Multidimensional analyses of walkability in city centres by using mobile methodologies: Beşiktaş and Delft experiences

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Abstract
This study is seeking an answer to the main research question of how the walkability of urban space can be analysed with a multidimensional approach considering spatial, phenomenological and perception dimensions. “Mobile Methodologies” has been the base of this research and within this scope, “Go-Along” walks with participants were conducted in the city centres of Beşiktaş of Istanbul, Turkey, and Delft of Netherlands as part of case studies. Based on the urban comparable studies approach, spatial and temporal comparisons of the city centres of Beşiktaş and Delft were made by using “replication logic”. Within the framework of this research, walkability studies in the literature were studied and six indicators as security, traffic safety, accessibility, comfort, pleasure and mixed-use were identified. These main indicators were used in the evaluation phase of case studies. According to the findings, it was concluded that walkability should be studied with a multidimensional approach and a relational perspective. In addition to this major conclusion, the necessity to use mobile methods for walkability analyses was described as the second significant result of the study.

Keywords Walking · Walkability · Mobile methodologies · Go-along · Pedestrian perception · Comparable urban studies

Introduction
Walking is one of the basic modes of mobility in human history, and is a phenomenon that has various motivations and dimensions such as being physically active, thinking and meditating, rebelling and protesting, exploring or wandering, in addition to reaching destinations. Whether in nature or urban areas, walking is one of the most liberating modes of active mobility. The role and place of walking in human history have transformed, gained different meanings, weakened by the development of motorized transportation. Nowadays walking has started to be rediscovered again. In recent years, the interest in research for making cities walkable has increased, and studies on this topic in various disciplines such as urban planning, architecture, sociology, and psychology have been made. Some of these studies are focussed on physical qualities and quantitative measurements (Krambeck 2006; Duncan et al. 2011; Lee and Talen 2014; Forsyth 2015), while others are focussed on the phenomenological meaning or perception dimension based on the claim that it may not be possible to quantify the experience and emotions of walking (Ewing and Handy 2009; Riggs 2017).

In the literature, it has been seen that walkability studies are mainly focussed on only a single dimension thus there is a limited number of studies that are focussed on both physical qualities and pedestrians’ perception. Related to this observation, this study is based on the hypothesis that “creating more walkable places in cities paves the way for encouraging people to walk more and improves pedestrian mobility. Making analyses to improve walkability in cities requires a multidimensional approach considering both the spatial and the pedestrian perception dimensions of walkability”. Based on this hypothesis, this study is seeking an answer to the main research question “How can walkability of an urban space be analysed with a multidimensional approach by using mobile methodologies?”. Within this scope, this study evaluates the walkability in a city with a holistic and relational approach through spatial, phenomenological, and perception dimensions. The spatial dimension includes the possibilities offered by the cities for the realization of the walking behaviour in line with their physical and social characteristics and configurations. This dimension, which consists of basic features such as urban functions,
urban fabric, transportation connections, topography features, demographic structure, and similar basic features, interacts with perceptual and phenomenological dimensions. The phenomenological dimension, which plays a role in the emergence of walking behaviour, includes the perceptions, the habits and the meanings that individuals attribute to walking in their daily lives, both related to and independent from the place. The perceptual dimension of the walkability of the space corresponds to the perception formed as a result of the combination of many sensory factors such as climatic, auditory and visual, which all contribute to the development of the perception that the space is walkable.

In addition to the multidimensional analysis approach, the necessity of approaching walkability analyses methodically in a different way has come to the fore in the study. Mobile methods, applied on the go, fill a gap for ground-based researches by discovering points in situ that would not come to mind in stationary methods, recalling memories, and getting more detailed answers by evoking ideas. Starting from this point, the "Mobile Methods" approach was taken as a basis for this study. In addition, an answer was sought to the sub-research question "How can mobile methods contribute to the analysis of the walkability of an urban space?". In this context, walks were held with the participants in the city centres selected for the fieldwork using the "Go-Along" method. The walks were carried out by the researcher and the participant regarding the walking experience in the space. This experience has turned out to be the method that opened important doors for the walkability analysis.

As a result of the literature review for this research, certain common indicators were determined from walkability studies as safety, traffic safety, accessibility, comfort, attractiveness, and mixed-use. These indicators were accepted as the main indicators for all three dimensions of the study as given in Fig. 1. Based on these selected indicators, a comparative field study was designed to examine the walking experience with the mobile methods approach. It was aimed to conduct a comparative and relational field study to see how the walkability indicators identified from the literature work in two cities with different conditions and to identify the factors affecting walking experience and perception. In this direction, field studies were carried out with the

Fig. 1 The Research Design of the Study
"replication logic" in the city centres of Beşiktaş district in Turkey-Istanbul and the city of Delft in the Netherlands. The data collected on the walking experience with the "Go-Along" method in the city centres of Beşiktaş and Delft, which have similar and different dynamics, were interpreted relationally with a multidimensional approach for the basic indicators of walkability.

The main limitation of the study was the Covid-19 pandemic that emerged during the research process. This research was active during the Covid-19 outbreak, which was declared as a worldwide pandemic in March 2020. Due to the limitations of the pandemic on daily lives, the design of the research had to be revised and the pandemic was included as a new dynamic in the research. In this way, it was aimed to move the pandemic beyond being a limitation and make it an input to the study, and it became possible to test the perception of walkability during uncertain conditions such as a global pandemic. Within this scope, a new research question as “How do walking experience and perception in cities change during uncertainty times?” was added to the study. This new question reformed the sub-question of “How can a comparative analyse of walkability in different cities contribute to the literature?” by adding a temporal comparison, thus exploring its effects on walking before and during the pandemic became another goal. With the inclusion of the pandemic, the final version of the research design is illustrated in Fig. 1.

The other limitation of the study due to the Covid-19 Pandemic was about recruiting participants. Before the pandemic, it was aimed to recruit at least 20 participants from each city and reach 40 interviews in total. Since it was not possible to find more participants due to the Covid-19 pandemic restrictions, increasing the number of interviews was aimed and 38 interviews were made with 20 participants in total before and during the pandemic. Therefore, the discussion of this study focuses on generating and testing an analyse method for walkability rather than representing the population of field studies.

