From NZ1, 1848 images and NZ2, 2152 were retrieved, making a total of 4000 images.

After retrieving the images, greenery pixels of the images were extracted with OpenCV Python script using HSV (Hue Saturation Value) Color Script (Figure 9). The HSV scale provides a numerical readout of an image that corresponds to the color names contained therein, and it is for selecting precise colors and color ranges (Masterclass, 2021). It should be mentioned that even though this automated greenery extraction method was validated with manual extraction by Lu (2019), there is a possibility of margin of error for this method, since, during the process of greenery pixel extraction, a green building or car, etc. would be calculated as well. After the extraction, using Adobe Photoshop software, extracted greenery pixels in a photo were calculated (Zang et al., 2020). The GVI is calculated by the ratio of pixels representing vegetation to total pixels from four images from a photo sampling point (He et al., 2020), as shown in the following equation:

$$Green\ view\ index = \frac{\sum_{i=1}^{4} Greenerypixels_i}{\sum_{i=1}^{4} Totalpixels_i}$$

GVI value ranges from 0.0 to 1.0; a higher value indicates more eye-level greenery (Zang et al., 2020).

Figure 9: Eye-level Street greenery assessment. (a) Sampling points with 50 m spacing were addressed (Retrieved from Google Maps, 2022). (b) Four streetscape images were captured for each point from GSV from the north, east, south, and west directions (Retrieved from Google Street View, 2022). (c) All vegetation in a photo was extracted with OpenCV Python script using HSV Color Script (Generated from OpenCV Python, 2022).

3.5.2. Survey Assessment

The survey consists of seven parts: residence-related questions, demographic information, neighborhood satisfaction and attachment, perceived neighborhood walkability, walking time, hedonic and eudaimonic well-being associated with the last walk trip a resident went in their neighborhoods. The first part was included to ensure the interview was conducted with people who met the criteria relating to place and time of residence in the neighborhood. The criteria for residence time were a minimum of one year (Lucchesi et al., 2021). The demographic part consists of age, gender, education level, working status, marital status, car ownership, health, and physical limitation. Health, employment, age, and marital status were included since there is strong empirical evidence on the socio-economic and personal characteristics affecting well-being (Ala-Mantila et al., 2018). Health was measured as a single item self-assessment on a 10-point Likert Scale ranging from very unhealthy (0) to very healthy (10) (Ettema & Schekkerman, 2016). Physical limitation was measured as a single item self-assessment of one's physical limitation on a 5-point Likert Scale; could not do physical activity (1), quite a lot (2), somewhat (3), very little (4), and not at all (5) (Nagata et al., 2020).

Neighborhood satisfaction and attachment were asked through two questions. Neighborhood attachment was measured by asking participants how attached they feel to their neighborhood on a 5-point Likert Scale ranging from "not at all" (1) to "a great deal” (5). This question was included since there may be a relationship between residents’ neighborhood attachment and their subjective evaluations of neighborhood walkability (Mouratidis, 2020). Neighborhood satisfaction was assessed by asking survey participants to evaluate how well their neighborhood meets their current needs on a 5-point Likert Scale ranging from “extremely poorly” (1) to “extremely well” (5) (Kearney, 2006). This question was asked since neighborhood satisfaction may mediate the relationship between neighborhood characteristics and well-being (Mouratidis, 2020).

Neighborhood walkability was included to measure the perceived neighborhood walkability of residents. Perceived neighborhood walkability was measured using the reduced version of the Chinese Neighborhood Environment Walkability Scale (Chinese NEWS-A). The reduced version has nine items from land-use mix-access, one item from street connectivity, three items from infrastructure and safety for walking, one item from aesthetic, one item from pedestrian traffic safety, and one item from safety from crime (Table 4). The reduced version was scored using the original 4-point Likert Scale from 1 (strongly disagree) to 4 (strongly agree) (Yu et al., 2017).

Table 4: Descriptive statistics of perceived neighborhood walkability.

Question	Please indicate how much you agree/disagree with following statements.
Items	**Land-use mix-access** 1. There are many places to go within walking distance at my home 2. The streets in my neighborhood are hilly, making my neighborhood difficult to walk in (reverse coded/scored)
	Street connectivity 3. There are many alternative routes for getting from place to place in my neighborhood
	Infrastructure and safety for walking 4. There are sidewalks on most of the streets in my neighborhood 5. There are covered bridges in my neighborhood 6. There are indoor, air-conditioned places (shopping malls) where people can walk
	Aesthetics 7. There are trees along the streets in my neighborhood
	Traffic safety 8. There is so much traffic along nearby streets that it makes it difficult or unpleasant to walk in my neighborhood (reverse coded/scored)
	Safety from crime 9. There is a high crime rate in my neighborhood which makes it unsafe to go on walks during the day or at night (reverse coded/scored)

In the next part of the questionnaire, the participants were asked whether they had walked in their neighborhoods in the last seven days with 'Yes' or 'No' options. If they answered 'No,' their survey was over; if they answered 'Yes,' they moved to the following part. Neighborhood walking time was measured with four questions from the Neighborhood-International Physical Activity Questionnaire (N-IPAQ). N-IPAQ is the modified version of the most popular physical activity questionnaire – the International Physical Activity Questionnaire (IPAQ). It was modified to measure neighborhood-based physical activity and contains measurements for walking and bicycling for recreation and transportation and the number of days of neighborhood-based moderate and vigorous physical activity (Frehlich, Blackstaffe, & McCormack., 2019).

The Satisfaction with Travel Scale (STS) was used to measure hedonic well-being during walking. It has two parts: the cognitive and affective dimensions of hedonic well-being. The original scale consists of nine paired items measured on 7-point semantic differential scales. The item pairs are bored/enthusiastic, fed up/engaged, tired/alert, stressed/calm, worried/confident, hurried/relaxed; "My trip…" was worst/best I can think of, worked poorly/well, was low/high standard (Ettema et al., 2011). Some items were changed or dropped since they had less than perfectly opposed definitions. So, "fed up/engaged" was changed to "unengaged/engaged" (Olsson et al., 2011), "tired/alert" to "tired/energized" (Singleton, 2019b), "hurried/relaxed" to "tense/relaxed" (Olsson et al., 2011; Singleton, 2019b), "my trip was low/high standard" to "my trip was displeasing/enjoyable" (Singleton, 2019b). "Worried/confident" and "My trip worked poorly/well" items were dropped since they referred to arrival time confidence (Singleton, 2019b).

The eudaimonic well-being questionnaire was adapted from Singleton and Clifton (2021). They created an instrument for measuring eudaimonic well-being during travel by adapting existing instruments. The survey consists of 22 words/phrases; they are placed into one of three question blocks: to "fulfill your desire for," "express," or "improve" something (Table 5). The survey question was changed from "Thinking about your most recent commute to work…" to "Thinking about your most recent walk in your neighborhood…". One of the phrases was eliminated since it reduced the travel to something that only happens between home and work. Participants answered questions with yes (1) and no (0) answers.

Table 5: Eudaimonic well-being while walking survey questions and items.

Question	Thinking about your most recent walk in your neighborhood, did walking allow you, at least a little bit to express your…		
Items	**…fulfill your desire for** Block 1	**…express for** Block 2	**…improve your** Block 3
	Variety Control Adventure Companionship Freedom Privacy Safety Comfort Stress relief A routine A challenge Membership in a group or class	Independence Social status Self-identity Courage Mastery of a skill Environmental values	Self-confidence Mental health Physical health

CHAPTER 4

RESULTS

This chapter includes findings of the pre-study of the neighborhood zones (neighborhood characteristics, neighborhood walkability, neighborhood eye-level street greenery assessment) and statistical analysis of the conducted surveys. Pre-study was made to assess the neighborhoods and zones within the neighborhoods. At the end of these assessments, specific residential areas within buffer zones were decided upon. Later, the survey participants were chosen from these particular residential areas and were asked to participate in an online survey. All quantitative data analyses were done by IBM SPSS Statistics software.

4.1. Neighborhood Zone Analysis

4.1.1. Neighborhood Characteristics and Walkability Assessment Analysis

This analysis stage evaluates neighborhoods within the zones regarding physical features and walkability. In that sense, density, diversity, and connectivity were considered, calculated, and compared. Later values of density, diversity, and connectivity were converted to z-scores and used in a walkability index. For the measure of population density, calculations were made regarding the neighborhoods in general and not specific to buffer zones. Table 6 shows the populations of Emek, Bahçelievler, and Yukarı Bahçelievler neighborhoods and their areas in km^2. Table 7 shows the calculated population density of the Emek, Bahçelievler, and Yukarı Bahçelievler neighborhoods. This calculation is made by dividing the number of people living in the neighborhood to the neighborhood land area. It can be seen that Bahçelievler has the highest density among the three, even though having the lowest population. Yukarı Bahçelievler has the least population density. For comparing the different neighborhood areas in terms of their population density, the average population density of areas was calculated; the average population density of Emek, Bahçelievler, and Yukarı Bahçelievler is 16.19.

Table 6: Population and areas of Emek, Bahçelievler, and Yukarı Bahçelievler neighborhoods.

Neighborhood Variable	**Neighborhoods**			**Total**
	Emek	**Bahçelievler**	**Yukarı Bahçelievler**	
Population	22.102	10.470	15.359	47.931
Neighborhood area (km^2)	1368.664	574.294	1082.257	3025.22

Table 7: Population density of Emek, Bahçelievler, and Yukarı Bahçelievler neighborhoods and their average.

Neighborhood Variable	**Neighborhoods**			**Average**
	Emek	**Bahçelievler**	**Yukarı Bahçelievler**	
Population Density (Person/ km^2)	16.15	18.23	14.19	16.19

Table 8 shows the populations of Sancak, Yıldızevler, and Hilal neighborhoods and their areas in km^2. Table 9 shows the calculated population density of the Sancak, Yıldızevler, and Hilal neighborhoods. This shows that Sancak has the highest density among the three, while Hilal has the least. The average population density of Sancak, Yıldızevler, and Hilal neighborhoods is 12.30. This means that Emek, Bahçelievler, and Yukarı Bahçelievler neighborhoods has a higher population density than Sancak, Yıldızevler, and Hilal neighborhoods. Higher population density is usually considered to be associated with higher walkability.

Table 8: Population and areas of Sancak, Yıldızevler, and Hilal neighborhoods.

Neighborhood Variable	Neighborhoods			Total
	Sancak	Yıldızevler	Hilal	
Population	11.263	12.687	6.649	30.599
Neighborhood area (km^2)	740.20	1104.60	650.79	2495.59

Table 9: Population density of Sancak, Yıldızevler, and Hilal neighborhoods and their average.

Neighborhood Variable	Neighborhoods			Average
	Sancak	Yıldızevler	Hilal	
Population Density (Person/ km^2)	15.21	11.48	10.21	12.30

Another neighborhood characteristic that is associated with walkability is connectivity. For measuring connectivity, intersection density was calculated. This calculation is made by dividing the number of intersections in the buffers to the buffer areas. In NZ1, there are 183 intersection points, and in NZ2, there are 194 intersection points. Buffer zones both have an area of 2010.619 km^2. Table 10 shows the intersection density of both neighborhood zones. Their intersection densities are similar, NZ1 has an intersection density of 0.091, and NZ2 has 0.096.

Table 10: Intersection densities of neighborhood zones.

Neighborhood Variable	Neighborhood Zones	
	NZ1	**NZ2**
Intersection Density (Intersection no./ km^2)	0.091	0.096

One of the other important characteristics of walkability in a neighborhood is the LUM. To calculate LUM, land parcels in both neighborhood zones were classified into four broad cases: recreational, residential, industrial, and commercial, and then the total area of the four and total land-uses were calculated within each neighborhood zone's buffers. Following that, the LUM was calculated via the entropy index. Figure 10 shows different land-use areas in NZ1. It can be seen that NZ1 is primarily residential and contains mainly four-story residential units. This can also be seen in Table 11; it shows different land-use types and areas (km^2) in NZ1 within the buffer.

Figure 10: Different land-use areas in NZ1 (Drawn by the author, 2022).

Table 11: Different land-use types and their areas in NZ1 within the buffer.

Land-Use Types	**Areas ($\mathbf{km^2}$)**
Residential	1217.16
Recreational	138.14
Industrial	21.16
Commercial	75.904
Sum	1452.36

Figure 11 shows different land-use areas in NZ2. It can be seen that NZ2 is also primarily residential. Contrary to NZ1, NZ2 contains more diverse-story residential units. Table 12 shows different land-use types and areas (km^2) in NZ2 within the buffer.

