ISSN:2790-1688 DOI: 10.56028/aetr.3.1.440

A Study on the Influencing Factors of Children-friendly Walking Space Perception in Elementary Schools

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Abstract. In this paper, based on the concept of child-friendly primary school students aged 7-12 years and their parents as the object, selected five typical primary schools in Shenyang as research cases, conducted social questionnaires and interviews, combined with the existing space problems and children's needs characteristics of the primary school walkable space are divided into children safe evacuation section and activity-friendly section. The SP method was used to obtain the perceptual preferences of children and parents in two virtual learning space segments, and the influencing factors of their perceptual preferences were explored. The results showed that green vision rate, buffer space type, and walking space width were the key factors affecting children's sense of security in the safe evacuation area, and green vision rate had no significant effect on parents' preference choice. In the child-friendly section, color vision, building line rate, building transparency along the street floor, and play space Settings have positive effects on children's comfort, while the interface aspect ratio has no obvious effect on children's comfort.

Keywords: virtual survey; Primary school access walking space; Perceived preference; Child Friendly

1. Child friendly and accessible walking space

Primary school walkable space is the only way for primary school students to go to and from school every day. A healthy and safe walkable space can improve children's walking comfort and ensure their physical and mental health and growth and development. But with the continuous development of urbanization, there is a phenomenon of excessive marketization in the general school space, which ignores the independent rights and interests of children [1]. With the launch of the "Child-friendly" city initiative by UNICEF, there are increasing activities around the world to protect the interests of children and provide better living space for children's physical and mental development. As the only way for primary school students to go to and from school every day, the walking space should meet the needs of children's psychological and behavioral activities. In recent years, with the development of perception and cognition, the update of evaluation methods, and the progress of evaluation methods, the research of primary school walk space based on children's subjective perception needs will become meaningful through new technology and new methods.

2. Virtual perception of walking space

2.1 Child-friendly exploration

In the context of the child-friendly concept, scholars from various countries have explored the evaluation indicators of the built environment under the guidance of child-friendly. In a series of studies and project practices, the "Cities for the Protection of Children Plan" led by UNICEF has put forward the characteristics of 12 cities for the protection of children [2]. Finnish scholar Kytta et al. established the Buller by model based on predecessors' knowledge of the importance of resource accessibility and diversity to children's living environment and combined it with Gibson's ecological perception theory. This model divides the main indicators for assessing a child-friendly environment into two parts, namely, the independence of children and the availability of the environment [3]. Lindsay, a Canadian scholar, believes that the characteristics of child-friendly environment are as follows: opportunities for children to play and explore, accessibility to the

ISSN:2790-1688 DOI: 10.56028/aetr.3.1.440
natural environment, opportunities for children to actively travel, and visibility of activities [4]. At the same time, some foreign scholars have conducted in-depth research on children's behavior. Children's behavior is the external manifestation of social environment and individual interaction, which can reflect the unique behavior style and needs of this group. The most representative research objects are game behavior, independent behavior, environmental availability, and so on. Some scholars have proposed that children's play area covers the family surrounding area, street, open space, and natural environment, and discussed the internal relationship between different space environments and children's play behavior [5]. Hannah Mitchell et al. took the three residential areas of Oakland as an example, conducted research on the topic of children's behavior, and proposed that with the change of age, economic conditions and school location, children's perception of space will also change, and children's activities outdoors are often limited by the single function of open space [6]. And Gascon et al. systematically sorted out the existing studies, including the relationship between environmental factors such as street connectivity, residential density, green space, food environment, and children's health [7]. Throughout the previous studies, few studies have evaluated whether the general school space around primary school can make children feel comfortable from the perspective of children. Since children are more sensitive to the surrounding environment than adults, the child-friendly concept should be implemented and objective factors affecting children's subjective cognition should be more targeted. The formulation of evaluation indicators should adopt a combination of subjective and objective methods. In sorting out the basis of the investigation, appropriate consideration should be given to the behavioral and psychological characteristics of children. Then formulate the best spatial planning strategy to improve the quality of the surrounding space of the primary school campus.