In order to control and reduce the effects of the Covid-19 pandemic, Turkey and the Netherlands, like all countries in the world, made various restrictions in line with their own dynamics. At the time of the study, schools were closed, and online education was started, commercial businesses in the food sector such as cafes and restaurants, cultural centres and sports facilities were closed, and crowded events were prohibited both in Turkey and the Netherlands. As a result, Beşiktaş and Delft city centres lost their vitality in the period of this research, the density of vehicles, and pedestrians decreased. The city centres took on a much calmer and quieter atmosphere than before the pandemic. Besides these, it is important to note that, unlike the Netherlands, in Turkey a curfew had been declared for citizens over the age of 65 in the whole country, and in Istanbul, on the weekend for everyone, and in this process, access to public areas such as parks and beaches were prohibited. On the other hand, the Netherlands implemented restrictions called "intelligent lockdown" (de Haas et al. 2020) which can be described as looser than similar restrictions in Turkey.

In the first part of the paper, a brief literature review of walkability will be given, and basic indicators of walkability obtained from the literature will be defined. After the literature review, the main methodology used for this research which is the mobile methodologies and "Go-Along" method will be explained. Following the section on methodology, the comparative field study carried out in Beşiktaş and in Delft city centres will be presented and an analysis of the data obtained will be given. After the section on the field study, a relational and holistic evaluation of the findings will be discussed. The paper will then be concluded with a new modal suggestion regarding a multidimensional and relational analysis of walkability.

Walkability in the literature and basic indicators of walkability

The concept of walkability can be described as the state of being convenient for walking behaviour. The term walkability refers to the physical conditions that affect walking behaviour and the quality of walking as well as non-physical qualities such as levels of comfort, safety and pleasant walking (Litman 2004). Walkability is closely related to how walkable a place is, how much it encourages walking behaviour and how much it provides the necessary conditions for walking. In other words, walkability defines how pedestrian-friendly an urban environment is. Environments that provide the necessary opportunities for the presence of walking behaviour and give priority to pedestrians in the transportation system are considered as pedestrian-friendly and walkable.

Studies about walkability in the literature vary between studies focussing on physical qualities that provide walkability and studies examining the perception of walkability. Studies focussing on the physical qualities mostly aim to measure or audit walkability (Southworth 2005; Forsyth and Southworth 2008; Cubukcu 2013; Forsyth 2015). These quantitative studies mainly focus on discovering and measuring the indicators that make a place walkable. Studies like The Global Walkability Index (Krambeck 2006), Walk Score (Duncan et al. 2011), and Walkability Audit (Department of Transport, 2011) are defining lists of walkability indicators and rating places according to these main indicators to determine the walkability level of a place. Yusuf and Waheed (Yusuf and Waheed 2015) developed a modified walkability index named “Local Walkability Index” for measuring walkability along with the Global Walkability Index and
Mehta (2008) studied the process of walking behaviour by making process of walking behaviour (Alfonzo 2005). and how walking behaviour occurs. Alfonzo (2005) presents how people perceive the environment they are walking in and neighbourhood design and walking behaviour (Owen et al. (2019). There are also studies at neighbourhood scale that investigate the relationship between walkability and work distinct pedestrian groups for exploring walkability scores at street level, and Asadi-Shekari et e. (2019) proposes a new model for evaluating and improving urban streets, focussing on inclusive pedestrian facilities (Asadi-Shekari et al. 2019). There are also studies at neighbourhood scale that investigate the relationship between neighbourhood design and walking behaviour (Owen et al. 2007; Zhao and Wan 2020). All the mentioned methods reveal technical analysis and are usually performed by experts in their fields.

Besides, there are perception-based studies focussing on how people perceive the environment they are walking in and how walking behaviour occurs. Alfonzo (2005) presents a hierarchy of walking needs for understanding the decision-making process of walking behaviour (Alfonzo 2005). Mehta (2008) studied the process of walking behaviour by taking into consideration user perception and street characteristics on main streets (Mehta 2008). Zacharias (Zacharias 2001) studied the relationship between walking behaviour and perception, while Lee and Talen (Lee and Talen 2014) proposed a hybrid auditing method that combines a GIS-based approach with the pedestrian perspective. Villavecce et al. (Villavecce et al. 2012) focussed on pedestrians’ perceptions of walking in terms of safety in relation to the built environment, while Lindelöw et al. (Lindelöw et al. 2014) explored perceptions of walking in the environment and in the context of everyday activities. Leslie et al. (2014) worked at neighbourhood scale and compared perceptions of pedestrians in different neighbourhoods (Leslie et al. 2005). On the other hand, Park, Deakin, and Lee (Park et al. 2014) developed a perception-based composite walkability index for evaluating the walking environment and discovered pedestrians’ perceptions in micro level, the same as Arshad et al (2016) investigate gender differences in pedestrian perception at street level (Arshad et al. 2016). Lee and Dean (2018) focussed on user groups and investigated the relationship between objective and subjective measures of walkability for seniors (Lee and Dean 2018). These studies focus on user experience and analyse the walking behaviours and perceptions of individuals. Within the scope of these studies, different research are conducted to explore the perceptions of pedestrians about the phenomenon of walking and the way they perceive the space they walk in.

In the literature, there are also studies both focussed on physical and perception-based dimensions of walkability. These studies draw attention to the lack of considering these dimensions separately from each other and emphasize the necessity of considering the concept of walkability with its different dimensions for drawing attention to the fact that physical and perceptual dimensions constitute a whole measure. For example, Ewing and Handy (2009) suggested a framework for studying walking behaviour considering physical features (Ewing and Handy 2009), urban design qualities and individual reactions as a whole. Lee and Dean (2018) studied the relationship between objective and subjective measures of walkability considering physical, personal and environmental dimensions (Lee and Dean 2018). In addition, Üstündağ (Üstündağ 2002) suggested studying physical and social indicators as a whole. In the same way, Yazıcıoğlu Halu and Yürekli (Yazıcıoğlu Halu and Yürekli 2011) emphasised to study the walkability with spatial, individual, social and regional features. On the other hand, Brown et al. (2007) studied pedestrian perception by using Irvine Minnesota physical environment audit tool and guided walks together (Brown et al. 2007). These studies indicate that it is possible to find detailed clues about creating more walkable spaces with a multidimensional approach, and therefore, this research study is based on this point of view related to the literature.

