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Determining of Planning Criteria that Encourage Walking in Urban Corridors: A Study with The Residents of Trabzon*

Kentsel Koridorlarda Yürümeyi Teşvik Edici Planlama Ölçütlerinin Belirlenmesi: Trabzon Sakinleriyle Bir Çalışma

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Abstract

Urban corridors, which were organized as pedestrian-oriented in the period before the invention of the automobile have entered the process of being organized as automobile-oriented in the modernization period when cities began to be reshaped. The widespread of automobile usage has been changing people's travel preferences which resulted in the decrease of walkable environments. Scientists from different disciplines conducted studies on walking and walkability. It is necessary to understand the sociocultural structure and environmental features that persuade people to walk. "Walking Preference Survey", which can be used as a preliminary study in the planning of walkable corridors, was prepared for this research. The survey was conducted with 597 participants in Trabzon/Ortahisar. The survey was subjected to validity and reliability tests for standardization. 8 walkability criterions were reached in the factor analysis applied to the survey within the scope of the construct validity analysis. In the study, differences in walking preference were observed according to demographic characteristics and travel habits. The study presents a method for determining the criteria that can be used in local walkability studies through user preferences.

Keywords: Urban corridor planning, Trabzon, Walking preference, Walkability criteria.

Özet

Otomobilin icadından önceki dönemde yaya odaklı olarak düzenlenen kentsel koridorlar, kentlerin yeniden şekillendirildiği modernleşme döneminde otomobil odaklı olarak düzenlenme sürecine girmiştir. Otomobil kullanımının yaygınlaşması, insanların seyahat tercihlerini değiştirmeye başlamıştır. Yürünebilir ortamların azalması ile sonuçlanan bu değişimin sonucunda farklı disiplinlerden bilim insanları, yürüme ve yürünebilirlik üzerine çalışmalar yürütmüştür. İnsanları yürümeye ikna eden sosyokültürel özelliklerle çevresel özellikleri anlamak gerekmektedir. Bu araştırma kapsamında, yürünebilir koridor planlamalarında ön çalışma olarak kullanılabilecek "Yürüme Tercih Anketi" düzenlenmiştir. Anket, Trabzon/Ortahisar'da 597 katılımcıyla yürütülmüştür. Anket standardizasyonu için geçerlik ve güvenirlik testlerine tabi tutulmuştur. Yapı geçerliği analizi kapsamında, ankete uygulanan faktör analizinde 8 yürünebilirlik ölçütüne ulaşılmıştır. Çalışmada demografik özelliklere ve seyahat alışkanlıklarına göre yürüme tercihinde farklılıklar gözlenmiştir. Çalışma, kullanıcı tercihleri üzerinden lokal yürünebilirlik çalışmalarında kullanılabilecek ölçütlerin tespiti için bir yöntem sunar.

Anahtar Kelimeler: Kentsel koridor planlaması, Trabzon, Yürüme Tercihi, Yürünebilirlik ölçütleri.

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1. Introduction

The spatial pattern and arrangement of the landscape elements reveal the structure of the landscape. Spatial arrangements that vary over time cause differences in the functions and landscape dynamics of each element. There are 3 basic elements that are important for land use planning: Matrix, corridor and patches. Corridors are linear parts of figuration that can be continuous or discontinuous; straight or curved; narrow or wide in the landscape mosaic. (Forman, 1995; Dramstad et al., 1996). Streams, roads, alles, valleys, coasts, ridges, lines of infrastructure elements in the landscape are examples of structures with corridor characteristics. (Forman, 1995). Based on this, boulevards, avenues and streets that undertake the task of transportation in urban areas can be expressed as corridors within the urban landscape pattern.

Before the automobile age, cities were inevitably more walkable and compact. Distances were close easily access the city centre, workplaces or market (Southworth, 2005). Urban corridors, which have been planned on a human scale for hundreds of years, started to be planned to serve motor vehicles especially in the 20th century. However, the possibility of negative effects of this planning approach on social common sense and quality of life has worried researchers from different disciplines since the second half of the same century (Alfonzo, 2005) and efforts have been launched to return pedestrians to urban corridors. As a result of these efforts, the creation and benefits of walkable environments have become a subject of study for many different professional disciplines. Because walkability is a multidisciplinary study subject, it should be evaluated from different perspectives by each professional discipline. While public health researchers work on promoting walking as a physical activity, transportation engineers or urban planners focus on issues such as reducing traffic density and noise, and increasing air quality (Reyer et al., 2014). Therefore, while evaluating the factors that affect walking, healthy living researchers consider the factors affecting personal activity level; urban planners consider the effects of environmental features (Alfonzo, 2005).

Walkability has to be defined correctly in order to create walkable urban environments. Walkability is the support level of the built environment for walking, providing safety, comfort and visually attractive opportunities for pedestrians traveling on different routes to their destination in reasonable time and with reasonable effort (Southworth, 2005). In other words, walkability is the degree of walking friendliness of the built environment (Abley, 2005). Although many researchers try to define walkability, Krambeck (2006), argues that,

it is very difficult to define walkability and to identify the components that fall within the scope of walkability.

Creating a walking community requires understanding the pedestrian characteristics of community such as the demographic structure, the reason and duration of the trips on foot (Bicycle Federation of America Campain to Make America Walkable, 1998). In order to prevent the use of personal vehicles, the aim should be to know how people are persuaded to walk. For this reason, the number of researches should be increased in order to understand the users propensities and the supply-demand balance that should be considered in planning strategies (Nigro et al., 2018).

