

Research on the Walkability Potential of Wangjing East Metro Station from the Perspective of Young Female

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Abstract This paper mainly evaluates the road space adaptability of the streets around Wangjing East Metro Station (hereinafter referred to as “Wangjing East Station”), and studies the impact of the road space adaptability of Wangjing East Street on the walking activities of young female residents. Through literature survey, POI data analysis and street view photo scoring, the street characteristics that young female residents are suitable for walking and like walking are analyzed. The paper includes 3 parts: determination of functional types of streets around Wangjing East Station; the characteristics of young women’s group walkability activities and the establishment of evaluation system; spatial adaptability assessment of the existing roads around Wangjing East Station.

Keywords Young female, Street space adaptability, Wangjing Business District

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Wangjing District is located in the north-east of Chaoyang District, Beijing, close to the Airport Expressway and Jingcheng Expressway. Beijing Metro Line 15 passes through this area, creating a very convenient traffic environment for this area. Due to the good traffic environment, a large number of foreign-funded enterprises settled in Wangjing, opening the prelude to the development of the region. Different from other CBD such as the International Trade Center, there are still a large number of aborigines living here in Wangjing area, bearing commercial and other functions. This paper mainly studies urban functions of the streets around Wangjing East Station of Beijing Metro Line 15.

1 Urban functions of streets around Wangjing East Station

Through big data survey, 10,999 POIs of urban facilities such as shops and residences in Wangjing District were collected, of which 1,702 were related to the streets around Wangjing East Station. According to the city functions, all POIs are divided into 6 categories: corporate enterprises, transportation hubs, education and culture, residential areas, municipal facilities and leisure and entertainment.

In order to determine the main functions of streets around Wangjing East Station, this paper calculates the proportion of POI related to Wangjing East Station and 6 types of POI in Wangjing area, and classifies various functions according to the percentage. The proportion below 15% is defined as Category C, the proportion between 15% and 30% is defined as Category B, and the proportion above 30% is defined as

Category A. The results are shown in Fig.1.

It can be seen from Fig.1 that most of the streets around Wangjing East Station are Category C streets, accounting for less than 15%, and residential areas account for the highest proportion, accounting for more than 20%. Wangjing East Station is a comprehensive functional area focusing on residential, corporate, leisure and entertainment. By studying the plan around the subway station, it is found that this phenomenon is closely related to the existence of foreign enterprises and state-owned enterprises in Wangjing. Foreign enterprises and state-owned enterprises in the region have attracted a large number of people to work and start businesses here, and also driven the establishment and development of local residential areas. The leading factors in leisure and entertainment are the existence of a large number of residential areas in Wangjing District and the Big Wangjing Park adjacent to Wangjing East Station. These

2 regions have attracted a large number of catering services and shopping centers, creating a distinctive business atmosphere.

2 Walkability characteristics of young female

The study population is young women aged 18–44. Through literature research methods, the existing relevant literature and theoretical research results are summarized and sorted out. It is found that the characteristics of young women’s group behaviors and activities are closely related to the cognitive process, social factors and environmental factors in the environment.

2.1 The cognitive process of female youth’s walkability

In the cognitive process, young women have a stronger perceptual perception of environmental color than young men, and young women believe that soft materials can bring

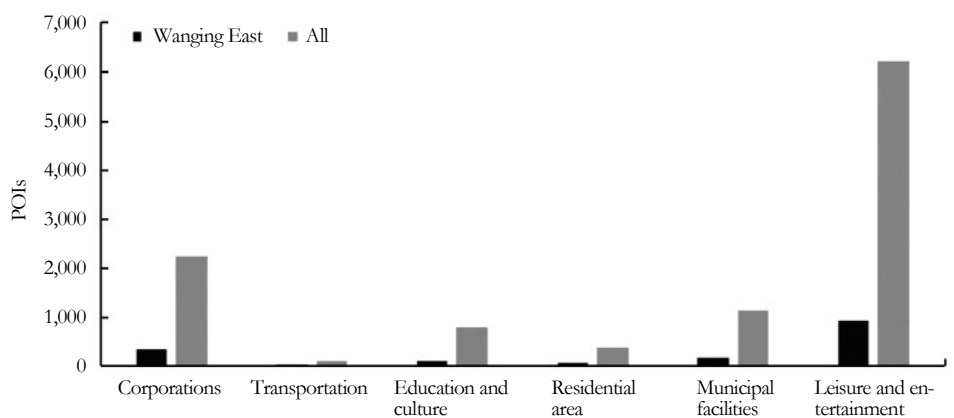


Fig.1 Punctuation evaluation results around the station

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better sensory experience in terms of material preference. In terms of cognition, cognition and perception of space, young men pay more attention to the location and environmental characteristics of the space than young women do.