2.2 School walking space

On the issue of children's access space, domestic children's access space research mainly focuses on traffic safety, the public built environment, surrounding public space, and so on. He Junling and Han Juan used the sampling survey method to analyze the causes of traffic jams around primary schools based on the traffic characteristics around the campus [8]. Han Zhiyuan et al. used the public participation method to establish the traffic safety evaluation index system of Tongxue Road, including six aspects of slow space, traffic facilities, and parking problems and pointed out that occupying the lane and parking and lack of crossing facilities are the main reasons affecting the safety of children going to school [9]. Fei Chenyi et al. took two primary schools in Beijing as examples and proposed countermeasures to ensure children's school safety from the perspective of traffic space and pedestrian streamlining optimization [10]. From the perspective of traffic safety, health, and safety, Wu Fengwen et al. constructed an evaluation index of the walkway and based on objective measurement data, proposed corresponding optimization countermeasures for traffic, comprehensive, and life service roads [11]. With the penetration of the concept of "child-friendly", scholars are paying more and more attention to the subjective perceptual needs of children. While improving the quality of the space environment around the school, they are also paying more attention to the psychological needs of children.

2.3 Virtual reality technology

Virtual reality technology is a kind of integrated information technology which that appeared in the late 20th century. G. Burdea from the United States proposed that VR technology has three main characteristics: interaction, immersion, and imagination. The virtual environment created and experienced by VR technology can integrate multi-source information to achieve interactive three-dimensional dynamic scenes and adapt to the physical activities of users. The study found that the experience of virtual reality scenes, sense of reality, three-dimensional sense, comfort, far and image and photo effect.

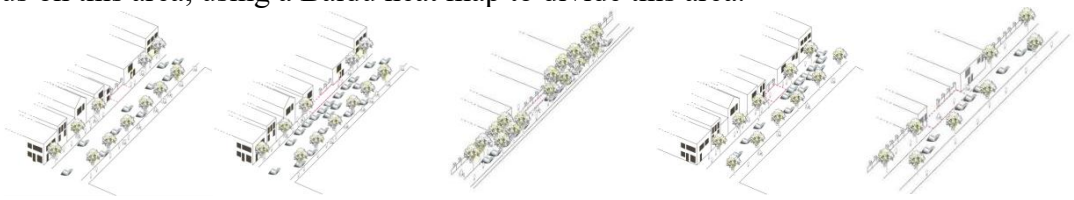
Virtual reality entered the high-tech world with the advent of CAVE systems in the early 1990s. The characteristics of virtual reality make the traditional computer has undergone a seismic change

ISSN:2790-1688 DOI: 10.56028/aetr.3.1.440
so that the computer can use a variety of tools, the virtual space can be perceived as information, and humans can rebuild an "immersive" space experience according to their own cognition. Mel Slater explored the control of visual attention in spatial decision-making by using eye movement experiments [12]. Brunette pointed out in Virtual Realities (Dag Stuhl Seminar 13241) that there are no obvious differences between subjects' path choices within real and virtual urban environments [13]. Heinrich H Bulthoff found that virtual reality technology can play an important role in the study of spatial perception. More importantly, virtual reality technology can also convey the changing space environment to the subjects in a real and effective way, making the results more effective [14]. Payam Tabrizi an takes a specific spatial feature as the object to discuss the impact of an immersive virtual environment on his psychological recovery ability [15]. There is no doubt that the emergence of emerging city technology has provided great help for the future urban spatial perception.

3. Virtual experiment of walking space for primary school students

3.1 Principles of division of pedestrian space

This paper takes the walkable space of primary schools as the main research object, selects the 5 representative primary schools required by this case through investigation, and summarizes the surrounding situation of the primary schools in this case. See Figure 1 for the analysis diagram. Based on the investigation of children's and parents' perceived needs of the walking space in primary school, we know that the lack of security and comfort in the walking space in primary school is to be solved. According to the survey, the author thinks that the school as the center of the radiation range within 500m is the primary school students' walking activity focus area, this paper will focus on this area, using a Baidu heat map to divide this area.