In process of deciding to travel on foot; the demographic characteristics of the pedestrian, environmental factors and cultural characteristics of other pedestrians using the space can cause changes in the reason and the form of walking (Alfonzo, 2005; Yazıcıoğlu Halu, 2010). The travel plan, which is made before the travels that are decided to be made on foot, is made by choosing the appropriate routes. The judgments between the route alternatives to be used and the purpose of walking are important at this stage (Zacharias, 2009). Even in neigbourhoods designed with infrastructure that will facilitate pedestrian access, the lack of attractive destinations and regulations encouraging the use of motor vehicles can negatively affect the decision to walk (Kulkarni, 2017). The density of people in streets and streets used for purposes such as providing transportation from one point to another or for purposes such as eating and drinking can attract other users (Jacobs, 2011). Although places that encourage pedestrians increase walking frequency and distance, personal preferences may also play a role in deciding to walk. In this case, environmental factors and the offers of the place cannot fully meet the preferences of the person (Zacharias, 2009). It is important to work on groups with different social statuses in various urban areas to understand the effectiveness of urban design factors that encourage walkable environments (Southworth, 2005).

According to studies dealing with pedestrian performance and preferences from different disciplines searched by Lo (2009), and revealed some common views on the measurement of environmental factors affecting the quality of pedestrian space and pedestrian quantity.

- Maintenance and continuity of pavements,
- Universal accessibility,
- The connection of the road network and the direction of the road,

- Safety of level crossings,
- Lack of high speed and heavy traffic.
- Separating pedestrian traffic from vehicle traffic,
- Land use density,
- Mixed-use building environments,
- Wooded streets and landscape,
- Visual interest and sense of space evoked by local conditions.
- Perceived or actual security (Lo, 2009).

In this study, it is aimed to determine the walkability criteria that encourage walking in urban corridors according to user preferences at the local level. For this purpose, walking preference scale was conducted.

2. Material and Method

This study was carried out with the people of the city living within the disrict of Trabzon/Ortahisar. Değirmendere, Tabakhane and Zagnos streams from east to west are important geomorphological formations in the study area. The area between Tabakhane and Zağnos streams is the oldest known settlement in the city. Written history of the city dates to the BC. 4000s (T.C. Ortahisar Kaymakamlığı, 2023). The population of the Ortahisar District of Trabzon in the years 2020-2021 represents the research population. According to Turkish Statistical Institude (2020), address-based registration system data, 330,373 people reside in Trabzon/Ortahisar.

It is known that socio-demographic characteristics and daily walking habits are effective on walking preference. The aim of this study to determine the criterions affecting the walking preference of the city residents during the walkable corridor planning process for Trabzon. Walking preference survey was organized and conducted on this aim. It is made up of three parts, including demographic questions, the questions of travel style and walking preference statements.

The part in which the travel style is benefited from Krambeck (2006). The part in which the preference of walking is questioned includes 30 statements. This part was prepared in accordance with the 5-point Likert Scale. In the first part of the scale making up 2 parts, the statements were answered as “Definitely Disagree”, “Disagree”, “Neutral”, “Agree”,

“Definitely Agree”. In the second part, the answers were given as “Strongly Unfavourable”, Unfavourable”, “Neutral”, Favourable” and “Strongly Favourable”. While preparing the statements of the walking preference (WP) survey, it was aimed to understand how the possibilities on the travel route affect the walking preferences of the participants. In the walkability literature while preparing questions of (WP) survey; safety (Alfonzo, 2005; Bicycle Federation of America Campain to Make America Walkable, 1998; Day et al., 2006; Dills et al., 2012; Krambeck, 2006; Sealens et al., 2003; Southworth, 2005; Speck, 2013), mixed uses (Dills et al. 2012; Dobesova & Krivka, 2012; McNally, 2010; Sealens et al., 2003; Speck, 2013), accessibility (Alfonzo, 2005; Bicycle Federation of America Campain to Make America Walkable, 1998) ; Day et al., 2006; Sealens et al., 2003; Southworth, 2005), attractiveness (Alfonzo, 2005; Bicycle Federation of America Campain to Make America Walkable, 1998; Day et al., 2006; Dills et al. 2012 ; Krambeck, 2006; Sealens et al., 2003; Speck, 2013), intensity of use (Dills et al. 2012), slope (Hoehner, 2011; Meeder et al., 2017) and walking conditions (Dills et al. 2012; Silitonga, 2020; Clarke et al., 2017; Giehl et al., 2012.) criteria were used.

2.1. Reliability and Validity

If the research population is 1,000,000 a sample size of 384 is sufficient to conduct the research with a sample error degree of 0.05 (Krejcie & Morgan, 1970). Within the scope of this research, a questionnaire form was conducted with 597 randomly selected participants. Thus, the amount of deviation was reduced below 0.05.

The accuracy and suitability of the scales developed to evaluate the relationships between people and objects/cases and to make certain decisions based on the results of the evaluation depends on the accuracy and suitability of the scale used. For this reason, the scale should be “standardized” (Ercan & Kan, 2004; p: 211). During the standardization of the quality of the scale used, the statements in the scale are analysed. The standardized scale is expected to have "reliability" and "validity" features (Ercan & Kan, 2004) and is a criterion that shows the value of this scale (Guilford, 1946).

The following reliability and validity tests were applied for the standardization of the questionnaire prepared in this study;

1. Construct validity: As a result of the literature review and expert opinions in the research, the walking preference statements created to determine the walking preferences of the participants were firstly subjected to exploratory factor analysis through the SPSS.22 statistical program to determine the construct validity. Explanatory factor analysis is one of

the methods considered sufficient to measure the validity of the test (Cronbach & Meehl, 1955; Eysenck, 1950; Guilford, 1946). In addition, the Kaiser-Meyer-Olkin (KMO) test was used to determine the sample adequacy, and the Bartlett test was used to determine the suitability of the correlation levels in the correlation matrix for factor analysis (Hair et al., 2009).

2. Convergent Validity: Composite reliability (CR) values and average variance extracted (AVE) values of the sub-factors of the walking preference scale were examined (Bagozzi & Yi, 1988).