The literature review of walkability has shown that there are some basic and common indicators that make a space walkable. A content analyses of the walkability literature were made to filter and group the common indicators. This analysis resulted in six main indicators as Safety, Traffic Safety, Accessibility, Comfort, Attractiveness and Mixed-Use. These six common indicators were determined as the main indicators of this study and were used in the multidimensional walkability analysis and for the evaluation of the case studies. These indicators were defined as follows:

**Security** is one of the most crucial needs of walking. Security is related to crime rates, disturbing people in the surrounding, abandoned/ruined buildings and eyes on the street which affect feeling safe while walking.

**Traffic Safety** points to the relationship between pedestrians and other modes of transport. Traffic safety focuses on the intersections of pedestrian and vehicle traffic, and covers all traffic-related factors such as the volume of vehicle traffic, speed limits, and crossings, which affect the feeling of safety while walking and prevent the pedestrian from travelling safely in traffic, risk their life, and cause crashes.

**Accessibility** indicates physical qualities such as the presence of a walkway, the continuity of the pavement, and compliance with standards as well as the existence of urban
services that can be accessed within walking distance. The perception of accessibility can be affected negatively by various obstacles such as table-chair occupation, slope, high walls, or long distances.

Comfort is described as an individual’s feeling of contentment and not feeling any discomfort while walking. Environmental qualities, urban design elements, the presence of urban furniture, situation and maintenance of sidewalks, width and height of sidewalks, intersection with vehicle traffic, pedestrian volume, crowd, shadow, noise etc. are factors affecting the feeling of comfort while walking.

Attractiveness includes all factors that make walking attractive and pleasurable. Architecture, historical buildings, facades, street sections, green elements, trees, colours, human scale, vitality, diversity of functions, visual and aesthetic elements are closely related to attractiveness.

Mixed-Use refers to environments that encourage walking behaviour in terms of urban functions and their diversity. This element, which is emphasized in different ways in the literature, as the diversity of land use or commercial functions, provides a reason for the realization of walking behaviour such as transportation, recreation, shopping or being active.

Methodology of the study: mobile methodologies and go-along

Today, paradigm shifts are affecting scientific studies, and a change is mentioned in the adopted approaches and methods used in research. In particular, the role of the researcher, her/his position in the study and the methods she/he uses change in studies that are place-oriented. Especially in place-oriented studies investigating human–environment relations, the role of the researcher and the methods being used are changing. At this point, the “Mobile Methodologies” approach which is based on Sheller and Urry’s “new mobilities paradigm” (Sheller and Urry 2006) is opening an important new door.

Mobile methodologies, which constitute the basis of this study, aim to carry out research in motion, unlike static methods, to experience the research field one-on-one with the participants, and to produce data while on the go. This methodical approach has become an important method used for research carried out in many fields such as spatial studies, urban mobility, urban history, and urban morphology (Kusenbach 2003; Anderson 2004; Hein et al. 2008; Carpiano 2009; Fincham et al. 2010; Büscher et al. 2011; Evans and Jones 2011; Merriman 2014; Spinney 2015). Within this qualitative method approach, researchers carry out the research in situ and in motion with participants by using mobile techniques. With the help of this approach, more detailed answers can be obtained in research especially in the context of place compared to the studies carried out at the desk. At the same time, it becomes possible to determine the positive and negative experiences of the people about the place in situ, to discover the points that would not come to mind at the desk, to remember memories and evoke ideas by being at the place and to look at the area from a different perspective. Within this scope, there are several methods in the literature as “Go-Alone” (Carpiano 2009; Kusenbach 2003; Merriman 2014; Spinney 2015), “Walking Interviews” (Anderson 2004; Lee and Ingold 2006; Jones et al. 2008; Clark and Emmel 2010; Evans and Jones 2011; Battista and Manaugh 2017), “Guided Walks” (Lashua and Cohen 2010; Evans and Jones 2011; Aksümer 2019), and “Commented Walks” (Layeb 2014; Thibaud 2017). In all these methods, structured or semi-structured mobile interviews can be done while walking, cycling or moving in a vehicle and can be tracked by GPS. Even though all methods have common features as participants being familiar with the place, there are also some distinguishing features between these methods. Go-Along walks mostly follow daily routes while walking interviews, guided walks and commented walks do not have to follow. Participants determine the route in go-along walks and walking interviews, while researchers or participants determine in guided walks and commented walks.

Within the context of the multidimensional analysis of walkability, it was thought that using a mobile method would provide richer and more detailed data, especially in analysing the perceptual dimensions of the walking phenomenon and walkability of the space. Analysing walking, which is a mobile action and an experience, with desk-based methods would contradict the nature of the walking phenomenon. Therefore, walking itself has become the method in this walkability research. For this reason, Mobile Methodologies were accepted as the basic methodological approach of the research and Go-Alone was accepted as the main method. The main reason for choosing the Go-Alone method for studying the walking experience of residents in city centres is that it focuses on the users’ daily routes, that the researcher does not know while the participant is familiar with the place and determines the route (Kusenbach 2003; Carpiano 2009; Merriman 2014; Spinney 2015). By going along with the participants, researchers can capture how participants perceive and interpret the environment, observe them within the spatial context and discover the impressions, experiences and memories they relate to the space (Kusenbach 2003).