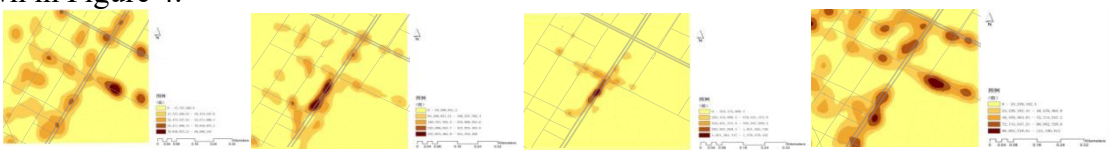


(a) Nanjing No. 1 School (b) Heping No. 1 School (c) Experimental Primary School (d) Hunnan No. 5 Primary School (e) Hunnan Experimental Primary School

FIG. 1 Analysis diagram of case primary school

(Photo credit: Self-drawn by the author)

A school in Nanjing was selected as a typical example for heat map analysis. Baidu heat map data were crawled to remove the influence of weather on children's activities and behaviors as far as possible, and relevant heat maps of working days and ordinary Saturdays and Sundays were randomly selected. By using the Baidu Map train collector, the thermal map data of a campus in Nanjing was collected in tif format, and the data was preprocessed on the ArcGIS platform. The vector data of the average calorific value of each unit at different times represent the congestion degree of the primary school at different times, that is, the vitality value of the case school Nanjing No. 1 Middle School at different times is shown in Figures 2 and 3. The histogram of activity values is shown in Figure 4.



(a) Time 15:30 (b) time 16:00 (c) Time 16:30 (d) time 17:00

FIG. 2 Spatial distribution of vitality in a Nanjing school during working days over time

(Photo credit: Self-drawn by the author)

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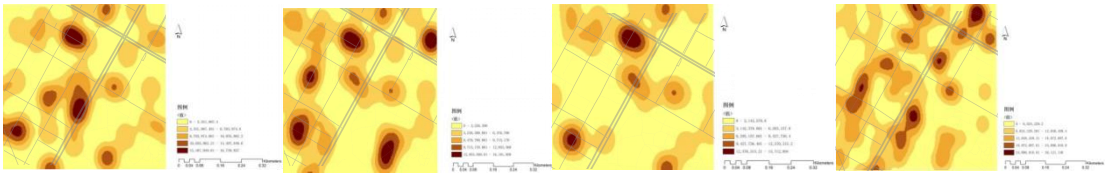
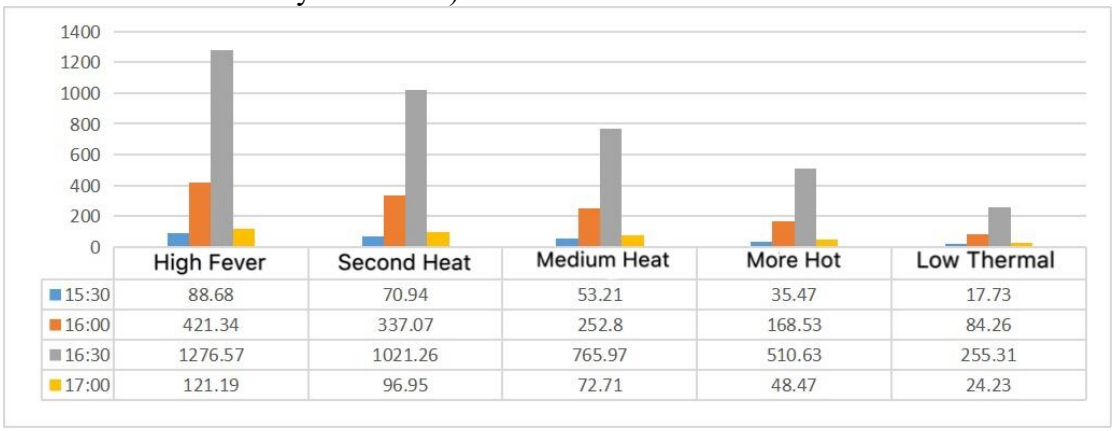