2.2 Social factors

In the growing environment, female groups are generally considered to have “introverted” family responsibilities and “positive” social responsibilities. This division of responsibility is often attributed to the different division of labor between men and women in ancient times, which is “male dominated outside, female dominated inside”. Women’s leisure space is also confined in the family for a long time. This makes women more inclined to leisure activities outside the family than men, and the choice of leisure space is more open. In today’s society, this is mainly reflected in that women prefer to go by bus rather than self driving, and women have higher requirements for the walking system and prefer simple roads. In addition, women are more sensitive to environmental security, so women have higher and more perfect requirements for public facilities such as public toilets, information signs and public services, and higher requirements for the quality and quantity of private and territorial places^[1-2].

2.3 Environmental factors

At the same time, it is found that young women spend more time on leisure activities than young men do. There are more stops for women than men in pedestrian routes, and the average stay time is longer^[3]. Because women’s physical

strength is generally worse than men’s, and some women wear high-heeled shoes, they need to stay and rest. Therefore, female pedestrians tend to stay near pools and green areas^[4]. The purpose of women’s march is not clear, and the route is more circuitous than men’s. And women pay more attention to the surrounding environment and are easily attracted. Therefore, women are more inclined to areas with good landscape and rich space.

3 Spatial adaptability evaluation of streets around Wangjing East Station

3.1 Establishing evaluation criteria

Based on the above research results, this paper defines the evaluation criteria of road spatial adaptability as 7 aspects: cleanliness, humanization, accessibility, landscape richness, leisure and entertainment adaptability, width and aspect ratio.

In order to facilitate data sorting, the total score of each item in the 5 items of neatness, humanization, accessibility, parking convenience and leisure and entertainment adaptability in the scoring system is designed as 1, and the score results are only 0 or 1. These 5 assessments are based on street view photos. The total score should be within the range of 0–5. The detailed definitions and rules of these 5 evaluation indicators are shown in Table 1.

3.2 Assessment of road spatial adaptability

This paper mainly analyzes the spatial

adaptability of 2 main roads in Wangjing area—Wangjing East Road and Qiyang Road, adjacent to Wangjing East Station. In this paper, we randomly select 3 locations on each street, and use Baidu Street View Map to capture the front, left and right street view photos of each location, thus forming a total of 18 punctuation points at six locations. Screen shots and selected street locations are shown in Fig.2, and the evaluation results are shown in Table 2.

4 Evaluation analysis

The street space around Wangjing East Station has the lowest average score of accessibility of 0.28 and the highest average score of neatness of 0.8 in 5 aspects of cleanliness, humanization, accessibility, parking convenience and leisure and entertainment adaptability. The main factors affecting accessibility are concluded: the roads around Wangjing East Station are too wide, and there are no crosswalks and other pedestrian facilities and turning roads. At the same time, residential buildings, office buildings and other buildings occupy most of the area, which makes the commercial and leisure entertainment facilities in the area present small and scattered distribution, and the street landscape is dull and monotonous without change, which is not favored by young women. In addition, the overly convenient parking environment in this area has affected the humanization and cleanliness of the street to a certain extent, and occupied the humanized facilities and street space. The average height

Table 1 Definitions and rules of 5 evaluation indicators

Criterina	Score	Notes
Cleanliness	0	The road surface is dirty and old, and the parking and goods are stacked disorderly
	1	The road is clean and tidy, no sundries are stacked, and the roadside parking is orderly
Humanization	0	The pavement has infrastructure for pedestrians, such as crosswalks, overpasses, bus stops, etc.
	1	The pavement has no infrastructure for pedestrians, such as crosswalks, overpasses, bus stops, etc.
Transparency	0	Have no bus or subway transfer stations around the street, or people on the road can't pass through he intersection
	1	Have bus or subway transfer stations around the street, or people on the road can pass through the intersection
Landscape richness	0	The street has no landscape facilities such as landscape sketches, and the street view is simple and boring
	1	The street has many diversified landscape facilities such as landscape sketches
Leisure and entertainment adaptability	0	The street has no leisure and entertainment facilities for pedestrians, and the street scenery is simple and boring
	1	The street has many diversified leisure and entertainment facilities for pedestrians