In the field study design based on mobile methods, making a comparative study of two cases was aimed in the context of the Comparable Urban Studies approach. Comparative Urban Studies have recently been on the rise again and started to be preferred due to reasons such as the inadequacy of defining cities through sharp distinctions and groupings such as east–west, developed-developing, America–Europe.
and comparing only cities in similar groups, the connection of cities in the global scale, and the flexibility of the concept of scale (Robinson 2002 2011). This approach claims that it is possible to discover new patterns and connections by comparing different cities rather than relatively similar ones. Robinson (2011) emphasises the need to move beyond the relatively narrow focus on global and world cities in a restricted range of economic, social and geographical contexts. Rather than comparing only similar cities, Robinson argues that it is important to make urban experiences debatable in a much broader context by comparing certain elements or processes in cities, the circulations and connections that shape cities. Within this direction, carrying a comparable study of the city centres of Beşiktaş and Delft, which have different geographical, cultural, historical, social and economic backgrounds, is suitable with this approach. With a comparative field study, it is aimed to evaluate the walking experience in two city centres in relation to the multidimensional approach and to identify similar and differentiating patterns affecting walkability. In this direction, field studies were carried out in Beşiktaş and Delft city centres before and during the pandemic with the "replication logic" (Yin 2018).

**Go-along experiences in the city centres of Beşiktaş and Delft**

Within the scope of the study, Sinanpaşa and Türkali neighbourhoods, which form the city centre of Beşiktaş District in Istanbul, Turkey, and Binnenstad, which is the city centre in Delft, Netherlands, were selected for the comparable field study. The reasons behind focussing on city centres are; since these urban areas are places for many different daily walks, they are appropriate for providing data on walking experience and perception. City centres have a high volume of pedestrians due to their commercial and cultural functions and therefore play as a scene of pedestrian journeys for various purposes such as shopping, socializing or reaching urban amenities.

The main reason for choosing Beşiktaş city centre for the field study was complaints of residents about walkability issues. According to the results of Beşiktaş Municipality’s satisfaction survey in 2018, the least satisfying services in the district were inadequacy and inaccessibility of sidewalks and pedestrian roads. In the survey of expected services from Beşiktaş Municipality in 2019, taking measures for pavement occupation, pavement and road maintenance services were in the top five. These data show that pedestrian accessibility and walkability are issues that are crucial to study in the area. In addition to these, Beşiktaş city centre, which is one of the oldest neighbourhoods in Istanbul, has a high volume of pedestrian traffic both on weekdays and weekends due to its residential and commercial urban functions.

After choosing Beşiktaş for field study, Delft city centre Binnenstad was chosen as the second research area. Besides having similar features to Beşiktaş city centre in terms of area size, population of around 12,000 and historical characteristics, Delft sets a good example in terms of walkability with many applications such as slowing down the traffic, creating a car-free city centre, and pedestrianizing streets, which were carried out to increase walkability in the city centre (Van der Spek 2011). In addition to these, Binnenstad was determined as the second field due to being a visiting researcher at TU Delft University within the scope of the study.

Figure 2 illustrates the urban fabric and functions in Beşiktaş and Delft, while Fig. 3 illustrates urban connections and pedestrian areas in these cities.

As the first step of the study, basic spatial analyses of urbanism discipline were made for Beşiktaş district and Delft city centres, and then field studies were carried out as Go-Along walks. In this context, exploring both perceptions of the participants about the phenomenon of walking and their daily walking experiences formed the basis of the fieldwork. In all these walks, which aim to discover the daily walking experience, the routes were determined by the participants. It is aimed to reach the memories, feelings and experiences of the person about the place through the body’s wandering in the space while walking on the routes determined by the participants. This made it possible for the researcher and participants to discover how they experience and make sense of the environment while moving together in the space and to identify the positive and negative factors that encourage them to walk with their reasons on the routes.

In the comparative field study carried out with a total of 20 participants, 10 in both fields; walkability perceptions of the pedestrians were experienced by walking together and walks took an average of 45 min in both city centres. These Go-along routes in two city centres are illustrated in Fig. 4. To learn about the general perceptions of the interviewees about the phenomenon of walking and their walking experiences, three questions were asked before the walk. These three questions were ‘How much do you walk in your daily life? Why/why not do you prefer walking?’ and ‘What are the positive and negative things that affect your walking experience?’. During the walk, ‘Can you describe what you feel, think, and see while walking and how you are affected positively and negatively?’ questions were asked, and a mobile interview was carried out in situ while walking. Field studies were carried out between 19th November and 5th December 2019 in Beşiktaş, and 7 and 14th of March 2020 and 5 and 13th of May 2020 with a break due to the Covid-19 restrictions. The data obtained from the fieldwork were recorded audibly and the transcript was converted to
text by the researcher to be analysed through the Maxqda software used for qualitative analysis. Data were labelled and grouped under six key indicators of walkability defined in the study as well as in positive and negative. Comments such as ‘noisy, crowded, unsafe’ etc. were labelled as negative, while ‘spacious, safe, enjoyable, comfortable’ etc. were
labelled as positive. The findings were interpreted comparatively and relationally. Participants were recruited among the residents of each city by using the snowball method. The interviewees who participated in the walks mostly have a working, young and educated profile between the ages of 26 and 42.

In both field studies, participants’ comments on the walking experience were matched with their spatial locations and visualized on the map. Examples of these walks are given in Fig. 5. According to the weight of the positive and negative comments made during the walk, positive comments on the routes are coloured in green, negative comments are coloured in red, and the parts with equal positive and negative comments are coloured yellow and orange.

In the evaluation phase of the results of Go-Along walks, the outcomes were summarized for the streets that participants took most and illustrated for Beşiktaş case as in Fig. 6 and Delft case as in Fig. 7.

In order to explore the effect of the pandemic on walking experience and habits, online and face-to-face semi-structured interviews were conducted in both fields with 18 participants. The interviewees who had previously participated in the Go-Along study in Beşiktaş were contacted, and eight out of ten participants were reached and interviewed. Seven of the eight participants interviewed during the period of 17 to 25 of April 2020 worked from home during this period, and one participant went to her workplace once a week. In Delft, online interviews were held between 25.04.2020 and 01.05.2020 and face-to-face meetings were held between 05.05.2020 and 13.05.2020 with 10 participants who participated in Go-Along walks. The majority of the participants were able to work from home during the pandemic, while one participant worked from home for the first two weeks of the pandemic, but then started to go to work and one participant returned to her country. None of the participants received a positive diagnosis of Covid-19 during the interviews.