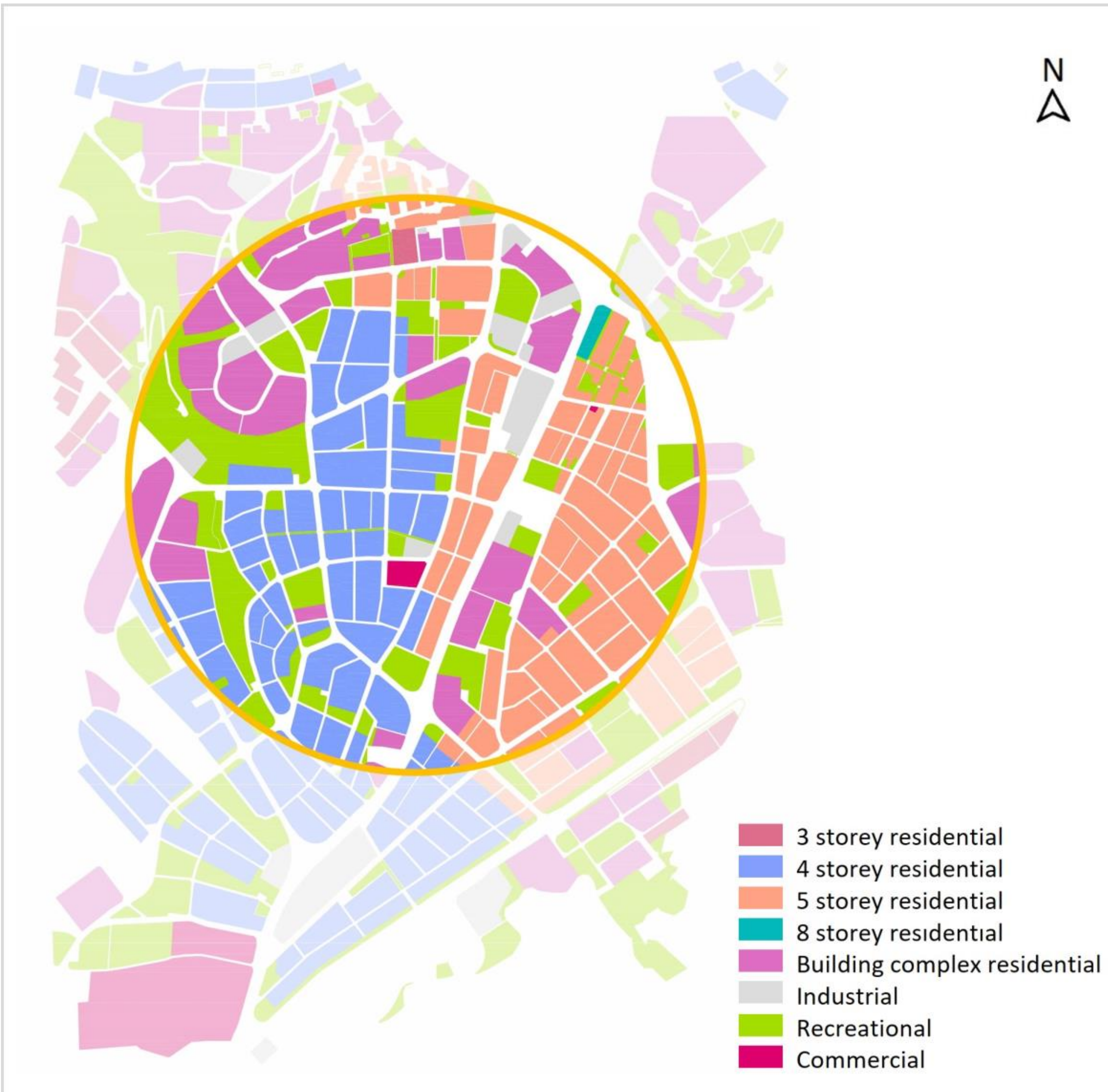

Figure 11: Different land-use areas in NZ2 (Drawn by the author, 2022).

Table 12: Different land-use types and areas in NZ2 within the buffer.

Land-Use Types	**Areas (km^2)**
Residential	1075.98
Recreational	300.76
Industrial	61.87
Commercial	6.473
Sum	1445.07

Table 13 shows the calculated land-use mixes of both neighborhood zones according to the entropy index. These results indicate that NZ2 has a more diverse land-use mix than NZ1.

Table 13: LUM of neighborhood zones.

Neighborhood Variable	**Neighborhood Zones**	
	NZ1	**NZ2**
LUM	0.4239	0.5088

Objective Walkability Assessment

Walkability was measured according to a walkability index (Frank et al., 2005). Both neighborhood zones' density, diversity, and connectivity were considered to measure walkability. Calculated density, diversity, and connectivity variables were brought together in an excel file. Z-scores were calculated for neighborhood variables since the units of the values were different from each other. Frank et al. (2005) methodology was used to calculate the walkability index. Table 14 shows the calculated walkability levels of both neighborhood zones according to the walkability index. According to these results, NZ2 is more walkable compared to NZ1.

Table 14: Walkability levels of neighborhood zones.

Neighborhood Variable	**Neighborhood Zones**	
	NZ1	**NZ2**
Walkability	-0.66667	1.007487

4.1.2. Eye-level Street Greenery Analysis

This analysis stage evaluates eye-level street greenery of the neighborhood zones. In that sense, 800 m circular buffer zones were created for both neighborhood zones, and all streets were sampled at every 50 m to measure street greenery. Four images were extracted from each sampling point. SVIs were collected from GSV, and greenery pixels of the images were extracted with OpenCV Python script using HSV Color Script. Following this, using Adobe Photoshop software, extracted greenery pixels in an image were calculated. Afterward, the GVI was calculated for each sampling point. The sum of every sampling point was calculated in both neighborhood zones and compared. Table 15 shows the eye-level street greenery values of both neighborhood zones according to the GVI. According to these results, although NZ1 has a slightly higher eye-level street greenery than NZ2, their greenery levels are very similar.

Table 15: Eye-level greenery quantity of neighborhood zones.

Neighborhood Variable	Neighborhood Zones	
	NZ1	NZ2
Eye-Level Street Greenery	0.137075774	0.1290433355

4.2. Survey Analysis

4.2.1. Descriptive Analysis

Residence-related questions

The first part of the questionnaire was residence-related questions that covered information about the participants' residence place and residence time. This part was included to ensure that the interview was conducted with people who met the neighborhood zone and residence time criteria. The criterion for residence time was a minimum of 1 year (Lucchesi et al., 2021). 259 people voluntarily participated in the survey (122 participants in NZ1 and 137 in NZ2). Among these participants, 17 people were eliminated due to their period of residence being less than 1 year (12 from NZ1, 5 from NZ 2). One person from NZ2 was eliminated due to missing responses to some questions. After the eliminations, analyses were conducted with 114 participants from NZ1 and 127 from NZ2, making a total of 241 participants overall. According to the survey's period of residence question, 52.6% of the participants have lived more than 10 years in NZ1, and 60.6% have lived more than 10 years in NZ2. This means most participants lived in their said neighborhood for more than 10 years. For the residence time distribution, see Table 16.

Table 16: Distribution of period of residence by the neighborhood zones.

Characteristic	Category		Neighborhood Zone		Total
			NZ1	NZ2	
Period of Residence	1 to 5 years	Count	40	20	60
		%	35.1%	15.7%	24.9%
	5 to 10 years	Count	14	30	44
		%	12.3%	23.6%	18.3%
	More than 10 years	Count	60	77	137
		%	52.6%	60.6%	56.8%
Total		Count	114	127	241
		%	100.0%	100.0%	100.0%

Demographic information

The demographic questionnaire obtained participants' age, gender, marital status, education status, health status, car ownership, and whether or not they have a physical limitation. As it was said, there were 114 participants from NZ1, where 71 of them were females, and 43 of them were males, with a mean age of 34.71 (SD= 11.638). In NZ2, there were 127 participants, where 68 of them were females, and 59 were males, with a mean age of 39.70 (SD= 14.769). Overall, there were 139 females and 102 males with a mean age of 37.34 (SD= 13.584). For the gender distribution of the participants, see Table 17. The age range of the participants was between 18 and 78, and the average age of the participants was 37.34 (SD= 13.584)

Table 17: Distribution of gender by the neighborhood zones.

Characteristic	Category		Neighborhood Zone		Total
			NZ1	NZ2	
Gender	Female	Count	71	68	139
		%	62.3%	53.5%	57.7%
	Male	Count	43	59	102
		%	37.7%	46.5%	42.3%
Total		Count	114	127	241
		%	100.0%	100.0%	100.0%

Table 18 shows the results of the marital status distribution by the neighborhood zones. According to the results, overall, within both neighborhood zones, 49.8% of the participants were single, 47.7% were married, and 2.5% were widows. In NZ1, a higher percentage of participants (%63.2) were single, whereas, in NZ2, a higher percentage of participants (%58.3) were married. There was a low percentage of widows in both zones: 0.9% in NZ1 and 3.9% in NZ2.

Table 18: Distribution of marital status by the neighborhood zones.

Characteristic	Category		Neighborhood Zone		Total
			NZ1	NZ2	
Marital Status	Single	Count	72	48	120
		%	63.2%	37.8%	49.8%
	Married	Count	41	74	115
		%	36.0%	58.3%	47.7%
	Widow	Count	1	5	6
		%	0.9%	3.9%	2.5%
Total		Count	114	127	241
		%	100.0%	100.0%	100.0%

The working status of the participants showed similarities between neighborhood zones. Both neighborhood zones had a higher percentage of employed people than unemployed and retired people. In NZ1, 74.6% of the participants were employed; likewise, in NZ2, 70.1% of the participants were employed. Moreover, 20.0% of the participants were unemployed in NZ1, and 20.5% were unemployed in NZ2. There was a small percentage of retired people; 5.3% in NZ1 and 9.4% in NZ2. Since the average age of the participants was 37.34, it was expected for the percentage of retired people to be lower compared to other categories of work status. For the working status distribution of the participants (see Table 19).

Table 19: Distribution of working status by the neighborhood zones.

Characteristic	**Category**		**Neighborhood Zone**		**Total**
			NZ1	**NZ2**	
Working Status	Employed	Count	85	89	174
		%	74.6%	70.1%	72.2%
	Unemployed	Count	23	26	49
		%	20.2%	20.5%	20.3%
	Retired	Count	6	12	18
		%	5.3%	9.4%	7.5%
Total		Count	114	127	241
		%	100.0%	100.0%	100.0%

Table 20 shows the results of the education status of participants. In NZ1, 93.0%, and in NZ2, 77.2% of the participants had either a university degree or above. According to these results, most of the participants had a high level of education in both zones.

Table 20: Distribution of education status by the neighborhood zones.

Characteristic	Category		Neighborhood Zone		Total
			NZ1	**NZ2**	
Education Status	Primary school & below	Count	1	3	4
		%	0.9%	2.4%	1.7%
	Middle school	Count	1	4	5
		%	0.9%	3.1%	2.1%
	High school	Count	6	22	28
		%	5.3%	17.3%	11.6%
	University & above	Count	106	98	204
		%	93.0%	77.2%	84.6%
Total		Count	114	127	241
		%	100.0%	100.0%	100.0%

Table 21 shows the results of the car ownership of participants. In NZ1, 57.0% of the participants owned a car, and 43.0% did not own a car. In NZ2, 71.1% of the participants owned a car, and 28.3% did not own a car. In both zones majority of the participants owned a car. However, in NZ2, a bigger percentage (71.1%) of people owned a car compared to the percentage of car owners in NZ1 (57.0%).

Table 21: Distribution of car ownership by the neighborhood zones.

Characteristic	Category		Neighborhood Zone		Total
			NZ1	**NZ2**	
Car Ownership	I own a car	Count	65	91	156
		%	57.0%	71.1%	64.7%
	I do not own a car	Count	49	36	85
		%	43.0%	28.3%	35.3%
Total		Count	114	127	241
		%	100.0%	100.0%	100.0%

Physical limitation was measured as a single item self-assessment of one's physical limitation on a 5-point Likert Scale; could not do physical activity (1), quite a lot (2), somewhat (3), very little (4), and not at all (5) (Nagata et al., 2020). None of the participants in both neighborhood zones rated themselves as incapable of physical activity (1) or having quite a lot of physical limitations (2). Physical limitation scores of the neighborhood zones showed similarities; in NZ1, 89.5%, and NZ2, 88.2% of the participants rated themselves as having no physical limitations. According to these results, the majority of the participants did not have any physical limitations. For the physical limitation distribution of the participants, see Table 22.

Table 22: Distribution of physical limitations by the neighborhood zones.

Characteristic	**Category**		**Neighborhood Zone**		**Total**
			NZ1	**NZ2**	
Physical Limitation	Somewhat	Count	2	3	5
		%	1.8%	2.4%	2.1%
	Very little	Count	10	12	22
		%	8.8%	9.4%	9.1%
	Not at all	Count	102	112	214
		%	89.5%	88.2%	88.8%
Total		Count	114	127	241
		%	100.0%	100.0%	100.0%

The health of the participants was measured as a single item self-assessment on a 10-point Likert Scale ranging from very unhealthy (0) to very healthy (10) (Ettema & Schekkerman, 2016). None of the participants rated their health below 3. The health status of participants showed similarities between neighborhoods; in NZ1, 37.7%, and NZ2, 33.1% of the participants rated their health at 7-8. In addition, in NZ1, 58.8%, and NZ2, 59.1% of the participants rated their health at 9-10. Overall, a big majority of the participants self-assessed their health with higher scores (7-8, 9-10) (Table 23).

Table 23: Distribution of health by the neighborhood zones.

Characteristic	**Category**		**Neighborhood Zone**		**Total**
			NZ1	**NZ2**	
Health	3-4	Count	1	3	4
		%	0.9%	2.4%	1.7%
	5-6	Count	3	7	10
		%	2.6%	5.5%	4.1%
	7-8	Count	43	42	85
		%	37.7%	33.1%	35.3%
	9-10	Count	67	75	142
		%	58.8%	59.1%	58.9%
Total		Count	114	127	241
		%	100.0%	100.0%	100.0%

Age can be an influencing factor of health and physical limitation. So, a Spearman's rank correlation was conducted between age groups and health. The test results showed a negative, weak correlation between the two variables that is significant at 0.05 level (r(241)= -.249 p= .000). Table 24 shows the distribution of health scales by the age groups; in the 18-29, 30-39, and 40-19 age groups most significant percentage of health ratings are on the 9-10 health scale; on the other hand, 50-59 and 60-69 age groups have more significant percentages on 7-8 health scale.

Table 24: Distribution of health by the age.