Table 2 Punctuation evaluation results around the station

	WEJ1-R	WEJ1-F	WEJ1-L	WEJ2-R	WEJ2-F	WEJ2-L	WEJ3-R	WEJ3-F	WEJ3-L	QY1-R	QY1-F	QY1-L	QY2-R	QY2-F	QY2-L	QY3-R	QY3-F	QY3-L	Average
Cleanliness	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0.80
Humanization	0	0	1	1	0	1	1	0	0	0	1	0	0	1	0	0	0	0	0.30
Transparency	0	0	1	1	0	1	0	0	0	0	1	0	0	1	0	0	1	0	0.28
Landscape richness	0	0	0	0	0	0	1	1	0	0	0	1	0	0	1	0	1	1	0.33
Landscape and entertainment suitability	0	0	0	0	0	1	1	0	1	0	1	1	0	0	0	0	0	1	0.30
Score	1	1	3	3	1	3	4	2	2	1	4	3	1	3	2	1	2	2	2.10
Street width//m	46	46	46	28	28	28	35	35	35	25	25	25	25	25	25	26	26	26	30.80
Street aspect ratio	0.6	0.6	0.6	1.2	1.2	1.2	1.8	1.8	1.8	0.8	0.8	0.8	2	2	2	0.5	0.5	0.5	1.15

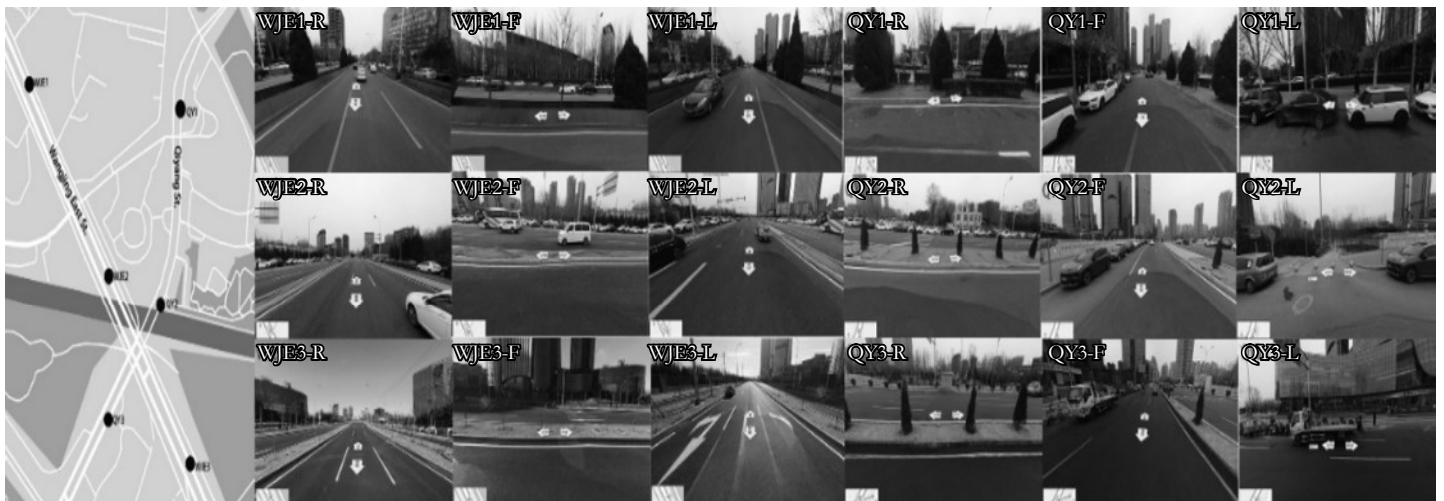


Fig.2 The street view photos of side streets around Wangjing East Station

width ratio of the street is 1.15, which indicates that the street space in this area has a weak sense of closure and is an open space suitable for young women's activities^[5].

The streets around Wangjing East Station can create more suitable street spaces for young women groups by improving street accessibility, humanized facilities and integration of leisure and entertainment places from the planning level. Appropriate scale and open and varied space can provide young women with a sense of security and interest. The construction of infrastructure for women cannot be ignored. In addition, because different groups have different

preferences for space composition, more efforts should be devoted to meet the space needs of different groups while creating and transforming urban street spaces, so as to create a more livable environment for all social groups.

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(Continued from P5)

west sides.

This paper puts forward the optimization strategies for passive form of architectural grey space based on climate adaptability, and provides a reference for form design of architectural grey space, which is conducive to creating a good outdoor thermal environment and a better living environment.

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