3. Discrimination Validity: The discrimination validity of each sub-factor in the walking preference scale was examined to explain the difference in structure from the others. The square root of the average variance extracted (√AVE) was taken to calculate discriminant validity. The obtained value was compared with the correlation scores between each sub-factor (Fornell & Larcker, 1981).

4. Reliability: Cronbach Alpha test was used to calculate the reliability coefficients of the walking preference (WP) survey used in the study.

2.2. Difference Tests

Difference tests were applied to the WP survey in order to understand the change in walking preference according to the demographic characteristics and daily travel preferences of the user. The tests performed on WP survey were selected according to the normality of distribution. Since the Kurtosis and Skewness values of the 4 expressions in the scale (P29, P30, P18 and P11) were not within the range of ±2, it was determined that they did not show a normal distribution (George & Mallery, 2020), it was decided to apply non-parametric tests. The difference between two independent variables was Mann Whitney U test; Kruskal-Wallis test was applied for cases where the independent variables were above two. The Games Howell post hoc test was used to analyze the reasons for the difference between the variables.

3. Results

3.1. Findings Regarding The Demographic Characteristics of The Participants

The socio-demographic characteristics of participant in line with the purpose of the study are given in detail of Table 1. When the age groups of the participants are analyzed, 27.3% are 36-45; 25% are 26-35; 24% are 18-25; 19.4% are 46-65 and 4.4% are over 65 years old. When the gender of the participants is examined, 51.8% are female and 48.2% are male.

Table 1. Socio-demographic characteristics of the participants.

Categories		n	%
Age	18-25	143	24.0
	26-35	149	25.0
	36-45	163	27.3
	46-65	116	19.4
	Over 65	26	4.4
Gender	Woman	309	51.8
	Man	288	48.2
Income	Under 2,020 TL	185	31.0
	2,020-3,000 TL	125	20.9
	3,001-5,000 TL	172	28.8
	5,001-10,000 TL	94	15.7
	Over 10,000 TL	21	3.5
Education	Primary School	40	6.7
	Secondery School	36	6.0
	High School	143	24.0
	Bachelor	316	52.9
	Postgraduate	62	10.4
Disability situation	Yes	10	1.7
	No	587	98.3
Movement limitation	Yes	64	10.7
	No	533	89.3
Driving license	Yes	404	67.7
	No	193	32.3

33.5% of the participants are daily walking 31-60 minutes, 28%16-30 minutes, 14.4% 61-90 minutes, 12.2% over 90 minutes and 11.9% 0 -15 minutes. Considering the reasons for daily walking, it is seen that an important part of it is for transportation purposes. Shopping and stroll follow respectively. The daily walking times of the participants and their reasons are given in detail of Table 2.

Table 2. Participants' daily walking time and reasons for walking.

Categories		n	%
Daily Walking	0-15 min.	71	11.9
	16-30 min.	167	28.0
	31-60 min.	200	33.5
	61-90 min.	86	14.4
	Over 90 min.	73	12.2
Transportation	No	258	43.2
	Yes	339	56.8
Shopping	No	370	62.0
	Yes	227	38.0
Sport	No	477	80.1
	Yes	119	19.9
Stroll	No	396	66.3
	Yes	201	33.7
Amusement	No	574	96.3
	Yes	22	3.7
Education	No	478	80.1
	Yes	119	19.9

The frequency analysis results of the survey conducted with 597 participants residing in Ortahisar District of Trabzon are detailed in Table 3.

Table 3. Frequency analysis of walking preference survey.

Preference (P)	Definitely Disagree		Disagree		Neutral		Agree		Definitely Agree	
	frq.	%	frq.	%	frq.	%	frq.	%	frq.	%
P1	11	1.84	23	3.85	57	9.55	302	50.59	204	34.17
P2	73	12.23	201	33.67	165	27.64	114	19.10	44	7.37
P3	34	5.70	127	21.27	140	23.45	225	37.69	71	11.89
P4	12	2.01	55	9.21	98	16.42	342	57.29	90	15.08
P5	11	1.84	88	14.74	113	18.93	290	48.58	95	15.91
P6	28	4.69	90	15.08	159	26.63	238	39.87	81	13.57
P7	24	4.02	54	9.05	92	15.41	238	39.87	189	31.66
P8	18	3.02	71	11.89	126	21.11	229	38.36	153	25.63
P9	38	6.37	61	10.22	119	19.93	281	47.07	98	16.42
P10	478	7.9	118	18.9	131	21.9	242	40.5	59	9.9
Preference (P)	**Strongly Unfavourable**		**Unfavourable**		**Neutral**		**Favourable**		**Strongly Favorable**	
	frk.	%	frk.	%	frk.	%	frk.	%	frk.	%
P11	5	0.84	7	1.17	58	9.72	282	47.24	245	41.04
P12	13	2.18	45	7.54	216	36.18	248	41.54	75	12.56
P13	13	2.18	43	7.20	130	21.78	287	48.07	124	20.77
P14	4	0.67	8	1.34	27	4.52	280	46.90	278	46.57
P15	7	1.17	52	8.71	164	27.47	259	43.38	115	19.26
P16	127	21.27	255	42.71	156	26.13	47	7.87	12	2.01
P17	36	6.03	163	27.30	210	35.18	141	23.62	47	7.87
P18	4	0.67	7	1.17	49	8.21	301	50.42	236	39.53
P19	15	2.51	23	3.85	121	20.27	307	51.42	131	21.94
P20	5	0.84	12	2.01	89	14.91	358	59.97	133	22.28
P21	14	2.35	67	11.22	165	27.64	281	47.07	70	11.73
P22	17	2.85	132	22.11	312	52.26	121	20.27	15	2.51
P23	4	0.67	11	1.84	37	6.20	256	42.88	289	48.41
P24	3	0.50	11	1.84	79	13.23	273	45.73	231	38.69
P25	212	35.51	280	46.90	60	10.05	32	5.36	13	2.18