Relational and comparative evaluation of walkability through multidimensional approach

Positive and negative findings of the Beşiktaş and Delft field studies were evaluated multidimensionally and in a comparative way, including spatial, phenomenological and perceptual dimensions, through the basic walkability indicators obtained from the literature review.

In the spatial dimension Beşiktaş and Delft city centres stand out with their sense of security. The majority of the participants stated that they felt safe while walking, which meets one of the most basic conditions for the walking experience.
Fig. 5 Map examples of Go-Along Routes with One of the Interviewers Participating in the Field Study of Beşiktaş City Centre (L) and Delft City Centre (R)

Fig. 6 Summarized Outcomes of the Beşiktaş Case
On the other hand, Beşiktaş and Delft are quite different in terms of traffic safety. The city of Delft converted many streets in the city centre to car-free as a result of its pedestrian priority policies and practices, and the vehicle traffic that remained in the city centre slowed down and decreased by the speed limit applications. Pedestrian nodes and axes formed by mentioned policies provide a safe and comfortable environment for pedestrians’ walking experience. On the other hand, problems mentioned by participants were encountered mainly between pedestrians and cyclists in Delft, which has a safe and strong bicycle network. While in Beşiktaş example, heavy vehicle traffic is one of the leading concerns stated by the participants that negatively affect the walking experience, due to the inadequacy of pedestrian priority policies and practices. Although the pedestrianized streets in the Çarşı district of Beşiktaş create a safe walking experience in terms of traffic safety, those areas are seen as insufficient compared to the pedestrian volume. Due to this situation, pedestrianized areas are densely crowded, and a comfortable walking experience is not possible which was indicated as a problem by most of the participants.

In terms of accessibility, Delft offers a more positive walking experience compared to Beşiktaş with the effect of pedestrian priority policies. The Delft city centre defines a high-quality walking experience with its continuous pavements that have appropriate width and height, smooth surfaces of streets and public squares, and highly accessible pedestrianized areas. On the other hand, the Beşiktaş city centre does not offer an accessible walking experience because of its narrow and discontinuous sidewalks, parked vehicles on sidewalks and occupation of tables and chairs in cafes as stated in Go-Along walks. In terms of accessibility, both cities also have positive features that affect walking, such as strong public transportation and road connections, low slopes in terms of topography, and ability to access urban services within walking distance.

Delft and Beşiktaş city centres also differ in terms of a comfortable walking experience. While the noisy atmosphere with heavy vehicle and pedestrian traffic in Beşiktaş was stated as a negative factor by participants, vehicle and pedestrian crowds did not create a problem for participants in Delft in terms of walking experience, except for the days when the local market is established. At this point, it must be noted that Beşiktaş city centre has a wider area of influence and attraction compared to Delft which has a smaller hinterland and a much quieter, calmer and less crowded atmosphere that is pedestrian-friendly.

In terms of attractive and enjoyable walking experiences, Delft and Beşiktaş show some similar characteristics. Both city centres have diverse commercial functions and mixed usage that make the walking experience both safe and enjoyable. As mentioned in Go-Along walks by participants, the lively atmosphere created by the diversity of functions in both cities makes the walking experience attractive. Old
markets in both city centres, historical buildings with human scale and green elements are additional features that make walking enjoyable for most of the participants. Although Beşiktaş is close to the Bosphorus, the participants did not mention the positive nature of the water element that provides a pleasant walking experience, as in Delft.

During the pandemic, with the effect of different spatial restrictions in both cities, the walking experience in Beşiktaş and Delft city centres was affected in different ways and caused the change of walking routes. In Beşiktaş, the participants could not walk in public places such as parks and coasts due to restrictions and had to change their daily routes. On the other hand, participants in Delft stated that they took walks in parks outside the city centre and started walking for longer distances and times compared to the times before the pandemic. In Beşiktaş, participants started shopping from closer distances, while some of them used shopping as an excuse and extend the walking route. While in Delft, most of the interviewees mentioned that they did not change their daily walking routes much for going shopping but added walking routes for sports purposes. Both cases provide a significant advantage with their commercial activities and functions that are located within walking distance in terms of access to necessities during the pandemic process. The spatial regulations that have restricted or motivated street life during the pandemic in both cities have affected the perception and behaviour of walking. The city centre of Delft already has large percentages of pedestrianized areas. With the additional regulations for spatial applications of 1.5 m distance rule due to the pandemic walking become easier while maintaining social distance. While in Beşiktaş, the lack of spatial arrangements that will respond to the users’ needs and pandemic conditions affected the experience and perception of walking more negatively.

In the phenomenological dimension, there are differences in the walking phenomenon of individuals living in Beşiktaş and Delft who participated in the study. For the participants in Beşiktaş, walking was mentioned as an important part of the daily life as a phenomenon. The participants mentioned that they walk every day for different purposes such as meeting their daily needs, shopping, and transportation other than for pleasure and sports. Since cycling is a more common form of transportation than walking in Delft, walking is not considered a part of daily life as much as in Beşiktaş which can also be determined from the daily walking durations of participants.

While the daily walking average of the participants in Beşiktaş was 30–60 min, the average in Delft was 20–30 min before the pandemic. The participants in Delft mostly prefer to use the bicycle for their daily transportation needs and consider cycling as the primary option and an alternative to walking because of the speed cycling offered. On the other hand, for the participants in Beşiktaş, walking is considered an alternative to crowded public transport and congested traffic. While in Beşiktaş, the phenomenon of walking is associated with concepts such as thinking, feeling good, distracting and daydreaming, the participants in Delft only associated it with mental and physical health and well-being.