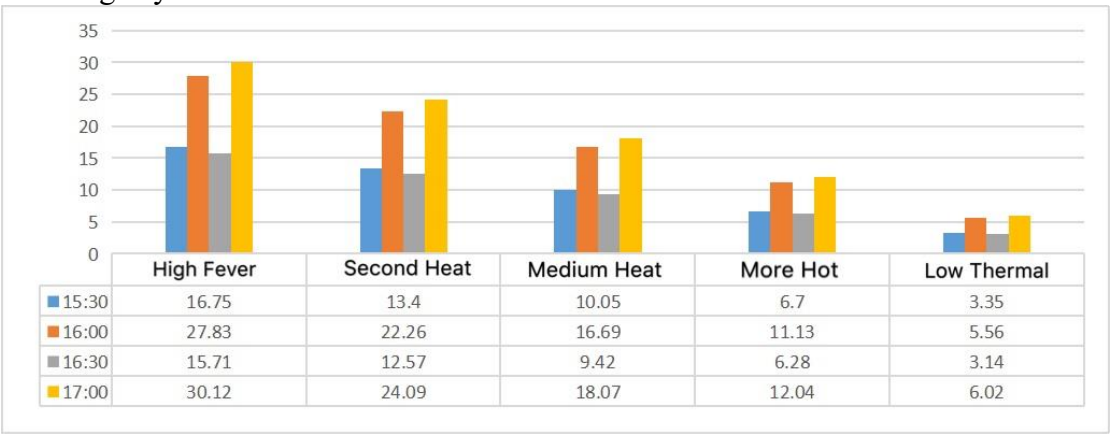
(a) Time 15:30 (b) time 16:00 (c) Time 16:30 (d) time 17:00

Figure 3 Spatial distribution of vitality of a school in Nanjing over time on rest days (Photo credit: Self-drawn by the author)



	High Fever	Second Heat	Medium Heat	More Hot	Low Thermal
15:30	88.68	70.94	53.21	35.47	17.73
16:00	421.34	337.07	252.8	168.53	84.26
16:30	1276.57	1021.26	765.97	510.63	255.31
17:00	121.19	96.95	72.71	48.47	24.23

(a) Working day and



	High Fever	Second Heat	Medium Heat	More Hot	Low Thermal
15:30	16.75	13.4	10.05	6.7	3.35
16:00	27.83	22.26	16.69	11.13	5.56
16:30	15.71	12.57	9.42	6.28	3.14
17:00	30.12	24.09	18.07	12.04	6.02

(b) Rest day

FIG. 4 Bar chart of vitality value of a school in Nanjing (Photo credit: Self-drawn by the author)

Taking Nanjing No.1 School as an example, heat map 2 shows the spatial distribution of the activity value of Nanjing No.1 School over time from 15:30 to 17:00 during working days. As can be seen from bar Figure 4, the crowd vitality within the area of a school in Nanjing is the lowest at 15:30, which means the crowd density within the area of a general primary school is low at this time. The crowd vitality begins to increase at 16:00, and the regional vitality reaches its peak at 16:30 at the school gate. According to the figure, the space thermal value is the highest at 0-70 to 80m, that is, the crowd is the densest. According to heat map 3, the heat value of the general walking space of a school in Nanjing did not change regularly with time during rest days, and the heat was generally low. By observing the vitality value of bar Figure 4 on rest days, it can be found that the heat of the pedestrian space of a school in Nanjing is higher at 16:00 and 17:00. However, the time when children leave school is 16:30, during which time, the crowd density at the school gate is not obvious. That is to say, the zoning of the walkable space of primary school on weekdays studied in this paper has certain research significance.