P26	114	19.10	292	48.91	128	21.44	46	7.71	17	2.85
P27	6	1.01	29	4.86	221	37.02	263	44.05	78	13.07
P28	19	3.18	49	8.21	176	29.48	282	47.24	71	11.89
P29	24	4.02	23	3.85	49	8.21	276	46.23	225	37.69
P30	12	2.01	2	0.34	22	3.69	253	42.38	308	51.59

P1: love to walk, P2: Walking preference in rainy/windy weather P3: Walking preference in sunny/humid weather, P4: Walking preference in daytime P5: Walking preference in eveningtime P6: Pedestrianized street preference, even if the travel distance is longer, P7: Pedestrian crossing/bridge preference even if the travel distance is longer, P8: The preference of places that can only be reached by walking, P9: The preference of undisabled spaces, P10: The preference of the places with mixed transportation planning, P11: The effect of the tree-lined route on the walking preference, P12: The effect of the bank/municipal/health center on walking preference, P13: The effect of the presence of urban furniture on walking preference, P14: The effect of the cleanliness on walking preference, P15: The effect of cafe/buffet/restaurant on walking preference, P16: The effect of uphill on walking preference, P17: The effect of downhill on walking preference, P18: The effect of open and green spaces on walking preference, P19: The effect of paving material comfort on walking preference, P20: The effect of walking distance of an average of 10 minutes on walking preference, P21: The effect of walking distance of more than 10 minutes on walking preference, P22: The effect of residential area on walking preference, P23: The effect of mountain/sea view on walking preference, P24: The effect of historical / touristic / cultural heritage richness on walking preference, P25: The effect of heavy vehicle traffic on walking preference, P26: The effect of heavy pedestrian traffic on walking preference, P27: The effect of school/museum/library on walking preference, P28: The effect of shopping mall/market/bazaar on walking preference, P29: The effect of safety against crime on walking preference, P30: The effect of pedestrian safety against traffic on walking preference.

Expressions measuring walking preference in the scale were abbreviated as “P1, P2, P3, P4,……,P30”. In the following parts of the article will be used their abbreviations.

41.04% of the participants in our survey gave “Strongly Favorable” response for P11, 46.57% for P14, %48.41 for P23 and 51.59% for P30.

57.29% of the participants in our survey gave “Agree” response for P4, 48.58% for P5, %47.07 for P9 and 40.5% for P10. 47.24% of the participants in our survey gave “Favorable” response for P11, 41.54% for P12, %48.07 for P13, 46.9% for P14, 43.38% for P15, %50.42 for P18, 51.42% for P19, %59.97 for P20, 42.88% for P23, 45.75% for P24, 46.23% for P29, 42.38% for P30.

3.2. Factor Analysis Results of Walking Preference Survey

As a result of the factor analysis, the research continued with 21 walking preference statements since the factor loads of 9 walking preference statements remained below 0.5 (Kaiser, 1974). Thus, the walking preference survey was divided into 8 sub-dimensions, and in the next process, walking preference was evaluated in 8 sub-dimensions. When the total explained variance rates were examined, the total explained variance value of 8 factors was calculated as 65.385%. Based on this ratio, it can be considered sufficient that 8 factors express 65% of the total variance. The factors were named to reflect the relationship between the survey expressions collected in the sub-dimensions (Table 4).

Table 4. Walking preference survey exploratory factor analysis.

Factor Name	Items	Factors							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Attractive walking	P23	**.776**	-.002	-.112	.207	.016	.054	.156	-.068
	P24	**.754**	.209	.013	.081	-.035	.015	.149	-.101
	P18	**.741**	.214	-.087	.141	-.032	.103	-.131	.107
	P11	**.646**	.059	-.122	.041	.149	.260	-.072	.151
Presences of facility and urban furniture in walking	P15	.115	**.732**	-.006	.059	-.037	-.027	-.033	.024
	P12	-.006	**.710**	.009	-.040	.150	.210	.025	.155
	P13	.163	**.676**	-.123	.054	.073	.210	-.066	.110
	P28	.065	**.627**	.310	.103	.072	-.140	.061	-.045
	P27	.276	**.533**	.191	.222	.104	-.052	.251	-.186
Traffic density in walking	P25	-.100	-.002	**.821**	-.159	.069	.032	.033	.074
	P26	-.122	.123	**.788**	.021	-.042	.044	-.037	.148
Safe walking	P29	.107	.162	-.047	**.871**	.088	.013	.007	-.007
	P30	.356	.039	-.103	**.734**	-.082	.154	-.018	.061
Walking for everyone	P9	.068	.069	-.042	.156	**.822**	-.009	-.020	-.010
	P10	-.011	.130	.076	-.128	**.797**	.033	.048	.041
Walking duration	P21	.097	.025	.067	.041	-.024	**.776**	.292	.109
	P20	.283	.156	.027	.106	.048	**.689**	-.071	-.156
Walking in every condition and time	P2	-.171	.046	-.069	.045	.007	.288	**.755**	.095
	P5	.223	.001	.050	-.046	.019	-.047	**.739**	.046
Slope in walking	P17	.165	.152	.065	.043	-.106	-.143	-.014	**.796**
	P16	-.146	-.014	.238	-.006	.198	.168	.212	**.703**

P2: Walking preference in rainy/windy weather, P5: Walking preference in eveningtime, P9: The preference of undisabled spaces, P10: The preference of the places with mixed transportation planning, P11: The effect of the tree-lined route on the walking preference,, P12: The effect of the bank/municipal/health center on walking preference, P13: The effect of the presence of urban furniture on walking preference, P15: The effect of cafe/buffet/restaurant on walking preference, P16: The effect of uphill on walking preference, P17: The effect of downhill on walking preference P18: The effect of open and green spaces on walking preference, P20 The effect of walking distance of an average of 10 minutes on walking preference, P21: The effect of walking distance of more than 10 minutes on walking preference, P23: The effect of mountain/sea view on walking preference, P24: The effect of historical / touristic / cultural heritage richness on walking preference, P25: The effect of heavy vehicle traffic on walking preference, P26: The effect of heavy pedestrian traffic on walking preference, P27: The effect of school/museum/library on walking preference, P28: The effect of shopping mall/market/bazaar on walking preference, P29: The effect of safety against crime on walking preference, P30: The effect of pedestrian safety against traffic on walking preference.