Characteristic	**Scale**		**Age**					**Total**
			18-29	**30-39**	**40-49**	**50-59**	**60-69**	
Health	3-4	Count	1	1	2	0	0	4
		%	1.1%	1.6%	5.4%	0.0%	0.0%	1.7%
	5-6	Count	1	0	3	4	2	10
		%	1.1%	0.0%	8.1%	10.8%	13.3%	4.1%
	7-8	Count	27	18	13	18	9	85
		%	30.3%	28.6%	35.1%	48.6%	60.0%	35.3%
	9-10	Count	60	44	19	15	4	142
		%	67.4%	69.8%	51.4%	40.5%	26.7%	58.9%
Total		Count	89	63	37	37	15	241
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Another Spearman's rank correlation was conducted between age groups and physical limitation. The test results showed a negative, weak correlation between the two variables that is significant at 0.05 level (r(241)= -.303 p= .000). Table 25 shows the distribution of physical limitations by the age groups; in all age groups biggest percentages are on the 'not at all' scale of physical limitation, but as age increases, within the 'not at all' scale of physical limitation percent sizes decreases.

Table 25: Distribution of physical limitation by the age.

Characteristic	**Scale**		**Age**					**Total**
			18-29	**30-39**	**40-49**	**50-59**	**60-69**	
Physical Limitation	Somewhat	Count	1	0	1	2	1	5
		%	1.1%	0.0%	2.7%	5.4%	6.7%	2.1%
	Very little	Count	1	4	6	7	4	22
		%	1.1%	6.3%	16.2%	18.9%	26.7%	9.1%
	Not at all	Count	87	59	30	28	10	214
		%	97.8%	93.7%	81.1%	75.7%	66.7%	88.8%
Total		Count	89	63	37	37	15	241
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

4.2.2. Neighborhood Satisfaction and Attachment Analysis

Neighborhood satisfaction

To examine participants' level of neighborhood satisfaction, first, the question's mode (M_o) and median (M_d) values were calculated. Neighborhood satisfaction was answered on a 5-point Likert scale by asking participants to evaluate how well their neighborhood meets their current needs ranging from "extremely poorly" (1) to "extremely well" (5). In NZ1, the M_o was found as 5 (extremely well), and M_d was found as 4 (well). In NZ2, the M_o and M_d were both found as 4 (well). Therefore, participants of NZ1 evaluated their neighborhood satisfaction as higher than the participants of NZ2. Table 26 shows the neighborhood satisfaction distribution of neighborhood zones.

Table 26: Distribution of neighborhood satisfaction by the neighborhood zones.

Characteristic	Scale		Neighborhood Zone		Total
			NZ1	NZ2	
Neighborhood Satisfaction	1	Count	1	7	8
		%	0.9%	5.5%	3.3%
	2	Count	4	11	15
		%	3.5%	8.7%	6.2%
	3	Count	17	30	47
		%	14.9%	23.6%	19.5%
	4	Count	41	41	82
		%	36.0%	32.3%	34.0%
	5	Count	51	38	89
		%	44.7%	29.9%	36.9%
Total		Count	114	127	241
		%	100.0%	100.0%	100.0%

Spearman's rank correlation tests were computed between neighborhood satisfaction and, period of residence, marital status, age groups, gender, working status, car ownership, education status, physical limitation, and health. The results showed positive, very weak correlations between neighborhood satisfaction and period of residence (r(241)= .052, p= .422), marital status (r(241)= .039, p= .551), age groups (r(241)= .079, p= .223), working status (r(241)= .008, p= .905), education status (r(241)= .081, p= .210), health (r(241)= .034, p= .798), not significant at 0.05 level, and car ownership (r(241)= .039, p= .550), significant at 0.05 level. There were negative, very weak correlation between neighborhood satisfaction and physical limitation (r(241)= -.022, p= .737), not significant at 0.05 level, and gender (r(241)= -.134, p= .038), significant at 0.05 level.

Neighborhood attachment

Neighborhood attachment was measured by asking participants how attached they feel to their neighborhood on a 5-point Likert Scale ranging from "not at all" (1) to "a great deal" (5). To compare the level of neighborhood attachment of the participants, the M_o and M_d values of the question were calculated. Calculated values of neighborhood attachment indicated that the participants of both neighborhood zones rated their level of neighborhood attachment as similar, and the majority of the participants in both zones showed a high neighborhood attachment. In both neighborhood zones, the

M_o was found as 5 (a great deal), and M_d was found as 4. Table 27 shows the neighborhood attachment distribution of neighborhood zones.

Table 27: Distribution of neighborhood attachment by the neighborhood zones.

Characteristic	**Scale**		**Neighborhood Zone**		**Total**
			NZ1	**NZ2**	
Neighborhood Attachment	1	Count	2	7	9
		%	1.8%	5.5%	3.7%
	2	Count	1	13	14
		%	0.9%	10.2%	5.8%
	3	Count	19	35	56
		%	16.7%	27.6%	22.6%
	4	Count	37	34	71
		%	32.5%	26.8%	29.5%
	5	Count	55	38	93
		%	48.2%	29.9%	38.6%
Total		Count	114	127	241
		%	100.0%	100.0%	100.0%

Spearman's rank correlation tests were computed between neighborhood attachment and, period of residence, marital status, age groups, gender, working status, car ownership, education status, physical limitation, and health. The results showed positive, very weak correlations between neighborhood satisfaction and period of residence ($r(241)= .110$, $p= .087$), marital status ($r(241)= .002$, $p= .970$), car ownership ($r(241)= .136$, $p= .035$), and health ($r(241)= .017$, $p= .798$), not significant at 0.05 level. Also, there was positive, moderate correlation between neighborhood attachment and working status ($r(241)= .068$, $p= .293$), not significant at 0.05 level. Moreover, the results showed negative, very weak correlations between neighborhood satisfaction and age groups (r(241)= -.008, p= .907), education status (r(241)= -.026, p= .685), physical limitation (r(241)= -.017, p= .793), not significant 0.05 level, and gender (r(241)= -.132, p= .040) that is significant 0.05 level.

Another Spearman's rank correlation was done between neighborhood attachment and neighborhood satisfaction variables. The correlation results showed a positive, moderate correlation between the two variables that is significant at 0.05 level (r(214)= .592, p= .000). There is a positive, consistent relationship between the two variables (Table 28).

Table 28: Distribution of neighborhood satisfaction scale by neighborhood attachment scale.

Characteristic	**Scale**		**Neighborhood Attachment**					**Total**
			1	**2**	**3**	**4**	**5**	
Neighborhood Satisfaction	1	Count	4	1	3	1	0	9
		%	50.0%	6.7%	6.4%	1.2%	0.0%	3.7%
	2	Count	0	3	5	6	0	14
		%	0.0%	20.0%	10.6%	7.3%	0.0%	5.8%
	3	Count	1	9	22	15	7	54
		%	12.5%	60.0%	46.8%	18.3%	7.9%	22.4%
	4	Count	0	2	13	37	19	71
		%	0.0%	13.3%	27.7%	45.1%	21.3%	29.5%
	5	Count	3	0	4	23	63	93
		%	37.5%	0.0%	8.5%	28.0%	70.8%	38.6%
Total		Count	8	15	47	82	89	241
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

4.2.3. Analysis of the Reduced Chinese NEWS-A

Reduced Chinese NEWS-A was used as the instrument to assess the participants' perceived walkability. The instrument's reliability was calculated, and the Cronbach's alpha for the overall survey was 0.641. According to the literature, Cronbach's alpha of the Chinese NEWS-A was 0.652; Yu et al. (2017) have reduced Chinese NEWS-A into 9 items, and the reduced version had a Cronbach's alpha of 0.776. At this point in the research, two items (W5 & W6) were eliminated from the questionnaire to improve the instrument's reliability. After the elimination, Cronbach's alpha for the overall survey was 0.704, which showed that the instrument is reliable. Furthermore, the Cronbach's alpha value of the eliminated version of the instrument is between the Cronbach's alpha values of Chinese NEWS-A and the Yu et al.'s (2017) reduced Chinese NEWS-A.

This thesis considered the objective walkability of a neighborhood zone as a factor that influences the perceived walkability of its residents. Therefore, to answer whether the objective high walkability facilitated a high perception of walkability, an independent samples t-test was conducted for the overall reduced Chinese NEWS-A between neighborhood zone with different objective walkability levels. First, the overall M_o and M_d values of the questionnaire were calculated. Perceived walkability questions were asked on a 4-point Likert Scale ranging from "strongly disagree" (1) to "strongly agree" (4), indicating a higher score higher the perceived walkability of the participant. In NZ1, the M_o was found as 3, and M_d was found as 3.14. In NZ2, the M_o was found as 3, and M_d was found as 2.86. The independent t-test for equal variances not assumed showed a significant difference in the overall perceived walkability of participants between the neighborhood zones (t= 4.444; df= 239; p= .000).

In the perceived walkability questionnaire, some items were related to the objectively assessed neighborhood characteristics. LUM was related to Land-use mix-access items (W1-W2) in the questionnaire, connectivity was related to the street connectivity item (W3), and eye-level street greenery was related to the aesthetics item (W7). For the street connectivity item of the survey, both NZ1 and NZ2's M_o and M_d values were found as 3.0, and objective assessments of the neighborhood zones also showed very similar results for connectivity (intersection density). For land-use mix-access items of the survey, in NZ2, both M_o and M_d were found as 3.0; in NZ1, both M_o and M_d were found as 2.5. Objective assessments of the neighborhood zones correlate with this finding. For the aesthetics item of the survey, in NZ1, both M_o and M_d values were found as 4.0, while in NZ2, both M_o and M_d values were found as 3.0. Objective assessments of the neighborhood zones showed a similar amount of greenery, while perceived assessments differed.

A Spearman's rank correlation test was conducted to determine if different neighborhood residence periods correlated with participants' overall perceived walkability. The results indicated a negative, weak correlation between the two variables, not significant at 0.05 level (r(241)= -.028, p= .664). Moreover, several Spearman's rank correlation tests were conducted between overall perceived walkability and demographic characteristics. The Spearman's rank correlation test between overall perceived walkability and gender showed a negative, weak correlation between the two variables, not significant at 0.05 level (r(241)= -.030, p= .642). Similarly, Spearman's rank correlation test between overall perceived walkability and marital status showed a negative, perfect correlation between the two variables; despite its strength, it is not significant at 0.05 level (r(241)= -.114, p= .077). The Spearman's rank correlation between overall perceived walkability and working status showed a positive, moderate correlation between the two variables, not significant at 0.05 level (r(241)= .054, p= .406). The Spearman's rank correlation between overall perceived walkability and health and perceived walkability and physical limitation showed similar results. A positive, moderate correlation was found between overall perceived walkability and physical limitation (r(241)= .050, p= .443), and overall perceived walkability and health(r(241)= .044, p= .499), not significant at 0.05 level. Spearman's rank correlation between overall perceived walkability and education status showed a positive, weak correlation between the two variables, not significant at 0.05 level (r(241)= .030, p= .646). Car owners' overall perceived walkability mean was lower (M_e= 2.95, SD= .461) than the mean of overall perceived walkability of participants who do not own a car (M_e= 3.00, SD= .486). A Spearman's rank correlation was conducted to measure the correlation between the two variables; there was a positive, perfect correlation between the two variables, and despite its strength, it is not significant at 0.05 level (r(241)= .112, p= .082).

Furthermore, a Spearman's rank correlation test was conducted between overall perceived walkability and neighborhood attachment. The results showed that there was a positive, moderate correlation between the variables (r(241)= .494, p= .000), at 0.05 level. Table 27 shows the overall perceived walkability range distribution by neighborhood attachment scale. It can be seen that the biggest proportion of perceived walkability is on the third row (3-4 range), and on the third row, the biggest proportion of intersection is on the 5th scale of neighborhood attachment. The second biggest proportion of perceived walkability is on the second row (2-2.9 range), and on the second row, the biggest proportion of intersection is on the 3rd scale of neighborhood attachment. So, there is a positive relationship between the two.

Table 29: The distribution of overall perceived walkability range by the neighborhood attachment scale.

Characteristic	**Range**		**Neighborhood Attachment Scale**					**Total**
			1	**2**	**3**	**4**	**5**	
Overall Perceived Walkability	1-1.9	Count	1	2	1	2	1	3
		%	11.1%	0.0%	1.9%	0.0%	1.1%	1.2%
	2-2.9	Count	7	12	38	30	21	108
		%	77.8%	85.7%	70.4%	42.3%	22.6%	44.8%
	3-4	Count	1	2	15	41	71	130
		%	11.1%	14.3%	27.8%	57.7%	76.3%	53.9%
Total		Count	9	14	54	71	93	241
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Similarly, the results showed a positive moderate correlation between overall perceived walkability and neighborhood satisfaction at 0.05 significance level (r(241)= .525, p= .000). Table 30 shows the distribution of the overall perceived walkability range by neighborhood satisfaction scales. It can be seen that the biggest proportion of overall perceived walkability is on the third row (3-4 range), and on the third scale row, the biggest proportion of intersection is on the 5th scale of neighborhood satisfaction. The second biggest proportion of perceived walkability is on the second row (2-2.9 range), and on the second row, the biggest proportion of intersections are on the 2nd scale of neighborhood attachment. So, there is a positive relationship between the two.

Table 30: The distribution of overall perceived walkability range by the neighborhood satisfaction scale.