Therefore, at the same time, the other four primary schools in the case, Chaoyang first School, Experimental Primary School, Hunnan Fifth Primary School, and Hunnan Experimental Primary School carried out thermal map climbing, and the results are similar. Based on the data of thermal

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value, the range of 0 to 80m walking space for primary school access is defined as a crowded section. By combing and summarizing the after-school activity characteristics of the primary school children in the case, it is found that the children in this section are mainly walking, running, and chasing, mostly accidental activities, which means that the children do not have much intention to stop in this section. Therefore, in this section, the children's mood in the crowd just out of the school gate brought anxiety. Define this section as a child-safe evacuation section. Outside the 80m range centered around the school gate, the children stepped out of the crowded section. The child's mood has changed from anxiety to relaxation. The children in this region had frequent transient sexual activity and prolonged sexual activity. Some children began to stay for group play, stop and rest, shop or ride. Therefore, the primary school walkable space in this area is defined as a child-friendly section.

3.2 Influence factors of pedestrian space

3.2.1 Independent variables of children's safe evacuation zones

The weight ratio of relevant spatial elements was obtained based on the on-site interviews with parents, and the elements were sorted and classified into sidewalk elements, road elements, school gate space, and interface form elements. The factors with high relative weight, such as buffer space form at the school gate, the width ratio of vehicle and sidewalk, the form of the non-separation zone, and the setting of parents' allelic zone, can be obtained. The factors with high weight can be included in the influence factor database of children's safe evacuation zone. The expert scoring evaluation was carried out through AHP, and the top three influencing factors of the weight ratio of the index layer in AHP were selected, which were respectively the buffer space form of the main entrance, green vision rate, and walking space width. Through the investigation of the relevant elements of the walking space of primary schools in Shenyang and the collation of previous literature research results, the value range of the independent variable of the influence factor set in the virtual experiment in this paper is obtained. According to the classification of the space in front of the school, the effective difference types are summarized, and the buffer space at the school gate is divided into two types: a rectangle with a short, and long side and a rectangle with a long horizontal side. The survey shows that all the walkable Spaces for primary school access are walkways combined with street trees and another greening, and the minimum walkable space width is no less than 1.5m. According to the actual situation, the walking space width level is set as 1.5m, 2.5m and 3.5m. The level of green vision rate was defined as below 5% in previous studies. 5 ~ 15% of green cognitive impairment; 15 ~ 25% partial green; 25 ~ 35% more green; 35% or more of very good green [10].

3.2.2 Children's activity friendly section independent variable

The influencing factors of the activity-friendly section of children should be obtained from the subjective evaluation of children. However, children are not mature physically and mentally, their ability to express their subjective thoughts and needs is weak, and they express their subjective feelings vaguely. Based on the previous research and literature review, this paper first established the impact factor database of the child-friendly activity section, introduced the public participation method for children, and further screened the relevant impact factors with the help of eye tracker equipment (see Figure 5). The results of children's eye movement data show that children's feelings of comfort during walking are more based on their feelings about street facades (see Figure 6).

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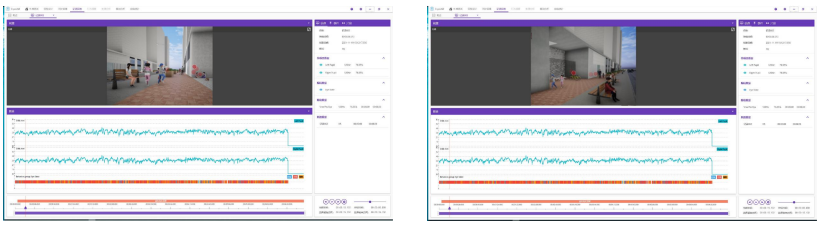

Figure 5. Interface of eye movement analysis
(Photo credit: Self-drawn by the author)