3.3. Factor Analysis Results of Walking Preference Survey

The Cronbach Alpha reliability coefficients of the walking preference (WP) survey used in the study were calculated as 0.72 on 8 factors. As a result of the analysis, it was concluded that the reliability of WP was good (Hair, et al. 2009). In addition, the reliability coefficient of each statement of the walking preference survey was above 0.70, and it was concluded that item deleted did not affect the reliability coefficient (Table 5). Thus, the research continued with the existing statements.

Table 5. Item total statistic of research variables.

Items	Scale mean if item deleted	Scale variance if item deleted	Corrected item – Total correlation	Cronbach's Alpha if item deleted
P2	71.2848	52.402	.158	.727
P5	70.4221	52.231	.214	.720
P9	70.4724	51.662	.219	.720
P10	70.7940	51.798	.196	.723
P11	69.7772	51.835	.355	.709
P12	70.4941	49.985	.436	.701
P13	70.2613	49.636	.437	.700
P15	70.3333	50.622	.365	.707
P16	71.7755	52.426	.210	.720
P17	71.0419	52.131	.202	.721
P18	69.7722	51.646	.394	.707
P20	70.0335	52.247	.328	.711
P21	70.4958	51.264	.311	.711
P23	69.6767	52.082	.336	.710
P24	69.8392	51.256	.394	.706
P25	72.1240	54.488	.063	.732
P26	71.7789	53.505	.130	.727
P27	70.4087	50.349	.455	.701
P28	70.4774	50.666	.361	.707
P29	69.9447	51.126	.293	.713
P30	69.6298	52.264	.307	.712

P2: Walking preference in rainy/windy weather, P5: Walking preference in eveningtime, P9: The preference of undisabled spaces, P10: The preference of the places with mixed transportation planning, P11: The effect of the tree-lined route on the walking preference,, P12: The effect of the bank/municipal/health center on walking preference, P13: The effect of the presence of urban furniture on walking preference, P15: The effect of cafe/buffet/restaurant on walking preference, P16: The effect of uphill on walking preference, P17: The effect of downhill on walking preference P18: The effect of open and green spaces on walking preference, P20 The effect of walking distance of an average of 10 minutes on walking preference, P21: The effect of walking distance of more than 10 minutes on walking preference, P23: The effect of mountain/sea view on walking preference, P24: The effect of historical / touristic / cultural heritage richness on walking preference, P25: The effect of heavy vehicle traffic on walking preference, P26: The effect of heavy pedestrian traffic on walking preference, P27: The effect of school/museum/library on walking preference, P28: The effect of shopping mall/market/bazaar on walking preference, P29: The effect of safety against crime on walking preference, P30: The effect of pedestrian safety against traffic on walking preference.

As a result of the analysis performed to understand the internal consistency of the survey, the fact that the integrated reliability scores in 5 factors are higher than 0.60 meet the conditions of convergent validity for these items (Bagozzi & Yi, 1988). However, although it approached the lower limit of composite reliability in 3 factors, they remained below. In addition, the scores of average variance extracted were above 0.50 (Fornell & Larcker, 1981), except for the "presences of facility and urban furniture in walking" sub-factor.

Table 6. Convergent validity results of the walking preference survey.

Factors	CR (composite reliabilities)	AVE (average variance extracted)
Attractive walking	0.82	0.53
Presences of facility and urban furniture in walking	0.79	0.43
Traffic density in walking	0.65	0.79
Safe walking	0.65	0.79
Walking for everyone	0.66	0.79
Walking duration	0.54	0.70
Walking in every condition and time	0.56	0.72
Slope in walking	0.56	0.72

Although the mean explained variance score of the "presences of facility and urban furniture in walking" sub-factor was 0.43, its composite reliability score above 0.70 (Hair, et al., 2009) was found to be a suitable value for the research. Thus, the necessity of developing the items “walking duration”, “walking in every condition and time” and “slope in walking” emerges for the convergent validity of the WP survey. However, the average variance extracted and factor loadings were found to be sufficient to continue the study.

When the mean square root of variance results were compared with the results of the correlation analysis, it was found that the values of each sub-factor were higher than the correlation loads (Fornell & Larcker, 1981). The obtained results are given in detail of Table 7.

Table 7. Discrimination validity results of the walking preference survey.

Factors	1	2	3	4	5	6	7	8
Attractive walking	**.728**							
Presences of facility and urban furniture in walking	.332	**.656**						
Traffic density in walking	-.190	.138	**.889**					
Safe walking	.418	.262	-.150	**.889**				
Walking for everyone	.070	.219	.046	.048	**.889**			
Walking duration	.312	.212	.008	.195	.074	**.837**		
Walking in every condition and time	.085	.090	.053	.042	.048	.258	**.849**	
Slope in walking	.028	.146	.240	.019	.084	.100	.147	**.849**

Thus, it was concluded that each of the sub-factors differed from other factors in itself. As a result, it can be said that the walking preference survey has discriminant validity.