Characteristic	Range		Neighborhood Satisfaction Scale					Total
			1	2	3	4	5	
Overall Perceived Walkability	1-1.9	Count	2	0	1	0	0	3
		%	25.0%	0.0%	2.1%	0.0%	0.0%	1.2%
	2-2.9	Count	4	15	35	33	21	108
		%	50.0%	100.0%	74.5%	40.2%	23.6%	44.8%
	3-4	Count	2	0	11	49	68	130
		%	25.0%	0.0%	23.4%	59.8%	76.4%	53.9%
Total		Count	8	15	47	82	89	241
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

4.2.4. Analysis of the N-IPAQ

From this point forward, only participants who have walked in the past 7 days were evaluated for the questionnaires. From NZ1, 100 participants, and NZ2, 95 participants stated that they have walked in their neighborhoods in the past 7 days, making up 195 participants. From NZ1, 14 participants, and NZ2, 32 participants stated they had not walked in their neighborhoods in the past 7 days, making a total of 46 eliminated participants.

For finding the walking time, four questions were used from the N-IPAQ. Participants were asked how frequently they walked outside their homes for both transportation and leisure purposes and the duration of these walks. Time spent on walking in the past seven days was calculated by multiplying the median and mean values of the frequency (day) and duration (minutes) (Yu et al., 2017). NZ1 had a mean of 5 (SD=2.017) for frequency and 26.02 (SD= 18.449) for the duration in the transportation walking category. NZ2 had a mean of 3 (SD=2.125) for frequency and 37.79 (SD= 38.309) for the duration in the transportation walking category. According to these results, NZ1 residents spend 130.1 minutes walking a week for transportation in their neighborhoods, while NZ2 residents spend 113.3 minutes on average. So, NZ1 residents walk more frequently than the residents of NZ2; however, NZ2 residents walk for longer durations in the walking for transportation category.

For leisure walking, NZ1 had a mean of 2.0 (SD=1.912) for frequency and 43.10 (SD= 26.929) for the duration. Similarly, NZ2 had a mean of 2.0 (SD= 1.870) for frequency and 53.50 (SD=49.192) for the duration. So, NZ1 residents spend 86.3 minutes walking a week for leisure purposes in their neighborhoods, and NZ2 residents spend 107 minutes on average. So, in total NZ1 residents spends 216.4 minutes walking in their neighborhood a week on average; similarly, NZ2 residents spend 220.3 minutes walking in their neighborhood a week on average. Nevertheless, NZ1 had a higher average walking time than NZ2.

If we look into the mean values of the two neighborhood zones combined, the mean value for the frequency of transportation walking was 4 (SD=2.110), and the mean value for the duration of transportation walking was 31.49 (SD=2.110). Moreover, the mean value for the frequency of leisure walking was 2.0 (SD=1.890), and the mean value for the duration of leisure walking was 47.94 (SD=39.127). In this connection, people walked more frequently for transportation purposes than for leisure; however, people spend longer durations on their leisure walks than on their transportation walks.

A Spearman's rank correlation test was conducted to see if the frequency of walks within a week correlated with overall perceived walkability. The test results showed a positive, very weak correlation between the two variables ($r(195)= .094$, $p= .193$). The correlation is not significant at the 0.05 level.

Additionally, transportation and leisure walking frequency between car owners and non-car owners was reviewed. It was found that 58.0% of non-car owners walk for transportation purposes on 5 to 7 days, while the percentage of car owners is 36.3%. So non-car owners walk more frequently for transportation purposes. Transportation duration times were similar for both categories. As for leisure purposes, the majority of the participants within both groups walk for 1 to 2 days, 39.3% for car owners, and 45.6% for non-car owners. Leisure duration times were similar for both categories.

4.2.5. Analysis of the STS

This thesis considered the objective and perceived walkability of a neighborhood zone as a factor that influences hedonic well-being during walking of its residents. Participants were asked about their hedonic well-being during walking with the STS instrument regarding the last time they walked in their neighborhoods. Therefore, firstly to answer whether the objective high walkability facilitated a high perception of momentary hedonic well-being during walking, an independent samples t-test was conducted for the overall STS. The M_o and M_d values of the questionnaire were calculated. STS questions were asked on a 7-point semantic differential scale, indicating higher the score higher the hedonic well-being during walking of the participant. In NZ1, the M_o was found as 5, and M_d was found as 5.36. In NZ2, the M_o was found as 5, and M_d was found as 4.93. The independent t-test for equal variances assumed showed that there was a significant difference in the overall STS of participants between neighborhood zones (t= 2.228; df= 192; p= .027).

This thesis considered the perceived walkability of a neighborhood zone as a factor that influences hedonic well-being during walking of its residents. A Spearman's rank correlation test was conducted to see if there was a correlation between the variables. According to the results, there was a positive moderate correlation between the variables at 0.05 significance level (r(194)= .564, p= .000). Table 31 shows the distribution of the overall STS range by overall perceived walkability ranges. It can be seen that the biggest proportion of overall STS is on the fourth row (5-7 range), and on the fourth row, the biggest proportion of intersection is on the 2^{nd} column of overall perceived walkability (2-2.9 range). The second biggest proportion of perceived walkability is on the third row (3-3.9 range). The biggest proportion of intersections on the third row is on the 1^{st} column of overall perceived walkability (1-1.9 range). So, there is a positive relationship between the two.

Table 31: The distribution of overall STS range by the overall perceived walkability range.

Characteristic	Range		Overall Perceived Walkability Range			Total
			1-1.9	2-2.9	3-4	
Overall STS	1-2.9	Count	13	1	0	14
		%	16.9%	0.9%	0.0%	7.2%
	3-3.9	Count	13	3	0	16
		%	16.9%	2.7%	0.0%	8.2%
	4-4.9	Count	27	29	0	56
		%	35.1%	25.7%	0.0%	28.9%
	5-7	Count	24	80	4	108
		%	31.2%	70.8%	100.0%	55.7%
Total		Count	77	113	4	194
		%	100.0%	100.0%	100.0%	100.0%

Also, this thesis evaluated eye-level street greenery as a mediator of well-being. Among the perceived walkability questionnaire aesthetics item (W7) asked participants to rate their agreement on 'There are trees along the streets in my neighborhood' statement. According to the results, there was a positive weak association between hedonic well-being and aesthetic item of the questionnaire (r(194)= .345, p= .000).

Since socio-economic and personal characteristics affect well-being (Ala-Mantila et al., 2018), Spearman's rank correlation was computed to assess the relationship between overall STS and health, working status, age groups, and marital status. The results showed a negative, weak correlation between overall STS and health (r(197)= -.054, p= .455); a positive, strong correlation between overall STS and working status (r(194)= .004, p= .956); a positive very weak correlation between overall STS and age (r(194)= .031, p= .672); and a negative, strong correlation between overall STS and marital status (r(194)= -.026, p= .718), all not significant at 0.05 level.

Two Spearman's rank correlation was computed for overall STS, neighborhood satisfaction, and neighborhood attachment. The results showed a positive, moderate association between the overall STS and neighborhood satisfaction at 0.05 significance level (r(194)= .498, p= .000). Table 32 shows the distribution of the overall STS range by neighborhood satisfaction scale. It can be seen that there is a positive, consistent relationship between the two variables.

Table 32: Distribution of overall STS range by the neighborhood satisfaction scale.

Characteristic	Range		Neighborhood Satisfaction Scale					Total
			1	**2**	**3**	**4**	**5**	
Overall STS	1-2.9	Count	2	3	6	3	0	14
		%	33.3%	33.3%	18.8%	4.3%	0.0%	7.2%
	3-3.9	Count	2	1	5	6	2	16
		%	33.3%	11.1%	15.6%	8.7%	2.6%	8.2%
	4-4.9	Count	1	4	12	24	15	56
		%	16.7%	44.4%	37.5%	34.8%	19.2%	28.9%
	5-7	Count	1	1	9	36	61	108
		%	16.7%	11.1%	28.1%	52.2%	78.2%	55.7%
Total		Count	6	9	32	69	78	194
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The results showed a positive moderate correlation between overall STS and neighborhood attachment variables at 0.05 significance level (r(194)= .579, p= .000). Table 33 shows the distribution of the overall STS range by neighborhood attachment scale. It can be seen that there is a positive, consistent relationship between the two variables.

Table 33: Distribution of overall STS range by the neighborhood attachment scale.

Characteristic	**Range**		**Neighborhood Attachment Scales**					**Total**
			1	**2**	**3**	**4**	**5**	
Overall STS	1-2.9	Count	1	1	6	5	1	14
		%	16.7	12.5	16.2	8.5	1.2	7.2
	3-3.9	Count	2	1	8	4	1	16
		%	33.3	12.5	21.6	6.8	1.2	8.2
	4-4.9	Count	1	4	14	24	13	56
		%	16.7	50.0	37.8	40.7	15.5	28.9
	5-7	Count	2	2	9	26	69	108
		%	33.3	25.0	24.3	44.1	82.1	55.7
Total		Count	6	8	37	59	84	194
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Lastly, a Spearman's rank correlation test was computed to see if there is a correlation between the frequency of walks a participant makes within a week and overall STS. The test results show a positive, weak correlation between the two variables (r(194)= .255, p= .000). It is significant at the 0.05 level.

The instrument's reliability was explored in terms of Cronbach’s alpha coefficient for the STS to determine the internal consistency of the total items. The Cronbach’s alpha for the overall survey was 0.913. Cronbach’s alpha score shows very strong reliability of the STS.

4.2.6. Analysis of Eudaimonic Well-Being Questionnaire

This thesis considered the objective and perceived walkability of a neighborhood zone as a factor influencing eudaimonic well-being during walking of its residents. Participants were asked about their eudaimonic well-being during walking regarding the last time they walked in their neighborhoods. In this connection, to answer whether the objective high walkability facilitated a high perception of overall momentary eudaimonic well-being during walking, an independent samples t-test was conducted. The M_o and M_d values of the questionnaire were calculated. Eudaimonic well-being questions were asked with yes (1) and no (0) options. If the participants answered “yes,” they evaluated that question positively, so the higher the overall score between 0 and 1, the better. In NZ1, the M_o was found as 1, and M_d was found as 0.64. In NZ2, the M_o was also found as 1, and M_d was found as 0.58. The independent t-test for equal variances not assumed showed that there was not a significant difference in the momentary eudaimonic well-being of participants between neighborhood zones (t= 2.223; df= 169.955; p= .134).

As was mentioned, this thesis considered the perceived walkability of a neighborhood zone as a factor that influences eudaimonic well-being during walking of its residents. According to the results, there was a positive moderate correlation between the variables at 0.05 significance level (r(192)= .418, p= .000). Among the perceived walkability questionnaire aesthetics item (W7), participants were asked to rate their agreement on the 'There are trees along the streets in my neighborhood' statement. There was a positive weak association between hedonic well-being and aesthetic item of the questionnaire (r(194)= .383, p= .000). Table 34 shows the distribution of overall eudaimonic well-being range by overall perceived walkability range.

Table 34: Distribution of overall eudaimonic well-being range by the overall perceived walkability range.

Characteristic	Range		Overall Perceived Walkability Range			Total
			1-1.9	2-2.9	3-4	
Overall Eudaimonic Well-being	0-0.19	Count	16	12	0	28
		%	20.8%	10.8%	0.0%	14.6%
	0.2-0.39	Count	18	10	0	28
		%	23.4%	9.0%	0.0%	14.6%
	0.4-0.59	Count	23	24	0	47
		%	29.9%	21.6%	0.0%	24.5%
	0.6-0.79	Count	12	38	0	50
		%	15.6%	34.2%	0.0%	26.0%
	0.8-1	Count	8	27	4	39
		%	10.4%	24.3%	100.0%	20.3%
Total		Count	77	111	4	192
		%	100.0%	100.0%	100.0%	100.0%

Since they are both well-being categories, this thesis hypothesized that there might be a correlation between hedonic and eudaimonic well-being. A Spearman's rank correlation test was conducted between overall hedonic and eudaimonic well-being. The results showed a positive, moderate correlation between the two variables, significant at 0.05 level (r(192)= .439, p=.000). Table 35 shows the distribution of overall eudaimonic well-being range by STS range.

Table 35: Distribution of overall eudaimonic well-being range by the overall STS range.

Characteristic	**Range**		**Overall STS Range**				**Total**
			1-2.9	**3-3.9**	**4-4.9**	**5-7**	
Overall Eudaimonic Well-being	0-0.19	Count	5	4	6	13	28
		%	35.7%	25.0%	11.1%	12.0%	14.6%
	0.2-0.39	Count	5	7	9	7	28
		%	35.7%	43.8%	16.7%	6.5%	14.6%
	0.4-0.59	Count	2	3	20	22	47
		%	14.3%	18.8%	37.0%	20.4%	24.5%
	0.6-0.79	Count	2	1	12	35	50
		%	14.3%	6.3%	22.2%	32.4%	26.0%
	0.8-1	Count	0	1	7	31	39
		%	0.0%	6.3%	13.0%	28.7%	20.3%
Total		Count	14	16	54	108	192
		%	100.0%	100.0%	100.0%	100.0%	100.0%

As was said before, there is strong empirical evidence on the socio-economic and personal characteristics affecting well-being (Ala-Mantila et al., 2018). So, several

Spearman’s rank correlation tests were computed between overall eudaimonic well-being and personal characteristics. Results showed a positive, very weak correlation between overall eudaimonic well-being and working status (r(192)= .012, p= .864), not significant at 0.05; neighborhood satisfaction (r(192)= .317, p= .000), neighborhood attachment (r(192)= .372, p= .000), and frequency of walks a participant makes within a week (r(192)= .160, p= .027), at 0.05 significance level. Moreover, the results showed negative, very weak correlations between overall eudaimonic well-being and health (r(192)= -.081, p= .265), age (r(192)= -.023, p= .75), and marital status (r(192)= -.103, p= .157), not significant at 0.05 level.