It has been found that the elements that encourage walking behaviour are common in both areas. For participants in both cities, natural elements such as trees and water surfaces, historical buildings, scenery, safety, lack of crowds, smooth and sufficiently wide sidewalks, car-free zones, lively atmosphere, human scale and nice weather encourage walking. On the other hand, elements that discourage walking differ at certain points. Crowds, noise, narrow and broken pavements, and intersections with vehicle traffic are common deterrents for the participants in both cities. In Beşiktaş, noise, bad smells, slopes and constructions negatively affect walking for participants, while the intersection with bicycle traffic negatively affects the participants in Delft. This situation is a result of the different conditions of both cities; since Beşiktaş has ongoing constructions, the topography of slopes and noises of heavy pedestrian and vehicle crowds; Delft only faces the effects of heavy bicycle traffic.

Pandemic restriction procedures applied in both countries also affected the walking phenomenon and motivation in different ways. In Beşiktaş, curfews and closure of public spaces such as parks and seaside created an uneasy atmosphere and reduced motivation for walking and restricted walking behaviour. But in Delft, the experience of walking out and moving, being physically active and healthy motivated the participants to walk since they were at home all day. In addition, more flexible pandemic restrictions in Delft defined a more positive atmosphere which created an encouraging environment for walking. Since there were different restrictions in Delft, the walking frequency and habits of the participants did not decrease, on the contrary, they increased with the effect of being inactive at home.

On the other hand, the Covid-19 pandemic brought some changes in the priorities and definitions of walking in both cities. In terms of a good walking experience, the need for safety during the pandemic has become a priority as stated in the interviews for participants in both Beşiktaş and Delft, and the definition of safety has changed from traffic safety and personal security to safety in terms of health. Again, in both cities, participants mentioned that the definition of comfort changed from being uncomfortable in the crowd while walking on pavements, to feeling uncomfortable from the threat of Covid-19. In addition, the definition of accessibility changed from pedestrian access, to accessing services in walking distance.

In the perceptual dimension, it has been observed that the perception and experience of walking differ according to the conditions of the basic walkability indicators. When Beşiktaş and Delft field studies were compared in terms of
walking experience in general, it has been seen that the participants in Beşiktaş made mostly negative comments on walking experience, while the participants in Delft made mostly positive comments. Based on the statements of participants as feeling personally safe while walking and feeling a sense of belonging to the walking areas, both Beşiktaş and Delft stand out as sites that do not pose a problem in terms of security.

Negative comments of participants regarding the walking experience in Beşiktaş focussed mostly on traffic safety, accessibility and comfort indicators. This situation can be associated with the lack of pedestrian-oriented local policies and practices in Beşiktaş. Even though there are limited pedestrian areas in Beşiktaş, implementations did not consider well enough the pedestrian volume and the need for creating more walkable areas. On the other hand, in Delft, statements of participants showed that there are no major problems regarding traffic safety, comfort and accessibility, while comments of the participants focussed more on making walking a more enjoyable experience. Considering that “enjoyment” is the last requirement in “the hierarchy of walking needs” (Alfonzo 2005), Delft can be qualified as a successful example that meets all of the basic needs for a good walking experience. In this respect, the city of Delft owes this situation to the pedestrian-oriented policies implemented after 2000, the efforts to develop a car-free and pedestrian-friendly city centre.

During the pandemic, individuals’ perception of walkability about the places they normally walk also transformed parallel to their walking experiences. This transformation is based on the changes in perceptions and priorities regarding walking and the rising expectations for a healthier and more comfortable walking experience. As a result, participants in Beşiktaş stated that the walking area is not answering their expectations for a more enjoyable and comfortable walking experience anymore. The uneasy and disturbing, tense and strange environment created by the pandemic restrictions in Beşiktaş seems to adversely affect the walking experiences and perceptions of the participants. However, positive changes were also experienced in terms of traffic safety. The interviewees stated that they felt safer and more comfortable while walking due to the decreasing vehicle and pedestrian traffic during the pandemic. On the other hand, in Delft, the perception of walkability regarding the walk-place did not bring negative changes; the participants stated that they felt comfortable, pleasant, peaceful, calm and safe in terms of traffic while walking. Common comments from participants were the decrease in the lively atmosphere in both city centres negatively affected their pleasant walking experiences.

The comparative study, which was carried out in two different sites, Beşiktaş and Delft, proved once again that six basic indicators obtained from the literature are the main factors affecting the walking experience in general. In addition, testing these indicators in two cities with different walkability levels revealed the effects of urban policies on creating walkable spaces for citizens in and around the city centres.

Discussion of a relational system of walkability indicators

As a result of the study, various findings have emerged that there is a relational system between the basic indicators of walkability. In terms of the relationality of walkability indicators, a comparison of findings obtained from the field studies of Beşiktaş and Delft showed that there are similar and differentiating points which are visualized in Fig. 8.

As an example, it has been observed that there are strong relationships between traffic safety and accessibility in both cities. In Beşiktaş, insufficient pavements negatively affect the walking experience especially at intersections of pedestrians and vehicles, while pedestrian priority policies in Delft eliminate the problems related to traffic safety and accessibility. Having to step down to the road at points where the pavement is insufficient is a very common negative experience in Beşiktaş, while it is less common in Delft.

In terms of traffic safety and comfort, there are strong similarities in both city centres. In both cities, areas that are closed to vehicle traffic offer a comfortable walking experience. On the other hand, denser vehicle traffic in Beşiktaş often prevents comfortable walking, in contrast, the low and slow vehicle traffic in Delft creates a basis for comfortable and safe walking. There are also connections between traffic safety, comfort and attractiveness. While in Beşiktaş participants state that they are uncomfortable and do not enjoy walking due to vehicle traffic, participants in Delft state that they can walk comfortably and happily because there is no vehicle traffic.

In terms of accessibility and comfort, some connections affect the walking experience in both cities. While Beşiktaş city centre cannot offer a comfortable walking experience due to its broken, narrow and discontinuous pavements occupied by tables and chairs, Delft offers better physical conditions. In Delft, most of the pedestrian paths and sidewalks meet the criteria of accessibility; however, participants were stating that they cannot walk comfortably due to the narrow sidewalks or parked bicycles on pavements. Accessibility and comfort are also associated with traffic safety, participants state that the sense of traffic safety is weak where the pavements are insufficient in both cities.