3.4. Walking Preference Survey Difference Test Results

3.4.1. Demographic Differences

Significant differences was found between the genders in the dimensions of "attractive walking", “safe walking” and “walking in every condition and time" in the survey of walking preference. While “safe walking” and “attractive walking” may be preferred more by women, “walking in every condition and time” is more preferable by men. (Table 8).

Table 8. Difference test result according to gender.

Factors	Gender	n	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	*z-value*	*p-value*
AW	Woman	309	331.65	102480	34407	76023	-4.861	**0**
	Man	288	263.97	76023				
SW	Woman	309	323.33	99909	36978	78594	-3.757	**0**
	Man	288	272.9	78594				
WC/T	Woman	309	278.82	86156	38261	86156	-3.011	**0.003**
	Man	288	320.65	92347				

AW=Attractive walking, SW=Safe walking, WC/T= Walking in every condition and time

According to Kruskal Wallis test results; there is no significant difference between "attractive walking”, “presences of facility” and “urban furniture in walking”, “traffic density in walking”, “safe walking”, “walking for everyone”, “walking duration”, “slope in walking" and age ranges. On the other hand, there is a significant difference between the age ranges of the participants and the criterion of "walking in every condition and time". The Games-Howell test, which is used for unequal variances, was used to determine which age ranges differed. According to the Games-Howell test results, there is a significant difference between the 18-25 age group and the 46-65 age group. In other words, "walking in every condition and time" is more preferable for the 18-25 age group (Table 9).

According to Kruskal Wallis results, there is a significant difference between the educational status of the participants and their walking preferences, between "attractive walking" and "safe walking". According to the Games-Howell test results, university graduates attach more importance to attractiveness than primary and high school graduates. However, it could not determined as a result of the Games-Howell test, which graduation status causes the significant difference between education status and safe walking preference (Table 9).

According to the Kruskal Wallis test results, there is a significant difference between "attractive walking", "safe walking" and "slope in walking" on income levels of the

participants. When we look at the results of the Games-Howell test to understand the difference between income levels, those with an income between 3,001-5,000 TL and 5,001-10,000 TL give more importance to the “attractive walking” dimension than those with an income of 2,020-3,000 TL. Participants with an income of 5,001-10,000 TL give more importance than those with an income between 2,020-3,000 TL to the criterion of the “safe walking”. Participants with an income of 2,020-3,000 TL prefer the “slope in walking” more than the participants with an income of 3,001-5,000 TL and 5,001-10,000 TL. “Slope in walking” is more acceptable for participants with an income of over 10,000 TL than those with an income between 3,001-5,000 and 5,001-10,000 TL (Table 9).

Table 9. Difference test result according to age, education and income.

	Factors	Kruskal Wallis *p-value*	Games Howell			
			Variable (I)	Categories (J)	Mean Difference (I-J)	*p-value*
Age	**WC/T**	0.001	18-25	26-35	0.22732	0.113
				36-45	0.18345	0.285
				46-65	0.4339	0.000
				Over 65	0.35664	0.182
Education	**AW**	0.000	Bachelor	Primary school	0.27176	0.045
				Secondery school	0.18495	0.264
				High school	0.20816	0.002
				Postgraduate	0.10341	0.778
Income (TL)	**AW**	0,005	2,020-3,000	Under 2,020	-0.12481	0.279
				3,001-5,000	-0.20412	0.019
				5,001-10,000	-0.20974	0.044
				Over 10,000	-0.25686	0.086
	SW	0.007	2,020-3,000	Under 2,020	-0.10541	0.791
				3,001-5,000	-0.21977	0.113
				5,001-10,000	-0.33617	0.006
				Over 10,000	-0.1619	0.618
	SLW	0.001	2,020-3,000	Under 2,020	0.13373	0.638
				3,001-5,000	0.29819	0.018
				5,001-10,000	0.29336	0.042
				Over 10,000	-0.07695	0.940
			Over 10,000	Under 2,020	0.21068	0.163
				2,020-3,000	0.07695	0.94
				3,001-5,000	0.37514	0.001
				5,001-10,000	0.37031	0.004

AW=Attractive walking, SW=Safe walking, WC/T= Walking in every condition and time, SLW= Slope in walking.

When disabled and individuals with movement limitation are gathered in the same group, there is a significant difference in the dimension of "walking for everyone". It is seen that the dimension of “walking for all” is more important for the participants with disabilities and/or individuals with movement limitation. No significant difference was found between

the participants with disabilities and/or individuals with movement limitation in the other seven dimensions and those who stated that they did not have any disability (Table 10).

Table 10. Difference test result according to age, education and income.

Factors	Categories	n	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	*z-value*	*p-value*
WE	Yes	71	337.11	23935	17450	156051	-2.034	0.042
	No	526	293.86	154568				

WE= Walking for Everyone

According to the results of the Mann Whitney U test, a significant difference was found between the participants with and without a driving license in terms of "safe walking" criteria. Participants with a driving license attach more importance to safety when choosing to walk than participants who do not (Table 11).

Table 11. Difference test results according to driver licence ownership.

Factors	Categories	n	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	*z-value*	*p-value*
SW	Yes	404	308.55	124655.5	35126.5	35126.5	-2.06	**0.039**
	No	193	279	53847.5				

SW=Safe Walking

3.4.2. Differences according to Daily Trips

The daily travels of the participants were questioned according to the purposes of transportation, shopping, sports, stroll, education and entertainment. Considering the results of the difference analysis according to the factors of the walking preference survey, no significant difference was found between the participants walking for transportation and entertainment purposes. Significant differences were found among the participants in shopping, sports, stroll and educational purposes (Table 12).

Table 12. Difference test results of daily trips purposes.