The instrument's reliability was explored in terms of Cronbach’s alpha coefficient for the STS to determine the internal consistency of the total items. The Cronbach’s alpha for the overall survey was 0.866. Cronbach’s alpha score shows very strong reliability of the eudaimonic well-being instrument.

CHAPTER 5

DISCUSSION

This chapter discusses the findings of the thesis and relates them to the existing studies. This thesis aimed to investigate the influence of different objective walkability levels on subjective walkability; and the impact of objective and subjective walkability on categories of subjective well-being (hedonic & eudaimonic) during walking. Since nature is a significant indicator of well-being, neighborhoods with similar amounts of eye-level street greenery were chosen.

Residence-related questions showed that most participants lived in their said neighborhood for more than 10 years. The demographic part of the questionnaire showed that, like in previous studies, the sample population in this thesis tended to be female and people of higher academic achievement (Zuniga-Teran et al., 2017b). Moreover, the two neighborhood zones showed similarities in terms of working statuses. Local factors may explain this; neighborhoods were decided upon with the help of a city consultant, and regions with higher similarities were chosen as much as possible in terms of demographic and neighborhood characteristics. Another possible explanation is the recruitment method. Web-based surveys may leave out participants with no access to a computer or the internet, which may be related to the education variable (Zuniga-Teran et al., 2017b). Moreover, the snowball sampling method was used to find people who belong to groups that are hard to locate. In this thesis's case target group was the residents of specific neighborhoods. Since, in snowball sampling, the sample group grows by existing participants' inducements, this may have led to the large portion of participants with high education and working status. Nevertheless, random effects of the sociodemographic variable (age) that may have influenced health and physical limitation outcome were tested. There were negative, weak correlations between age, physical limitation, and health. It was found that as age increases, health state and physical capacity decrease.

5.1. Walkability and Neighborhood

The study of the neighborhood zones showed that NZ2 had higher objective walkability than NZ1. However, to better assess and evaluate a neighborhood's impacts on its residents, both objective and subjective walkability should be combined and studied (Yu et al., 2017). So, the first research question investigated the relationship between perceived walkability and objective walkability (**RQ1:** What is the relationship between objective walkability and perceived walkability?). The results showed a significant difference in the overall perceived walkability of participants between the neighborhood zones. However, residents of the neighborhood with lower objective walkability (NZ1) perceived their neighborhood as more walkable than those with higher objective walkability (NZ2). Researchers could not reach a common decision on this issue; there have been studies that reveal a discrepancy between perceived and objective measures (Ball et al., 2008; Bozovic et al., 2020; Lee et al., 2017; Nagata et al., 2020), but there have also been studies that show a general agreement between the measures (Leslie et al., 2005). So, the findings of this thesis align with the literature suggesting that there is a discrepancy between perceived and objective measures. This discrepancy might be due to the multi-layered nature of walkability; there are macro and micro dimensions of built environments (Lucchesi et al., 2021). Three macro-scale dimensions of the built environment were assessed in this study (density, diversity, connectivity), and not micro-scale dimensions, such as sidewalk condition (Hanibuchi et al., 2019). There are studies suggesting that the experience of walking might be more related to micro-scale environmental characteristics than macro-scale ones (Ewing et al., 2016). Moreover, this study did not cover all aspects of macro-scale objective measurements of the built environment (e.g., block size) (Ewing & Cervero, 2010). So, the results might be due to the lack of coverage in all objective macro and micro-scale built environmental characteristics. The hypothesis suggested that the residents of neighborhoods with higher objective walkability had a higher overall mean of perceived walkability (**H1:** Residents of neighborhoods with higher objective walkability have a higher overall mean of perceived walkability). The findings showed the opposite of this. Thus, **H1** was rejected.

In line with previous studies that studied neighborhood walkability, participants were asked about their residence time (Chan et al., 2021; Lucchesi et al., 2021), health conditions (Chan et al., 2021; Lee & Dean, 2018; Nagata, 2020), physical limitations (Nagata et al., 2020; Yu et al., 2017), walking time (Chan et al., 2021; Lu et al., 2018; Yu et al., 2017), car ownership (Seles & Afacan, 2019), neighborhood satisfaction (Lee et al., 2017; Mouratidis, 2020; Sirgy & Cornwell, 2002), and neighborhood attachments (Mouratidis, 2020). It was found that people who do not own a car walk more frequently in their neighborhoods than car owners for transportation purposes. This was expected since non-car owners mostly rely on public transportation for their journeys. There were no significant correlations between overall perceived neighborhood walkability and residence time, health, physical limitation, walking time, and car ownership. Even though there was no significant relationship, it should be mentioned that non-car owners evaluated their neighborhoods as more walkable than car owners. Since non-car owners walk more frequently in their neighborhoods, this may impact their perceptions of walkability. Moreover, neighborhoods had no significant differences with different objective walkability levels regarding residence time, physical limitation, health, and walking time. There was a significant difference within neighborhoods in car ownership percentage. The percentage of car owners in the neighborhood zone with higher objective walkability (NZ2) was higher than the percentage of car owners in the neighborhood with lower objective walkability (NZ1). This finding does not align with previous studies that suggest higher objective walkability is linked with less car usage/ownership (Eriksson et al., 2012; Glazier et al., 2012). These results may also be related to the high dependency on car usage in Ankara due to the rapid urbanization and economic development in the past 50 years (UN-Habitat, 2018a).

On the other hand, there were significant positive moderate correlations between perceived walkability, neighborhood attachment, and neighborhood satisfaction. So, people who are attached to their neighborhoods and satisfied by them rated their neighborhood's walkability higher, or vice versa. Both neighborhood zones evaluated their neighborhood attachment the same; however, neighborhood satisfaction scores differed. Residents of the neighborhood with higher objective walkability (NZ2) rated their neighborhood satisfaction lower than the residents of the neighborhood with lower objective walkability (NZ1). Since NZ1 had higher perceived walkability, this finding aligns with previous findings suggesting that subjective evaluations of neighborhood characteristics are more important in explaining neighborhood satisfaction than objective measures (Lu, 2002; Mantey, 2021).

5.2. Walkability and Well-Being

The second (**RQ2:** Does objective walkability influence well-being while walking?) research question investigated the influence of objective walkability on momentary perceived hedonic and eudaimonic well-being while walking. The results showed a significant difference between neighborhoods regarding overall perceived momentary hedonic well-being and no significant difference in participants' momentary eudaimonic well-being during walking. Residents of the neighborhood with the higher objective walkability (NZ2) evaluated their momentary hedonic and, although there was not a significant difference, eudaimonic well-being lower than the residents of the neighborhood with the lower objective walkability (NZ1). As a result, in terms of both eudaimonic and hedonic well-being, residents of the neighborhood with higher objective walkability experienced lower momentary well-being during walking than those with lower objective walkability. Although neighborhood characteristics define the walking activity's area, it is not entirely clear how these would shape well-being (Ettema & Schekkerman, 2016). There are studies suggesting that there is a direct link between objective characteristics (density, diversity, e.g.) of a neighborhood with well-being (Ala-Mantila et al., 2018; Ettema & Schekkerman, 2016; Schwanen & Wang, 2014), yet they could also cause sensory overload, weariness, worry, and even fear, thereby reducing well-being (Schwanen & Wang, 2014). It should be noted that between neighborhoods, connectivity levels were similar, NZ1 had a higher level of density, and NZ2 had a higher level of diversity. According to the literature, aside from positive impacts of it, high levels of density and diversity could impose negative impacts since it tends to create a 'messy' place with noise, traffic, and possible stranger danger (Cao, 2016). However, density indicators, such as degree of urbanization, city size, and accessibility to infrastructure have been linked to overall well-being (Nordbakke & Schwanen, 2015). The difference in momentary well-being between the neighborhoods could be due to the different levels of diversity and density, and there is an optimum range to them, both too much and too little could impact well-being negatively. Additionally, the divergence across studies, including this thesis, could also reflect differences in study designs (different sample composition, variable definitions, e.g.) (Nordbakke & Schwanen, 2015). The hypotheses suggested that higher objective walkability positively influenced the overall mean of momentary perceived hedonic (**H2:** Residents of neighborhoods with higher objective walkability have a higher overall mean of momentary perceived hedonic well-being while walking.) and eudaimonic (**H3:** Residents of neighborhoods with higher objective walkability have a higher overall mean of momentary perceived eudaimonic well-being while walking.) well-being while walking. However, the findings indicated the opposite of the hypotheses. Thus, **H2** and **H3** were rejected.

The third research question investigated the influence of perceived walkability on momentary perceived hedonic and eudaimonic (**RQ3:** Does perceived walkability influence well-being while walking?) well-being while walking. The results showed a significant positive moderate correlation between perceived walkability and hedonic and eudaimonic well-being. These findings align with the previous findings suggesting that subjective evaluations are more likely to predict better subjective well-being than objective well-being (Ettema & Schekkerman, 2016; Kent, Ma, & Mulley, 2017). Objective measurements rely on land use data and, as the name implies. On the other hand, subjective measurements hold an individual's perceptions and experiences towards environmental characteristics and are not expected to be accurate assessments but rather their evaluation of them (Ettema & Schekkerman, 2016). As a result, subjective measures can predict subjective well-being better since they are more biased towards one's preferences by their definition. The hypotheses suggested a statistically significant correlation between overall perceived walkability and overall momentary perceived hedonic and eudaimonic well-being while walking (**H4:** There is a statistically significant correlation between overall perceived walkability and overall momentary perceived hedonic well-being while walking) (**H5:** There is a statistically significant correlation between overall perceived walkability and overall momentary perceived eudaimonic well-being while walking.).Thus, **H4** and **H5** were not rejected.

Moreover, this thesis calculated the objective eye-level greenery. According to the literature, there is a positive impact of exposure to greenery on well-being (Wang et al., 2019). The results showed positive weak correlations between the perception of trees (There are trees along the streets in my neighborhood) and momentary hedonic and eudaimonic well-being. This finding aligns with studies suggesting that greenery matters to momentary well-being (Schwanen & Wang, 2014).

Most studies regarding well-being emphasized the importance of studying both eudaimonic and hedonic well-being in subjective well-being studies (De Vos et al., 2013; Ryan & Deci, 2001; Nordbakke & Schwanen, 2014; Schwanen & Wang, 2014; Singleton, 2019a). The hypothesis suggested that two dimensions of well-being (hedonic & eudaimonic) correlated to one another (**H6:** There is a statistically significant correlation between overall momentary perceived hedonic well-being and overall momentary perceived eudaimonic well-being while walking.) The results showed a significant positive moderate correlation between the two. Since eudaimonic and hedonic well-being are categories of well-being, they correlate to each other and show a better understanding of overall well-being (De Vos et al., 2013; Ryan & Deci, 2001). Thus, **H6** was not rejected.

Health, employment, age, and marital status were included since there is strong empirical evidence on the socio-economic and personal characteristics affecting well-being (Ala-Mantila et al., 2018). There were no significant correlations between momentary hedonic and eudaimonic well-being, health, employment, age, and marital status. These results may be due to the descriptives of the study group; for instance, the majority of the participants rated themselves as healthy, so there was not much data to compare healthy and unhealthy people. Moreover, the relationship between neighborhood attachment and satisfaction and well-being dimensions were also studied. For eudaimonic well-being and neighborhood attachment and satisfaction, significant positive yet very weak correlations were found. However, there was a significant positive moderate correlation for both neighborhood satisfaction and neighborhood attachment in the case of hedonic well-being. The results showed that neighborhood attachment, satisfaction, perceived walkability, and hedonic well-being were positively correlated. This finding aligns with studies suggesting that neighborhood attachment and perceived neighborhood walkability are linked

(Mouratidis, 2020), and neighborhood satisfaction is a mediator in the relationship between neighborhood characteristics and well-being (Mouratidis, 2020).

To sum up, objective walkability was not found to positively impact perceived walkability, hedonic, and eudaimonic well-being during walking. This could be due to the built environment's measured characteristics, how they are measured, their levels, or the lack of coverage of all built environmental characteristics. On the other hand, perceived walkability correlated positively with both well-being dimensions during walking. This could be due to the nature of subjective evaluations; since subjective evaluations are more biased towards one’s preferences, they can predict subjective well-being better. Moreover, both well-being dimensions correlated with one another positively.

Table 36: Hypotheses of the thesis.

Hypotheses	Findings	Decision	Consistent	Inconsistent
H1: Residents of neighborhoods with higher objective walkability have a higher overall mean of perceived walkability.	Residents of the neighborhood with lower objective walkability (NZ1) perceived their neighborhood as more walkable than those with higher objective walkability (NZ2).	Rejected	Ball et al., 2008; Bozovic et al., 2020; Lee et al., 2017; Nagata et al., 2020	Leslie et al., 2005
H2: Residents of neighborhoods with higher objective walkability have a higher overall mean of momentary perceived hedonic well-being while walking.	Residents of the neighborhood with higher objective walkability (NZ2) evaluated their momentary hedonic well-being as lower than those with lower objective walkability (NZ1).	Rejected		Ala-Mantila et al., 2018; Ettema & Schekkerman, 2016; Schwanen & Wang, 2014
H3: Residents of neighborhoods with higher objective walkability have a higher overall mean of momentary perceived eudaimonic well-being while walking.	Residents of the neighborhood with higher objective walkability (NZ2) evaluated their momentary eudaimonic well-being as lower than those with lower objective walkability (NZ1).	Rejected		Ala-Mantila et al., 2018; Ettema & Schekkerman, 2016; Schwanen & Wang, 2014
H4: There is a statistically significant correlation between overall perceived walkability and overall momentary perceived hedonic well-being while walking.	The results showed a significant positive moderate correlation between perceived walkability and hedonic well-being.	Not rejected	Ettema & Schekkerman, 2016; Kent, Ma, & Mulley, 2017	
H5: There is a statistically significant correlation between overall perceived walkability and overall momentary perceived eudaimonic well-being while walking.	The results showed a significant positive moderate correlation between perceived walkability and eudaimonic well-being.	Not rejected	Ettema & Schekkerman, 2016; Kent, Ma, & Mulley, 2017	
H6: There is a statistically significant correlation between overall momentary perceived hedonic well-being and overall momentary perceived eudaimonic well-being while walking.	The results showed a significant positive moderate correlation between overall momentary perceived hedonic well-being and overall momentary perceived eudaimonic well-being while walking.	Not rejected	De Vos et al., 2013; Ryan & Deci, 2001	

CHAPTER 6

CONCLUSION

This thesis examined the influence of objective and subjective walkability on momentary hedonic and eudaimonic well-being while walking in neighborhoods. Findings provide insight into the relationship between walkability in the neighborhood environments and momentary context-specific well-being.