Strong connections between comfort, accessibility and attractiveness have been detected in terms of walking experience in both cities. The congested pedestrian crowd was noted as an important negative factor affecting the walking experience, especially in Beşiktaş, while in Delft, it was emphasized only for the weekend and the days when the
local market was set up. Beşiktaş's role as an attractive centre in Istanbul and its large urban hinterland with a denser pedestrian volume has negative effects on the comfortable and pleasurable walking experience. Participants in Beşiktaş mention their feelings of uncomfortable and unpleasant walking experiences as the pavements are not only narrow, but also, they are in addition discontinuous and deformed. However, in Delft, wide enough pavements not only make the walking experience accessible but also makes it enjoyable as it reduces the feeling of uneasiness.

In terms of safety and attractiveness, similar effects occur on the walking experience in both cities. Participants who found the area they walked in safe due to their memories, sense of belonging and community also stated that their walking experience was enjoyable. These data clearly show the effects and importance of spatial perception on
the walking experience. Feeling safe in terms of security allows participants to walk comfortably as well as pleasantly in both cities.

In terms of mixed-use and attractiveness, the sense of vitality created by the commercial functions and the diversity of the urban functions in both cities makes walking attractive. Different cafes and restaurants, shops and other businesses in both Beşiktaş and Delft city centres encourage walking behaviour and make walking enjoyable.

These correlations were also observed during the pandemic period and are shown in Fig. 9. In the Beşiktaş field study, participants stated that they could not walk safely and comfortably due to the heavy traffic before the pandemic, while the participants expressed that a decrease in vehicle traffic and the noise level during the pandemic provided them a more comfortable walking experience. In addition to the vehicle traffic, the high density of pedestrian crowds was seen as an important variable preventing comfortable walking before the pandemic. The decrease in pedestrian traffic during the pandemic reduced the pressure on walking and positively affected the walking experience. In addition, closures of cafes due to pandemic restrictions eliminated the café table-chair occupation on sidewalks. These occupations were seen as important parameters preventing comfortable walking before the pandemic, while the decrease in pedestrian volume during the pandemic improved accessibility and comfortable walking.

However, it has been stated that the closure of cafes and shops decreased vitality and changed the social profile which played a negative role in enjoyable walking experience compared to pre-pandemic times. Some participants commented that the sense of attractiveness and security weakened while walking in the conditions that occurred during the restrictive pandemic period. In terms of comfort and pleasure, participants stated that they were not able to feel comfortable psychologically while walking due to the uneasiness brought by the pandemic concerns and the desire to stay healthy. There are fewer changes observed in Delft regarding the relations among the walkability indicators. Cyclist and pedestrian traffic, as well as vehicle traffic, decreased during the pandemic, which made the walking experience even more comfortable. However, the decrease in the crowd density had a negative effect in the sense of security for some participants who stated as they were worried about the possibility of not having anyone around to help in an emergency during the pandemic period. Closure of cafes and shops due to pandemic restrictions have reduced the liveliness and attractiveness created by the mixed-use of functions while walking in Delft, as in Beşiktaş. In terms of comfort and attractiveness, participants stated that seeing

| DELFT | BEFORE THE PANDEMIC | DURING THE PANDEMIC |
|-------|---------------------|---------------------|
| - a lot of people going on here | - there is a lot of people going on here |
| - I feel satisfy, it's a fun and cozy place to sit and relax | - I feel satisfied, it's a fun and cozy place to sit and relax |
| - the street is crowded, it's not so pleasant | - the street is crowded, it's not so pleasant |
| - there are so many nice places to look at and enjoy | - there are so many nice places to look at and enjoy |
| - I think it's a little variety, so I choose different ways | - I think it's a little variety, so I choose different ways |
| - There are different types of shops, mostly vintage, boutique and designer shops | - There are different types of shops, mostly vintage, boutique and designer shops |
| - The walking experience is not comfortable | - The walking experience is not comfortable |
| - Seeing people around, trying to pay attention to them and the distance while walking is not very comforting, making walking difficult | - Seeing people around, trying to pay attention to them and the distance while walking is not very comforting, making walking difficult |
| - The street is crowded, it's not so pleasant | - The street is crowded, it's not so pleasant |
| - It's not a good place to walk here when it's crowded, but it's enjoyable | - It's not a good place to walk here when it's crowded, but it's enjoyable |
| - I don't feel comfortable walking, vehicles and trucks have an effect on this. | - I don't feel comfortable walking, vehicles and trucks have an effect on this. |
| - Since this place is closed to traffic, it makes walking more comfortable. | - Since this place is closed to traffic, it makes walking more comfortable. |
| - The walking experience is not comfortable | - The walking experience is not comfortable |
| - I feel more comfortable and calm while walking as there is no vehicle and pedestrian traffic as before. | - I feel more comfortable and calm while walking as there is no vehicle and pedestrian traffic as before. |
| - There are very few people walking down the street, which is unusual. | - There are very few people walking down the street, which is unusual. |
| - The walking experience is not comfortable | - The walking experience is not comfortable |
| - Since the cafes are closed, the sidewalks are no longer occupied, so I can walk much more comfortably. | - Since the cafes are closed, the sidewalks are no longer occupied, so I can walk much more comfortably. |

| BEŞİKTAŞ | BEFORE THE PANDEMIC | DURING THE PANDEMIC |
|----------|---------------------|---------------------|
| - I don't want to walk because of the crowd. | - I don't want to walk because of the crowd. |
| - I don't feel comfortable walking, vehicles and trucks have an effect on this. | - I don't feel comfortable walking, vehicles and trucks have an effect on this. |
| - Since the place is closed to traffic, it makes walking more comfortable. | - Since the place is closed to traffic, it makes walking more comfortable. |
| - The walking experience is not comfortable | - The walking experience is not comfortable |
| - I feel more comfortable and calm while walking as there is no vehicle and pedestrian traffic as before. | - I feel more comfortable and calm while walking as there is no vehicle and pedestrian traffic as before. |
| - Since the cafes are closed, the sidewalks are no longer occupied, so I can walk much more comfortably. | - Since the cafes are closed, the sidewalks are no longer occupied, so I can walk much more comfortably. |

Fig. 9 Comparison of Beşiktaş and Delft Field Studies during the Pandemic According to the Relational System among the Basic Indicators of Walkability
people around and feeling a sense of community gives them walking pleasure before the pandemic times. However, this situation changed in Beşiktaş with the curfews and the decrease in the number of people going out during the pandemic. The participants in Beşiktaş stated that walking on empty streets was comfortable but not as attractive as it used to be.