	Factors	Categories	n	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	*z-value*	*p-value*
Shopping	**AW**	Yes	227	325.13	73804	36064	104699	-2.941	**0.003**
		No	370	282.97	104699				
	F&F	Yes	227	323.94	73533.5	36334.5	104969.5	-2.789	**0.005**
		No	370	283.7	104969.5				
	WC/T	Yes	227	268.47	60942	35064	60942	-3.445	**0.001**
		No	370	317.73	117561				
Sp	**WD**	Yes	119	368.62	43865.5	20037.5	134040.5	-5.171	**0.00**

	Factors	Categories	n	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	*z-value*	*p-value*
		No	477	281.01	134040.5				
	WC/T	Yes	119	361.76	43050	20853	134856	-4.556	**0.00**
		No	477	282.72	134856				
	SLW	Yes	119	330.83	39369	24534	138537	-2.362	**0.018**
		No	477	290.43	138537				
Stroll	**AW**	Yes	201	332.86	66905	32992	111598	-3.467	**0.001**
		No	396	281.81	111598				
	SW	Yes	201	328.24	65976	33921	112527	-3.105	**0.002**
		No	396	284.16	112527				
	WD	Yes	201	325.29	65383	34514	113120	-2.764	**0.006**
		No	396	285.66	113120				
Education	**AW**	Yes	119	342.35	40740	23282	137763	-3.109	**0.002**
		No	478	288.21	137763				
	SW	Yes	119	329.61	39223	24799	139280	-2.276	**0.023**
		No	478	291.38	139280				

AW=Attractive walking, F&F= Presences of facility and urban furniture in walking, TD= Traffic density in walking, SW=Safe walking, WE= Walking for Everyone, WD= Walking duration, WC/T= Walking in every condition and time, SLW= Slope in walking.

According to the Mann Whitney U Test results: although "attractive walking" and "presences of facility and urban furniturein walking" are more important for participants who walk to shopping than those who do not walk for shopping, "walking in every condition and time" is not preferable for participants who walk to shopping. Participants who walk for sports purposes in daily travels give more importance to "walking duration", "walking in every condition and time", and "slope in walking" compared to those who do not walk for sports. "Attractive walking", "safe walking" and "walking duration" are more important for participants who walk to stroll than those who do not walk to stroll. On the other hand, "attractive walking" and "safe walking" are more preferable for educational walkers (Table 12).

According to Kruskal Wallis test results; There is no significant difference between daily walking duration of the participants in the criterions of "attractive walking", "presences of facility and urban furniturein walking", "traffic density in walking", "walking for everyone". However, there is significant difference between daily walking duration in criterions of "safe walking", "walking duration", "walking in every condition and time", and "slope in walking".

Table 13. Difference test results of daily walking duration.

	Factors	Kruskal Wallis *p-value*	Games Howell			
			Variable (I)	Categories (J)	Mean Difference (I-J)	*p-value*
Daily walking duration	**SW**	0.009	Over 90 min.	0-15 min.	**0.49315**	**0.003**
				16-30 min.	0.22369	0.105
				31-60 min.	0.22315	0.075
				61-90 min.	**0.29548**	**0.04**
	WD	0.003	0-16 min.	16-30 min.	-0.22544	0.252
				31-60 min.	-0.28592	0.074
				61-90 min.	**-0.32894**	**0.046**
				Over 90 min.	**-0.46537**	**0.003**
	WC/T	0.000	61-90 min.	0-15 min.	**0.47339**	**0.004**
				16-30 min.	**0.44733**	**0.000**
				31-60 min.	**0.2843**	**0.042**
				Over 90 min.	-0.04755	0.997
			Over 90 min.	0-15 min.	**0.52093**	**0.006**
				16-30 min.	**0.49487**	**0.002**
				31-60 min.	0.33185	0.07
				61-90 min.	0.04755	0.997
	SLW	0.001	61-90 min.	0-15 min.	**0.26711**	**0.045**
				16-30 min.	0.20652	0.354
				31-60 min.	0.26233	0.84
				Over 90 min.	-0.06754	0.094
			Over 90 min.	0-15 min.	**0.33465**	**0.000**
				16-30 min.	**0.27405**	**0.000**
				31-60 min.	**.32986***	**0.002**
				61-90 min.	0.06754	0.094

SW=Safe walking, WD= Walking duration, C/TW= Walking in every condition and time, SLW= Slope in walking.

According to the Games-Howell test results, participants who walk for over 90 minutes daily attach more importance to safety than those who walk for 0-15 minutes and 61-90 minutes. In addition, participants who walk between 61-90 minutes and over 90 minutes care more about walking duration than those who walk between 0-15 minutes.

According to the Games-Howell results, “walking in every condition and time” is more acceptable, for participants walking between 61-90 minutes daily, than those walking 0-15 minutes, 16-30 minutes and 31-60 minutes; it is also more acceptable for participants walking over 90 minutes daily than those walking 0-15 minutes and 16-30 minutes. On the other hand, walking in slope is more acceptable for those walking over 90 minutes daily than those walking 0-15 minutes, 16-30 minutes and 31-60 minutes; in addition, it is also more acceptable for those walking 61-90 minutes daily than those walking 0-15 minutes (Table 13).

4. Discussion and Conclusion

Walkable spaces can show different features from each other (Forsyth, 2015). In the literature, it has been determined that many researchers working on walkable spaces and physical activity use different methods and criteria (Saelens & Handy, 2008). For this reason, it is difficult to standardize the all criteria while planning walkable environments. In this research, we prepared a survey form that can be easily understood and answered quickly without boring the participant, in which the criteria are revealed through user preferences. We named this form the “Walking Preference Survey”. This survey was prepared in order to obtain the user preferences which should be takin into consideration in the planning of walkable urban coridors. The survey was conducted in Trabzon/Ortahisar, and it reached 8 important criteria regarding the walking preferences of the people.