Previous studies examined hedonic and eudaimonic well-being while walking in commute-oriented travels by comparing them to other commute typologies (De Vos et al., 2013; Martin et al., 2014; Singleton, 2019; Singleton & Clifton, 2021), or general subjective hedonic and eudaimonic well-being and neighborhood walkability relationship (Lucchesi et al., 2021). Additionally, while analyzing well-being in the context of one's neighborhood, long-term impacts are considered most of the time, and the effect of momentary context-specific factors is overlooked and needs an expansion in literature (Schwanen & Wang, 2014). Reviewing the literature showed that no study has tested the momentary effect of subjective and objective walkability on hedonic and eudaimonic well-being during walking. In this respect, this thesis attempted to understand the impact of both subjective and objective walkability on momentary hedonic and eudaimonic well-being during walking in a context-specific manner. Moreover, since exposure to greenery and nature increases well-being, in long term exposures (Huang et al., 2021) and in constant (Wang et al., 2019) and active states (Zumelzu & Herrmann-Lunecke, 2021), neighborhoods with equal eye-level street greenery and different objective walkability levels were chosen as the setting.

The results showed objective walkability of the neighborhoods did not have a positive impact on perceived walkability. This might be due to the measured objective characteristics of the built environment (density, diversity, connectivity) in the thesis. The measured objective characteristics were macro-scale, and there are macro and micro-scale dimensions of the built environment. Other macro-scale (e.g., block size) or micro-scale (e.g., thermal comfort, slope) measurements of the built environment might better predict perceived well-being.

Through data analysis, perceived walkability and momentary hedonic and eudaimonic well-being were significantly correlated. However, objective walkability did not positively influence momentary hedonic and eudaimonic well-being. Thus, perceived environmental characteristics are a higher mediator of subjective momentary well-being than objectively assessed environmental characteristics.

These findings provided new insights to researchers for means to facilitate and support momentary subjective well-being through perceived walkability dimensions. Perceived walkability has a positive influence on momentary subjective well-being while walking. Understanding the perceived walkability components that facilitate higher subjective well-being during walking in depth can help improve walkability and support walking in neighborhood environments.

There are a few limitations of the study. The first limitation is using macro-environmental characteristics as the scale of walkability. Even though being an indicator of walkability, macro characteristics do not cover the whole walking experience. Micro-environmental features such as slope, sidewalk condition, thermal comfort, e.g., impact walkability and might impact well-being during walking. Future studies should consider both macro and micro-scale features of the environment and neighborhoods. The second limitation is related to GSV images. To measure eye-level street greenery, SVIs were collected from streets at uniform distances of 50 m. More images could be gathered to increase the accuracy of calculation; however, the number of images in GSV was limited, and it would have been time-consuming. Additionally, all SVIs were not taken at the same season, year, or time of day; thus, images might have shown different qualities and greenery levels.

The third limitation stemmed from how the survey was carried out. Well-being questionnaires asked participants to evaluate their momentary well-being regarding the last time they walked in their neighborhoods within the previous week. However, it would have been better to conduct the survey right after people walked into their neighborhoods so that their evaluations would have been more accurate. The fourth limitation was due to the data collection period. The survey study was completed in a one-month scope. During that one-month scope, there were different weather conditions. Also, people walked in their neighborhoods at different times of the day. It would have been better to collect data from specific times of the day with similar weather conditions. Lastly, one of the data collection methods was snowball sampling. Due to the nature of snowball sampling, it is non-random, so the results of the study might be hard to generalize beyond the studied sample group.

Future studies should analyze the relationship between the objective environmental characteristics and people's perceptions of them so that urban environments can be healed and improved in an informed way to elevate people's perceptions of them, thus their momentary well-being while walking within them. Moreover, most of the participants in the sample group had high education, health, and physical ability. These may, especially health and physical limitations, impact how they evaluate their neighborhood's perceived walkability and their subjective well-being while walking in their neighborhoods. So, future studies can be made with more diverse sample groups in terms of these variables. Lastly, future studies, similar to this thesis, should evaluate both hedonic and eudaimonic well-being in their well-being studies, to get a better understanding of general well-being.

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APPENDIX A

THE APPROVED ETHICS FORMS BY THE BILKENT UNIVERSITY ETHICS

Bilkent Üniversitesi
Akademik İşler Rektör Yardımcılığı

Tarih : 16 Şubat 2022

Gönderilen : Müge Sarıgöl

Tez Danışmanı : Yasemin Afacan

Gönderen : H. Altay Güvenir
İnsan Araştırmaları Etik Kurulu Başkanı

Konu : *"Perceived And ..."* çalışması etik kurul onayı

Üniversitemiz İnsan Araştırmaları Etik Kurulu, 16 Şubat 2022 tarihli görüşme sonucu, *"Perceived And Objective Neighborhood Walkability Impact on Eudaimonic and Hedonic Well-Being While Walking In Equal Eye-Level Street Greenery Neighborhoods"* isimli çalışmanız kapsamında yapmayı önerdiğiniz etkinlik için etik onay vermiş bulunmaktadır. Onay, ekte verilmiş olan çalışma önerisi, çalışma yürütücüleri ve bilgilendirme formu için geçerlidir.

Bu onay, yapmayı önerdiğiniz çalışmanın genel bilim etiği açısından bir değerlendirmedir. Çalışmanızda, kurulumuzun değerlendirmesi dışında kalabilen özel etik ve yasal sınırlamalara uymakla ayrıca yükümlüsünüz.

Kovid-19 salgını nedeniyle konulmuş olan kısıtlamaların yürürlükte olduğu süre içinde, tüm komite toplantıları elektronik ortamda yapılmaktadır; aşağıda isimleri bulunan Bilkent Üniversitesi Etik Kurulu Üyeleri adına bu yazıyı imzalama yetkisi kurul başkanındadır.

Etik Kurul Üyeleri:

Ünvan / İsim	**Bölüm / Uzmanlık**	
Prof.Dr. H. Altay Güvenir	Bilgisayar Mühendisliği	Başkan
Prof.Dr. Erdal Onar	Hukuk	Üye
Prof.Dr. Haldun Özaktaş	Elektrik ve Elektronik Müh.	Üye
Doç.Dr. Işık Yuluğ	Moleküler Biyoloji ve Genetik	Üye
Dr. Öğr. Üyesi Burcu Ayşen Ürgen	Psikoloji	Üye
Dr. Öğr. Üyesi Didem Özkul McGeoch	İletişim ve Tasarımı	Yedek Üye
Dr. Öğr. Üyesi A.Barış Özbilen	Hukuk	Yedek Üye

Kurul karar/toplantı No: 2022_02_16_01

Bilkent Üniversitesi, 06800 Bilkent, Ankara • Telefon: (312) 290 12 13 • (312) 290 12 14 • Faks: (312) 266 41 52

(Form Student_EN*)

Ethics form for graduate and undergraduate students - human participants

Note - group projects fill in one copy with all your names on it. Consult your project supervisor for advice before filling in the form.

Your name(s): **Müge Sarıgöl**
Project Supervisor: **Assoc. Prof. Dr. Yasemin Afacan**

A. Write your name(s) and that of your supervisor above.
B. Read section 2 that your supervisor will have to sign. Make sure that you cover all these issues in section 1. Discuss what you are going to put on the form with your project supervisor.
C. Sign the form and get your project supervisor to complete section 2 and sign the form.

1. Project Outline (to be completed by student(s))

(i) Full Title of Project:

Perceived And Objective Neighborhood Walkability Impact on Eudaimonic and Hedonic Well-Being While Walking In Equal Eye-Level Street Greenery Neighborhoods

(ii) Aims of project:

The aim of this study is to understand how perceived and objective neighborhood walkability impact eudaimonic and hedonic well-being while walking in equal eye-level street greenery neighborhoods.

(iii) What will the participants have to do? (brief outline of procedure; please draw attention to any manipulation that could possibly be judged as deception; *for survey work, a copy of the survey should be attached to this form*):

The participants of this study will be asked to fill out different questionnaires. They will be asked to sign a consent form at the beginning of the questionnaire. Questionnaire will be held online or with paper in person. The questionnaire comprises the reduced version of Chinese Neighbourhood Environment Walkability Scale, neighbourhood attachment and satisfaction questions, Neighbourhood International Physical Activity Questionnaire, Satisfaction with Travel Scale, and Travel Eudaimonia Scale. Additionally, participants will be asked for information about their age, gender, marital status, working status, car ownership, education status, personal monthly income level, perceived physical limitation and health. The obtained data from the questionnaire will be processed using SPSS software. The names of the participants will be coded into the numbers and personal information will be held confidential.

(iv) What sort of people will the participants be and how will they be recruited? In the case of children state age range. (*Any participant who has not lived through his/her 18th birthday is considered to be a child!*)

The participants of this study will be residents of Bahçelievler, Yukarı Bahçelievler, Emek, Sancak, Yıldızevler, and Hilal neighbourhoods. They will be recruited via neighbour municipalities and internet. The minimum number of participants will be 30 people per neighbourhood who are aged above 18 years old.

*If you are testing children or other vulnerable individuals, state whether all applicants have CRB** clearance*

(v) What sort stimuli or materials will your participants be exposed to? Tick the appropriate boxes and then explain the form that they take in the space below, please draw attention to any content that could conceivably upset your participants).
Questionnaires[x]; Pictures[ ]; Sounds [ ]; Words[ ]; Caffeine[ ]; Alcohol[ ]; Other[ ].

There will be two options for the questionnaire, with QR code (directing to online survey) or with paper.

25.02.2022

* Adapted from *www.york.ac.uk/depts/psych/www/research/ethics/HumanProjForm.doc*
** Criminal Records Bureau – Please attach relevant clearance documentation.

Bilkent University Informed Consent Form

Please fill in the blanks after read the form carefully.

1	**Name and Surname of the participant:**	______________________
2	**The contact information (adress, e-mail, mobile phone) of the person chosen by the participant in case of any trouble**	______________________

Name of the Research:
Perceived And Objective Neighborhood Walkability Impact on Eudaimonic and Hedonic Well-Being While Walking In Equal Eye-Level Street Greenery Neighborhoods

The aim, method and the expected benefits of the research

The aim of the study is to analyse the impact of perceived and objective neighbourhood walkability on eudaimonic and hedonic well-being during walking in neighbourhoods with equal eye-level street greenery.

The experiments have 7 parts. In the first part the participants will be asked about their place of residency and time of residency, in the second part they will be asked about their demographic data. In the third part they will be asked about their neighbourhood satisfaction and attachment, then in the fourth part about their perceived neighbourhood walkability, in the fifth part about their walking times in their neighbourhoods in the last 7 days, in the sixth and seventh part they will be asked about their subjective hedonic and eudaimonic well-being during walking in their neighbourhoods. No personal information will be released at any stage of this research and all your data will be held in confidence by the researcher.

Part A

A1	The participants have the right to terminate their participation in the research at any time without any explanation.
A2	Participants' decisions to not to volunteer or terminate being part of the research will not influence the nature of the ongoing relationship they may have with the researchers, the involved faculty members, and the nature of their relationship with Bilkent University either now, or in the future.
A3	No personal information will be released at any stage of this research and all the personal data will be held in confidence by the researcher.
A4	The information participants supply, which are directly related to the research, may be published for academic purposes. However, the participants will not be identified, and the personal results will remain confidential.
A5	Participants will be chosen from neighborhood residents.

Part B – Signatures

B1 The Participant

I am ______________________

I have understood the nature of this project and wish to participate. My signatue below indicates my consent.

Signature: **Date:**

B2 The Researcher

I am **Müge Sarıgöl**

I explained the aim, the method and the expected benefits of this research to the perticipant and I admit to preserve the confidentiality of given infomation by the participant and the results of the research.

Signature: ______________________ **Date:** ______________________

(Form Staff_EN*)

Staff Application Form for Experiments with Human Participants

(A separate application form must be completed for each experiment and staff member.)

Please check one: ___ ***I need a formal approval letter for an external agency (TÜBİTAK, etc.)***

X ***An internal communication letter informing me of the approval will be sufficient***

1. Name of applicant (graduate students should indicate their supervisors)

Graduate Student: Müge Sarıgöl; Supervisor: Assoc. Prof. Dr. Yasemin Afacan

2. Funder of grant/studentship if any:

3. Full title of experiment/project

Perceived And Objective Neighbourhood Walkability Impact on Eudaimonic and Hedonic Well-Being While Walking In Equal Eye-Level Street Greenery Neighbourhoods

4. When do you wish to start data collection: ____15.02.2022____________

5. Aims of project:

The aim of this study is to understand how perceived and objective neighbourhood walkability impact eudaimonic and hedonic well-being while walking in equal eye-level street greenery neighbourhoods.