**Conclusion**

In this study, which discusses walkability with a multidimensional approach and relational perspective, three main conclusions have been reached.

The first conclusion is that pedestrians evaluate walkability through a thinking process in which spatial, phenomenological, and perceptual dimensions interact. The interactions between all of these dimensions of walkability affect individuals' walking experiences positively or negatively. The phenomenon of walking, the walkability conditions of a place, and the perception of people while walking are important elements that shape the experience of walking. This multidimensional way of thinking is the key to analysing pedestrians' walking experiences with a holistic approach that leads to the multidimensional analysis of walkability in cities.

The second conclusion shows that there are strong interrelationships among the basic indicators of walkability. As a result of this study, the necessity of a "relational thinking system" that considers the "network relationships" established by these walkability measures has emerged. This is seen in contrast with the "linear" approach as in studies in the literature that advocate the measurability of walkability indicators, or the hierarchical approach as in studies focusing on walking needs. This conclusion, which redefines the concept of walkability with a holistic and relational approach, reveals that the basic indicators of walkability work in a relational system and offers a new perspective to the existing walkability literature. The interrelations among the indicators of walkability have certain patterns as the feeling of safety, comfort and attractiveness; accessibility, comfort, traffic safety, and pleasure; mixed-use, security and attractiveness work together in pedestrians' perception of a place as walkable. These measures work as a network and create a walkable space.

The third conclusion is that it is possible to get detailed and relational results about the walking experience and the phenomenon of walking by using mobile methodologies that offer a new perspective on the analysis of walkability. By studying the phenomenon and the experience of walking in its context, it became possible for the participants to provide more input compared to the desk-based interview methods. In addition, mobile methodologies acted as an effective tool in terms of evaluating spatial and perceptual dimensions together and providing a holistic approach. It also allowed the researcher to get participants' points of view and record the physical and perception-based factors that affect the experience of walking in positive and negative ways in situ. As the researcher and the participants walked together in the walk space and the movement, it became possible for the researcher to discover how the participants experienced and made sense of the environment, and to identify the situations that the participants enjoyed walking or felt comfortable. The researcher was able to observe factors encouraging or negatively affecting the participants during the walk, and the reasons that participants changed or shaped their route. During Go-Along walks, it became easier to make sense of the walk space passed through and to access the memories, feelings, and experiences of the participants about the space by using participants' body's wandering in the space. In this way, detailed information was obtained on how personal memories and emotions affect walkability, in addition to the physical elements that affect walking. Analysing walkability with mobile methods helped to discover the interrelationships among the indicators of walkability.

As a result of the findings obtained from the study, it was concluded that walkability should be analysed using mobile methods with a multidimensional and relational perspective, and this result was transformed into a model proposal as in Fig. 10. According to this model proposal, which has two basic approaches as multidimensionality and relationality, the phenomenological, perceptual and spatial dimensions are considered together and form a complete system. The concept of walkability, which is located at the intersection of this multidimensional model, is considered with a relational approach. This relationality emphasizes the strong interrelations between spatial, perceptual and phenomenological dimensions and suggests that the walking experience is shaped as a result of this relational and multidimensional structure. This relational structure can have an effect that strengthens and weakens each other from time to time. Therefore, this model predicts that studying the indicators of walkability with a relational approach rather than a linear one will provide much healthier results.

The phenomenological dimension of the model includes the main factors such as individuals’ walking habits, needs, goals, and motivations affecting the perception of walkability. All these factors shape the walking behaviours and experiences of individuals, and they are fed by the qualities of the place they walk and the perceptions they acquire while walking about the place. In the spatial dimension, many features such as urban functions, transportation systems, pedestrian centres and axes, topography, urban texture and architectural features, social profile and historical background come into play. The possibilities offered by the place shape both the perception of walking
and the mind maps of the walking phenomenon. In the perceptual dimension, positive and negative elements that affect the walkability perception of the walk space come to the fore. These elements affect the experience through visual and auditory senses as well as senses such as smell and taste. In addition, the pleasure, fun, calmness, spaciousness, anxiety, peace, security and similar feelings felt after the walking experience are also an important part of this perceptual dimension. Analysing these items with mobile methods such as the “Go-Along” method also enables to inclusion of both perceptual and spatial elements that shape the walking experience together.

The internal relations among the walkability indicators can change according to different conditions and work in different ways. This form of work has been tested and experienced through fieldwork carried out in two different city centres. In this way, it has been determined that the priority order of the walkability indicators changes according to the pedestrian-oriented policies implemented by the cities and differentiates the walking experience. Reducing vehicle traffic in the city centre, speed limits, pedestrianization, and spatial interventions that provide safe and comfortable access for pedestrians improve the walking experience, and shape the expectations and priorities of pedestrians regarding a walkable environment.

Future studies and policies aiming to create walkable cities and encourage walking behaviour must consider the multidimensional structure proposed by this model that shapes the walking experience. In other words, the insufficiency of physical improvements only to provide suitable conditions for walking and the necessity to support these studies with implementations considering the phenomenon and the perception of walking has occurred as important results of the research. Creating urban environments that encourage walking behaviour with an approach that includes everyone living in the city and offers equal opportunities that are based on pedestrian rights will be possible with this multidimensional and relational perspective. At this point, involving the citizens in the process with active methods in situ such as “Go-Along” and a participatory approach will provide an important opportunity to develop pedestrian-oriented policies and create more walkable cities.

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Fig. 10 Model of Multidimensional and Relational Analyses of Walkability by Using Mobile Methods
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