1. Attractive walking,
2. Presences of facility and urban furniture in walking
3. Traffic density in walking
4. Safe walking
5. Walking for everyone
6. Walking duration
7. Every condition and time walking
8. Slope in walking

This study carried out in Trabzon showed that differences such as demographic structure, mode of travel, reason for travel, daily travel time cause differences in walking preference. In the study, more differences were observed between the variables in terms of safety and attractiveness compared to other factors.

According to the results of the study, attractive walking environments are more demanded by women. Green areas and clean environments, which are planted correctly and give a sense of security, positively affect women's walking preference (Golan et al., 2019). Those who have been undergraduate education and up as well as middle-income and upper-middle-level individuals care about attractiveness when traveling as pedestrians. “Attractive walking” criterion makes walking more preferable in shopping, sightseeing and educational trips. Travels for transportation to work/school and shopping can provide utilitarian travel as well as socialization, healthy life and entertainment value travels (Southworth, 2005). Therefore, "attractive walking" can increase walking preference in utilitarian walks.

“Presences of facility and urban furniture in walking” comes to the fore in travels planned for shopping purposes. In this case, while planning the walkable corridor, it should be taken into account that stores and shops in the commercial corridors, alongside presences of facility and urban furniture that can meet the various needs of the user positively affects walking preference. According to Robertson (1993), the quality of the equipment in the space affects the duration of stay there. Qualified urban furniture used in shopping streets will also contribute to the economic value of the space, as it will increase the lifetime of the space. As a result, it can be said that mixed space planning and the use of equipment to meet the need have an encouraging role in shopping trips.

One of the most important components of walkability studies is safety. Places where the sense of security and safety is lacking reduces the pedestrian's use of the space, so safety is the basis for sustainable environments (Abdulla et al., 2017). According to the results of the WP survey, participants with driving license care about safety. Hence, it can be interpreted that environments with low sense of security increase individual motor vehicle use. However, in order to increase the sense of safety, especially in low-density pedestrian corridors, it should be intersected by a street with vehicular traffic approximately every 91.5 meters (Robertson, 1993). Therefore, vehicular traffic should not be completely removed from walkable spaces, but it should be prevented that heavy vehicular traffic negatively affects walking preference. Interestingly, intense pedestrian traffic also negatively affects the choice of walking. For this reason, walkable corridors should be planned around the pedestrianized streets by taking into account the comfort distance according to the intensity of use. According to Jaskiewicz (1999), safety and comfort encourage pedestrianity as an alternative travel form. The significant difference between men and women in “safe walking” in the survey results is not surprising. Safety is a factor that significantly affects women's walking preferences (Golan et al. 2019). In addition, users who walk for educational and sightseeing purposes care more about safety during their travels. According to Lizárraga et al. (2022), the low sense of security while traveling to the place of education may cause higher education students to decrease their walking preference by more than 8 times. The findings of two studies show that safe environments in educational travel also increase walking time in daily transportation routine.

Spaces designed for everyone and complying with universal design rules come to the fore as an important factor in the preference of pedestrianity for users with disabilities and restricted movement due to any reason. A significant difference was observed in the “walking for everyone” criterion between the disabled/ones with movement limitation

participating in the study and the other participants. The factors that limit the walking experience also reveal the demand in the walking criterion for everyone.

In sports and stroll travels; unlike the walks for transportation, education, shopping and amusement purposes, a significant difference was found in the "walking duration" criterion. The majority of those who walk for sports and leisure purposes travel more than 30 minutes on daily average; they prefer walking on short-distance trips too. The significant difference between participants whose daily walking time is longer than 60 minutes and those who walk less than 15 minutes daily shows that: the purpose of the trip and how long it will take are important in deciding to travel on foot. Similarly, Yang and Diez-Roux (2012) found that walking distance and duration are significantly longer in recreational walking than in other walking purposes.

When the criterion of every condition and time walking is evaluated, walking in the evening and in rainy weather is more preferable for men compared to women as well as for young adults compared to middle-aged participants. In addition, evening hours, rainy and windy weather negatively affect the travel choice for shopping as pedestrian. According to Robertson (1993), although the number of trips on foot decrease during unfavourable weather conditions, climatisated malls formed as indoor galeries has been admired. But according to WP survey results, the participants who had the purpose of sport in their daily walking routine are not discouraged by these weather conditions from walking. Also, participants walking more than 60 minutes in their daily routine don't give up their daily walk due to the unfavourable conditions. Humpel et al. (2004) also concluded that climatic weather conditions don't be changed the walking perception of people who do high exercise.

The slope is generally a factor that negatively affects walking preference. In particular, the necessity of moving uphill causes a negative effect on the walking preference. Where the slope is steep, the slope is perceived as a barrier (Broach & Dill, 2015). When the incline rises over 10%, the tendency to walk decreases dramatically. Per 1% increase in slope causes a 10% loss in walking preference (Meeder et al., 2017). However, according to the results of the WP survey, slope is more tolerable for participants who walk for sports and for those who walk for at least 90 minutes in their daily routine.

Within the scope of this study, WP survey was used as a tool to reveal the criteria to be considered in the planning of walkable corridors based on user preferences. WP survey, which was prepared by considering local characteristics and requirements, was put forward as a method for locally determining the criteria that can be used for walkable corridor planning.

During the development process of the questionnaire, the natural and cultural structure and demographic structure, which are considered important in the planning studies, were taken into consideration. For this reason, it can be used as a preliminary study in walkable urban corridor planning studies. However, the factors of “slope in walking”, “every condition and time walking” and “walking duration” need to be improved in terms of convergent validity. The fact that the factors are represented by 2 statements each may lead to results that reduce the convergent validity (Hair, et al., 2009). Therefore, in order to increase internal consistency, more items should be added to measure walking preference in sloped areas, travel time affecting walking preference, and adverse weather/environment conditions. That's why WP survey is under development. This WP survey can be used to understand the walking preference of the user in different places and can reveal different criteria according to the habit of the users in the place where it is used.

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