6. What will the participants have to do? (Provide a brief outline of procedure, *for survey work, a copy of the survey should be attached to this form.*) Please indicate if the participants may be exposed to stimuli which may upset them:

The participants of this study will be asked to fill out different questionnaires. They will be asked to sign a consent form at the beginning of the questionnaire. Questionnaire will be held online or with paper in person. The questionnaire comprises the reduced version of Chinese Neighbourhood Environment Walkability Scale, neighbourhood attachment and satisfaction questions, Neighbourhood International Physical Activity Questionnaire, Satisfaction with Travel Scale, and Travel Eudaimonia Scale. Additionally, participants will be asked for information about their age, gender, marital status, working status, car ownership, education status, personal monthly income level, perceived physical limitation and health. The obtained data from the questionnaire will be processed using SPSS software.

7. What sort of people will the participants be and how will they be recruited? In the case of children state age range. (*Any participant who has not lived through his/her 18th birthday is considered to be a child!*)

The participants of this study will be residents of Bahçelievler, Yukarı Bahçelievler, Emek, Sancak, Yıldızevler, and Hilal neighbourhoods. They will be recruited via neighbour municipalities and internet. The minimum number of participants will be 30 people per neighbourhood who are aged above 18 years old.

I have CRB clearance yes / no**

8. Arrangements for consent and debriefing (attach information sheet and consent form)

Participants will be asked to read and sign a consent form, which explains the procedure.

9. How will you guarantee confidentiality of participants?

All the participants of the study will be asked to sign a consent form to satisfy ethical procedures (See consent form attached). The names of the participants will not be asked at any point of the study. All personal information of participants obtained during the research will be held in confidence by the researcher.

* Adapted from *www.york.ac.uk/depts/psych/www/research/ethics/StaffPGEthicsForm.doc*

** Criminal Records Bureau – clearance is required for non-university personnel, including students, for experiments involving children. Please attach relevant documentation.

7.5/2/22

Student's signature: ....Müge Sarıgöl................. date: .....25.02.2022.................
(all students must sign if this is a group project, please initial all other pages)

The signatures here signify that researchers will conform to the accepted ethical principles endorsed by relevant professional bodies, in particular to

Declaration of Helsinki (WMA):
http://www.wma.net/en/30publications/10policies/b3/index.html

Ethical Principles of Psychologists and Code of Conduct (APA):
http://www.apa.org/ethics/code2002.html

Ethical Standards for Research with Children (SCRD):
http://www.srcd.org/about-us/ethical-standards-research

2. Supervisor's assessment (supervisor to complete - circle yes or no)

Yes/No - I confirm that I have secured the resources required by this project, including any workshop time, equipment, or space that are additional to those already allocated to me.

Yes/No - The design of this study ensures that the dignity, welfare and safety of the participants will be ensured and that if children or other vulnerable individuals are involved they will be afforded the necessary protection.

Yes/No - All statutory, legislative and other formal requirements of the research have been addressed (e.g., permissions, police checks)

Yes/No - I am confident that the participants will be provided with all necessary information before the study, in the consent form, and after the study in debriefing.

Yes/No - I am confident the participant's confidentiality will be preserved.

Yes/No - I confirm that students involved have sufficient professional competency for this project.

Yes/No - I consider that the risks involved to the student, the participants and any third party are insignificant and carry no special supervisory considerations. If you circle "no" please attach an explanatory note.

No/Yes - I would like the ethics committee to give this proposal particular attention. (Please state why below)

Supervisor's signature: .... date: ...25/02/22

<u>Please e-mail an electronic version of this word processed form (without signatures) along with other application material to the committee to start the evaluation process.</u> Paper copies of all application material, (properly signed where indicated, and initialed on all other pages) should be sent after possible modifications suggested by the committee are finalized.

Bilkent University does not allow the use of students of research investigators as participants. Students who have the potential of being graded by the investigators during or following the semester(s) in which the study is being carried out should not participate in the study. Students may not receive any credit for any university course, with the exception of the GE250/GE251 courses, for their participation. The GE250 and GE251 (Collegiate Activities I and II) courses include an optional activity which encompasses volunteering as a participant in a research project.

MS. 25.02.2022 YA.

(vi) **Consent** Informed consent must be obtained for all participants before they take part in your project. The form should clearly state what they will be doing, drawing attention to anything they could conceivably object to subsequently. It should be in language that the person signing it will understand. It should also state that they can withdraw from the study at any time and the measures you are taking to ensure the confidentiality of data. If children are recruited from schools you will require the permission of the head teacher, and of parents. Children over 14 years should also sign an individual consent form themselves. When testing children you will also need Criminal Records Bureau clearance. Testing to be carried out in any institution (prison, hospital, etc.) will require permission from the appropriate authority. (Please include documentation for such permission.)

Who will you seek permission from?

Participants' full permission will be obtained prior to the experiment. All participants will be aged above 18 years old.

Please attach the consent form you will use. Write the "brief description of study" in the words that you will use to inform the participants here.

The experiments have 7 parts. In the first part the participants will be asked about their place of residency and time of residency, in the second part they will be asked about their demographic data. In the third part they will be asked about their neighbourhood satisfaction and attachment, then in the fourth part about their perceived neighbourhood walkability, in the fifth part about their walking times in their neighbourhoods in the last 7 days, in the sixth and seventh part they will be asked about their subjective hedonic and eudaimonic well-being during walking in their neighbourhoods. No personal information will be released at any stage of this research and all your data will be held in confidence by the researcher.

(vii) **Debriefing - how and when will participants be informed about the experiment, and what information you intend to provide? If there is any chance that a participant will be 'upset' by taking part in the experiment what measures will you take to mitigate this?**

Participants will be asked to read and sign a consent form, which explains the procedure.

(viii) **What procedures will you follow in order to guarantee the confidentiality of participants' data?** Personal data (name, addresses etc.) should only be stored if absolutely necessary and then only in such a way that they cannot be associated with the participant's experimental data.

All the participants of the study will be asked to sign a consent form to satisfy ethical procedures (See consent form attached). The names of the participants will not be asked at any point of the study. All personal information of participants obtained during the research will be held in confidence by the researcher.

(vii) **Give brief details of other special issues the ethics committee should be aware of.**

(viii) **Tick any of the following that apply to your project**

[ ] it uses Bilkent facilities;
[ ] it uses stimuli designed to be emotive or aversive;
[ ] it requires participants to ingest substances (e.g., alcohol);
[x] it require participants to give information of a personal nature;
[ ] it involves children or other vulnerable individuals;
[ ] it could put you or someone else at risk of injury.

YA.
23.02.2022

10. Please e-mail an electronic version of this word processed form (without signatures) along with other application material to the committee to start the evaluation process. Paper copies of all application material, (properly signed where indicated, and initialed on all other pages) should be sent after possible modifications suggested by the committee are finalized.

Signature(s):

Person carrying out the work

... Müge Sarıgöl..

Supervisor, grant holder, or Principal Investigator: I am satisfied that that the procedures adopted will ensure the dignity, welfare and safety of all participants in this work.

.......................Yasemin Acar.....................................

The signature above signifies that researchers will conform to the accepted ethical principles endorsed by relevant professional bodies, in particular to

Declaration of Helsinki (WMA):
https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/

Ethical Principles of Psychologists and Code of Conduct (APA):
http://www.apa.org/ethics/code2002.html

Ethical Standards for Research with Children (SCRD):
http://www.srcd.org/about-us/ethical-standards-research

Bilkent University does not allow the use of students of research investigators as participants. Students who have the potential of being graded by the investigators during or following the semester(s) in which the study is being carried out should not participate in the study. Students may not receive any credit for any university course, with the exception of the GE250/GE251 courses, for their participation. The GE250 and GE251 (Collegiate Activities I and II) courses include an optional activity which encompasses volunteering as a participant in a research project.

YA.

APPENDIX B

THE SURVEY INSTRUMENT (ENGLISH)

You are invited to participate in a survey on your well-being and the walkability of your neighborhood. Before making a decision, it is important to understand why this research was conducted and what it will include. Please take the time to read the information below and talk to others if you wish. Consider if there is anything unclear or if you want more information.

Research Title: Perceived and Objective Neighbourhood Walkability Impact on Eudaimonic and Hedonic Well-Being While Walking In Equal Eye-Level Street Greenery Neighborhoods

What is the purpose of the project?
The aim of this study is to gain knowledge about the perceived walkability of the neighborhoods and subjective well-being during their last walks in their neighborhoods through subjective evaluations of the residents . This survey study is specific to six neighborhoods in Çankaya District in Ankara: Bahçelievler, Yukarı Bahçelievler, Emek, Sancak, Hilal, and Yıldızevler Neighborhoods. If you do not live in these neighborhoods, you may not take the survey.

Why was I chosen?
You have been asked to attend because you are a local resident the neighborhoods mentioned above.

Do I have to attend?
Participation in this study is voluntary, you may withdraw at any stage of the study.

What should I do?
If you agree to participate in the survey, you will be asked to fill out the questionnaire reporting your subjective judgments about walking in your neighborhood, and your well-being during your recent walk in your neighborhood. If necessary, take a walk around your neighborhood before filling the questionnaire.
You will also be asked to answer demographic questions and questions about your neighborhood.
The survey takes about 5-7 minutes; but since there is no time limit, you can use as much time as you want.
The survey language is Turkish.

Are there any downsides to participating?
There is no predictable disadvantage for your participation. If you are unhappy or have more doubts at any stage of the survey, please address your concerns first to the researcher by sending an e-mail (muge.sarigol@bilkent.edu.tr) to the researcher. You also have the right to leave the survey at any time.

Will all my information be kept confidential?
Your identity is not asked in the survey. All your data collected during the research will be kept confidential by the researcher and will be handled in accordance with ethical research guidelines.

What will happen to the results of the research study?
Collected data will be analyzed by SPSS and other statistical analysis programs. The results of these analyzes can be published in master's thesis, conference reports and / or journal articles; however, all information will be kept strictly confidential and anonymized. Your data will be stored in a secure system.

Will I be paid to participate in the research?
No, you will not be paid.

Where and how can survey questions be answered?
You can access and answer survey questions from anywhere with an internet connection.

Who can be contacted for more information?
Name and Contact Information of the Researcher: Interior Architect Müge SARIGÖL
(muge.sarigol@bilkent.edu.tr)

On-line Survey Link: https://forms.gle/hoFy75RupFNu5MU96

Date:	Participant No:
PART 1: RESIDENCE INFORMATION	
Place of Residence (Neighborhood) ☐ Bahçelievler ☐ Yukarı Bahçelievler ☐ Emek ☐ Yıldızevler ☐ Hilal ☐ Sancak	**Period of Residence (By Years)** ☐ Less than 1 years ☐ 1 to 5 years ☐ 5 to 10 Years ☐ More than 10 years
Name of your street: ____	

PART 2: DEMOGRAPHIC INFORMATION		
Age: ___ (in numbers)	**Gender:** ☐ Female ☐ Male	**Marital Status:** ☐ Single ☐ Married ☐ Widow
Working Status: ☐ Employed ☐ Unemployed ☐ Retired	**Car Ownership** ☐ I own a car ☐ I do not own car	**Education Status:** ☐ Primary school & below ☐ Middle school ☐ High school ☐ University & above

Do you have a physical limitation?

☐ Could not do physical activity ☐ Quite a lot ☐ Somewhat ☐ Very little ☐ Not at all

Health

	0	1	2	3	4	5	6	7	8	9	10	
Very unhealthy	○	○	○	○	○	○	○	○	○	○	○	Very healthy

PART 3: NEIGHBORHOOD ATTACHMENT AND SATISFACTION

NA. How attached do you feel to your neighborhood?

	1	2	3	4	5	
Not at all	○	○	○	○	○	A great deal

NS. How well does your neighborhood meet your current needs?

	1	2	3	4	5	
Extremely poor	○	○	○	○	○	Extremely well

PART 4: PERCEIVED NEIGHBORHOOD WALKABILITY

Please indicate how much you agree/disagree with following statements.

W1. There are many places to go within walking distance at my home.

☐ Strongly disagree ☐ Disagree ☐ Agree ☐ Strongly agree

W2. The streets in my neighborhood are hilly, making my neighborhood difficult to walk in.

☐ Strongly disagree ☐ Disagree ☐ Agree ☐ Strongly agree

W3. There are many alternative routes for getting from place to place in my neighborhood.

☐ Strongly disagree ☐ Disagree ☐ Agree ☐ Strongly agree

W4. There are sidewalks on most of the streets in my neighborhood.

☐ Strongly disagree ☐ Disagree ☐ Agree ☐ Strongly agree

W5. There are covered bridges in my neighborhood.

☐ Strongly disagree ☐ Disagree ☐ Agree ☐ Strongly agree

W6. There are indoor, air-conditioned places (shopping malls) where people can walk.

☐ Strongly disagree ☐ Disagree ☐ Agree ☐ Strongly agree

W7. There are trees along the streets in my neighborhood.

☐ Strongly disagree ☐ Disagree ☐ Agree ☐ Strongly agree

W8. There is so much traffic along nearby streets that it makes it difficult or unpleasant to walk in my neighborhood.

☐ Strongly disagree ☐ Disagree ☐ Agree ☐ Strongly agree

W9. There is a high crime rate in my neighborhood which makes it unsafe to go on walks during the day or at night.

☐ Strongly disagree ☐ Disagree ☐ Agree ☐ Strongly agree

Did you walk in your neighborhood in the last 7 days?

☐ Yes

☐ No

PART 5: NEIGHBORHOOD WALKING TIME

T1. During the last 7 days, on how many days did you walk to go from place to place inside your neighbourhood?

___ days per week

T2. How much time did you usually spend on one of those days walking from place to place inside your neighbourhood?

___ hours per day

___ minutes per day

T3. Not counting any walking you have already mentioned, during the last 7 days, on how many days did you walk for recreation, leisure, or exercise inside your neighbourhood?

___ days per week

T4. How much time did you usually spend on one of those days walking for recreation, leisure, or exercise inside your neighbourhood?

___ hours per day

___ minutes per day

PART 6: HEDONIC WELL-BEING DURING WALKING

Thinking about yourself and your most recent walk in your neighborhood, indicate to what extent you felt while walking the followings:

	1	2	3	4	5	6	7	
Bored	○	○	○	○	○	○	○	Enthusiastic
Disengaged	○	○	○	○	○	○	○	Engaged
Tired	○	○	○	○	○	○	○	Energized
Stressed	○	○	○	○	○	○	○	Calm
Tense	○	○	○	○	○	○	○	Relaxed
My trip was the worst I can think of.	○	○	○	○	○	○	○	My trip was the best I can think of.
My trip was displeasing.	○	○	○	○	○	○	○	My trip was enjoyable.

PART 7: EUDAIMONIC WELL-BEING DURING WALKING

E1. Thinking about your most recent walk in your neighborhood, did walking allow you, at least a little bit to fulfill your desire for...

	Yes	No
Variety	◯	◯
Control	◯	◯
Adventure	◯	◯
Companionship	◯	◯
Freedom	◯	◯
Privacy	◯	◯
Safety	◯	◯
Comfort	◯	◯
Stress relief	◯	◯
A routine	◯	◯
A challenge	◯	◯
Membership in a group or class	◯	◯

E2. Thinking about your most recent walk in your neighborhood, did walking allow you, at least a little bit to express your...

	Yes	No
Independence	◯	◯
Social status	◯	◯
Self-identity	◯	◯
Courage	◯	◯
Mastery of a skill	◯	◯
Environmental status	◯	◯

E3. Thinking about your most recent walk in your neighborhood, did walking allow you, at least a little bit to improve your...

	Yes	No
Self-confidence	◯	◯
Mental health	◯	◯
Physical health	◯	◯

APPENDIX C

THE SURVEY INSTRUMENT (TURKISH)

Mahallenizin yürünebilirliği ve yürürken nasıl hissettiğiniz hakkında bir ankete katılmaya davetlisiniz. Bir karar vermeden önce, bu araştırmanın neden yapıldığını ve neleri içereceğini anlamak önemlidir. Lütfen aşağıdaki bilgileri okumak için zaman ayırın ve isterseniz başkalarıyla konuşun. Belirsiz bir şey olup olmadığını veya daha fazla bilgi isteyip istemediğinizi düşünün.

Araştırma Başlığı: Göz Hizası Sokak Yeşilliği Aynı Miktardaki Mahallelerde Yürürken Sübjektif ve Objektif Yürünebilirliğin Hedonik ve Eudaimonik İyiliğe Etkisi

Projenin amacı nedir?
Bu çalışmanın amacı, mahalle sakinlerinin öznel değerlendirmeleri yoluyla mahallelerin algılanan yürünebilirlikleri ve mahallelerinde son yürüyüşlerinde öznel iyi oluşları hakkında bilgi edinmektir. Bu anket çalışması Ankara ili Çankaya bölgesindeki altı mahalleye özeldir: Bahçelievler, Yukarı Bahçelievler, Emek, Sancak, Hilal ve Yıldızevler Mahalleleri. Bu mahallelerde yaşamıyorsanız ankete katılmayabilirsiniz.

Neden seçildim?
Yukarıda belirtilen mahallelerde ikamet ettiğiniz için katılmanız istendi.

Katılmak zorunda mıyım?
Bu çalışmaya katılım isteğe bağlıdır, istediğiniz aşamada çalışmadan çekilebilirsiniz.

Ne yapmalıyım?
Ankete katılmayı kabul ederseniz, mahallenizde yürüyüşe ilişkin öznel yargılarınızı ve mahallenizdeki son yürüyüşünüz sırasındaki refahınızı bildiren anketi doldurmanız istenecektir. Gerekirse, anketi doldurmadan önce mahallenizde dolaşın. Ayrıca demografik soruları ve mahallenizle ilgili soruları yanıtlamanız istenecektir. Anket yaklaşık 5-7 dakika sürer; ancak süre sınırı olmadığı için istediğiniz kadar zaman kullanabilirsiniz. Anket dili Türkçedir.

Katılmanın herhangi bir dezavantajı var mı?
Katılımınız için öngörülebilir bir dezavantaj yoktur. Anketin herhangi bir aşamasında memnun değilseniz veya daha fazla şüpheniz varsa, lütfen araştırmacıya bir e-posta (muge.sarigol @bilkent.edu.tr) göndererek endişelerinizi öncelikle araştırmacıya iletin. Ayrıca istediğiniz zaman anketten ayrılma hakkına da sahipsiniz.

Bilgilerim gizli tutulacak mı?
Ankette kimliğiniz sorulmamaktadır. Araştırma süresince toplanan tüm verileriniz araştırmacı tarafından gizli tutulacak ve etik araştırma yönergelerine uygun olarak ele alınacaktır.

Araştırma çalışmasının sonuçlarına ne olacak?
Toplanan veriler SPSS ve diğer istatistiksel analiz programları tarafından analiz edilecektir. Bu analizlerin sonuçları yüksek lisans tezi, konferans raporları ve/veya dergi makalelerinde yayınlanabilir; ancak, tüm bilgiler kesinlikle gizli tutulacak ve anonim hale getirilecektir. Verileriniz güvenli bir sistemde saklanacaktır.

Araştırmaya katılmak için bana ödeme yapılacak mı?
Hayır, size ödeme yapılmayacaktır.

Anket soruları nerede ve nasıl yanıtlanabilir?
Anket sorularına internet bağlantısı olan her yerden ulaşabilir ve cevaplayabilirsiniz.

Daha fazla bilgi için kiminle iletişime geçilebilir?
Araştırmacının Adı ve İletişim Bilgileri: İç Mimar Müge SARIGÖL (muge.sarigol@bilkent.edu.tr)

Çevrimiçi Anket Bağlantısı: https://forms.gle/hoFy75RupFNu5MU96

Tarih:	Katılımcı Numarası:

1. KISIM: İKAMET BİLGİLERİ

İkamet Yeri (Mahalle)	**İkamet Süresi (Yıl Olarak)**
☐ Bahçelievler ☐ Yukarı Bahçelievler ☐ Emek ☐ Yıldızevler ☐ Hilal ☐ Sancak	☐ 1 yıldan az ☐ 1-5 yıl arası ☐ 5-10 yıl arası ☐ 10 yıldan fazla

İkamet ettiğiniz sokak: ____

2. KISIM: DEMOGRAFİK BİLGİLER

Yaşınız: ____	**Cinsiyetiniz:**	**Medeni Haliniz:**
	☐ Kadın ☐ Erkek	☐ Bekar ☐ Evli ☐ Dul

Çalışma Durumunuz:	**Otomobil Sahipliğiniz:**	**Eğitim Dereceniz:**
☐ Çalışan ☐ İşsiz ☐ Emekli	☐ Otomobilim var ☐ Otomobilim yok	☐ İlkokul ve altı ☐ Ortaokul ☐ Lise ya da Dengi Okul ☐ Yüksekokul / Üniversite

Fiziksel bir sınırlamanız/engeliniz var mı?

☐ Fiziksel aktivite yapamayacak derecede	☐ Oldukça fazla	☐ Biraz	☐ Çok az	☐ Hiç

Sağlık durumunuz:

	0	1	2	3	4	5	6	7	8	9	10	
Çok sağlıksız	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Çok sağlıklı

3. KISIM: MAHALLE BAĞLILIĞI VE MEMNUNİYETİ

NA. Mahallenize ne kadar bağlı hissediyorsunuz?

	1	2	3	4	5	
Hiç	◯	◯	◯	◯	◯	Bir hayli

NS. Mahalleniz mevcut ihtiyaçlarınızı ne kadar iyi karşılıyor?

	1	2	3	4	5	
Son derece kötü	◯	◯	◯	◯	◯	Son derece iyi

4. KISIM: ALGILANAN MAHALLE YÜRÜNEBİLİRLİĞİ

Lütfen aşağıdaki ifadelere ne kadar katıldığınızı/katılmadığınızı belirtiniz.

W1. Evime yürüme mesafesinde gidilecek çok yer var.

☐ Kesinlikle katılmıyorum ☐ Katılmıyorum ☐ Katılıyorum ☐ Kesinlikle katılıyorum

W2. Mahallemdeki sokaklar engebeli, mahallemde yürümeyi zorlaştırıyor.

☐ Kesinlikle katılmıyorum ☐ Katılmıyorum ☐ Katılıyorum ☐ Kesinlikle katılıyorum

W3. Mahallemde bir yerden diğer bir yere yürüyerek ulaşmak için birçok alternatif yol var.

☐ Kesinlikle katılmıyorum ☐ Katılmıyorum ☐ Katılıyorum ☐ Kesinlikle katılıyorum

W4. Mahallemdeki sokakların çoğunda kaldırım var.

☐ Kesinlikle katılmıyorum ☐ Katılmıyorum ☐ Katılıyorum ☐ Kesinlikle katılıyorum

W5. Mahallemde üstü kapalı köprüler var.

☐ Kesinlikle katılmıyorum ☐ Katılmıyorum ☐ Katılıyorum ☐ Kesinlikle katılıyorum

W6. Mahallemde insanların yürüyebileceği kapalı, klimalı yerler (alışveriş merkezleri) var.

☐ Kesinlikle katılmıyorum ☐ Katılmıyorum ☐ Katılıyorum ☐ Kesinlikle katılıyorum

W7. Mahallemin sokaklarında ağaçlar var.

☐ Kesinlikle katılmıyorum ☐ Katılmıyorum ☐ Katılıyorum ☐ Kesinlikle katılıyorum

W8. Sokaklarda o kadar çok trafik var ki mahallemde yürümeyi zorlaştırıyor veya tatsız hale getiriyor.

☐ Kesinlikle katılmıyorum ☐ Katılmıyorum ☐ Katılıyorum ☐ Kesinlikle katılıyorum

W9. Mahallemde gündüz veya gece yürüyüşe çıkmayı güvensiz kılan yüksek bir suç oranı var.

☐ Kesinlikle katılmıyorum ☐ Katılmıyorum ☐ Katılıyorum ☐ Kesinlikle katılıyorum

Son 7 gün içinde mahallenizde yürüdünüz mü?

☐ Evet
☐ Hayır

5. KISIM: MAHALLEDE YÜRÜME SÜRESİ

T1. Son 7 gün içinde mahallenizde bir yerden bir yere gitmek için haftanın kaç günü yürüdünüz?

Haftada___ gün

T2. Mahallenizde bir yerden bir yere yürüdüğünüz o günlerden birinde genellikle ne kadar zaman harcardınız?

Günde___ saat

Günde___ dakika

T3. Son 7 gün içinde daha önce bahsettiğiniz yürüyüşleri saymazsak, mahallenizde dinlenme, keyif veya egzersiz amaçlı haftanın kaç günü yürüdünüz?

Haftada___ gün

T4. Mahallenizde dinlenme, keyif veya egzersiz amaçlı yürüdüğünüz o günlerden birinde genellikle ne kadar zaman harcardınız?

Günde ___ saat

Günde ___ dakika

6. KISIM: YÜRÜYÜŞ SIRASINDA HEDONİK İYİLİK

Kendinizi ve mahallenizde en yakın zamanda yaptığınız yürüyüşü düşünerek, yürürken aşağıdakileri ne ölçüde hissettiğinizi belirtin:

	1	2	3	4	5	6	7	
Sıkılmış	○	○	○	○	○	○	○	Heyecanlı
İlgisiz	○	○	○	○	○	○	○	İlgili
Yorgun	○	○	○	○	○	○	○	Enerjik
Stresli	○	○	○	○	○	○	○	Sakin
Gergin	○	○	○	○	○	○	○	Rahat
Yolculuğum düşünebileceğimin en kötüsüydü.	○	○	○	○	○	○	○	Yolculuğum düşünebileceğimin en iyisiydi.
Yolculuğum keyifsiz geçti.	○	○	○	○	○	○	○	Yolculuğum keyifli geçti.

7. KISIM: YÜRÜYÜŞ SIRASINDA EUDAİMONİK İYİLİK

E1. Mahallenizdeki en son yürüyüşünüzü düşününce, yürümek, en azından biraz olsun, aşağıdakilere yönelik arzularınızı yerine getirmenize izin verdi mi?

	Evet	Hayır
Çeşitlilik	○	○
Kontrol	○	○
Macera	○	○
Arkadaşlık	○	○
Özgürlük	○	○
Mahremiyet	○	○
Emniyet	○	○
Konfor	○	○
Gerginlik atma	○	○
Rutin	○	○
Mücadele	○	○
Bir gruba veya sınıfa üyelik	○	○

E2. Mahallenizdeki en son yürüyüşünüzü düşününce, yürümek, en azından biraz olsun, aşağıdakileri ifade etmenize izin verdi mi?

	Evet	Hayır
Bağımsızlık	○	○
Sosyal statü	○	○
Öz kimlik	○	○
Cesaret	○	○
Bir beceride ustalaşma	○	○
Çevresel statü	○	○

E3. Mahallenizdeki en son yürüyüşünüzü düşününce, yürümek, en azından biraz olsun, aşağıdakileri geliştirmenize izin verdi mi?

	Evet	Hayır
Özgüven	○	○
Akıl sağlığı	○	○
Fiziksel sağlık	○	○