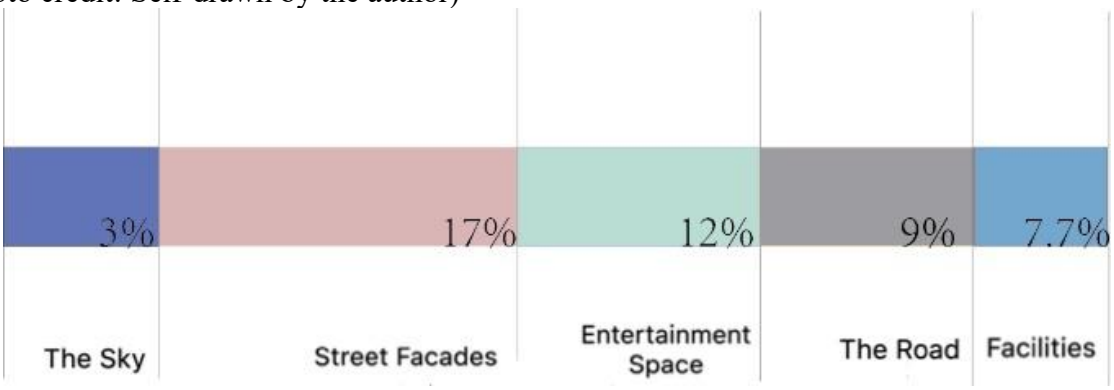

Figure 6. Bar graph of eye movement data
(Photo credit: Self-drawn by the author)

Factors such as game activity space, education space, rate of pasting, visual comfort of color, transparency of ground buildings along the street, the richness of shops along the street, diversity of facilities, leisure seating Settings, and aspect ratio between roads and buildings are included into the influence factor database of the child-friendly section of primary school walkway space. Through AHP hierarchical analysis, the children's activity-friendly section was scored and evaluated by experts, and the top five influencing factors were selected as the independent variables of this study, which were four elements of the walking space: color vision, the rate of building adherence, the transparency of the ground floor building along the street, the aspect ratio of the interface, and one element of the staying space: the setting of the play space.

3.3 Virtual model establishment

3.3.1 Safe evacuation section experiment space

There are three influencing factors in the safe evacuation of children experiment, and different expressions of levels in the virtual experiment model are as follows. In this experiment, we arranged four independent variables of green visual rate, two forms of buffer space, and three independent variables of walking space width to get 24 scene models. The control models of different independent variables are shown in Figure 3.7 below.

Green | | | 25% 15% depending on the rate of 0% to 35%

The width of elementary school pedestrian street was controlled within a fixed range and considering that the green vision rate was jointly affected by several factors, the canopy width of street trees was selected as the independent variable to control the green vision rate in this study. At the same time, the green vision rate of the experimental model is controlled. In the Mars model, a model photo is captured every 15m from the viewpoint of a human, and the green vision level is controlled to be within the corresponding independent variable range through Photoshop pixel processing. The average green vision rate captured is taken as the total green vision rate of the safety evacuation section at this level. The greenness of the model ranges from 0% to 35%. They are 0 percent, 15 percent, 25 percent, and 35 percent respectively.

(2) | no buffer space form

Control green vision rate, primary school walkway width must be certain. The buffer area between parents and pupils is set up by controlling the form of the border between the walking path

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and the school gate. According to the field survey, if there is a certain concession area between the walking path and the school gate, the relationship is shown in Figure 7. Children will have a slightly stronger orientation when going out after school, and the possibility of congestion at the gate will be reduced. Therefore, this paper tries to set up two forms, namely buffer space, and non-buffer space, to explore the influence relationship between children's sense of security.

(3) walking space width 1.5 m 2.5 m | | 3.5 m

Control green vision rate is certain, and the school gate space buffer form is certain. The width of the walking space is set as 1.5m, 2.5m, and 3.5m according to the relevant regulations and previous research. The width of the walking space does not include the occupied width of street trees and railings.

3.3.2 Experiment space in active friendly section

There are five factors affecting comfort in the children's activity friendly section experiment. In the virtual experiment model, the different expressions of the five factors at different levels are shown in Figure 7 below.

(1) the space has | no game

The play space is mainly set up as a potential activity field in the pedestrian space of the primary school, which can be used for children to stop and play after school and improve their sense of participation in the street on the boring way home.

(2) the specular color vision space without | | moderate concentration

The expression of the highlight space of color vision in the virtual reality model is mainly the setting of the structures in the walking space, and the colors of the structures are selected as bright colors. Each dotted highlight space set in the pedestrian space is interspersed in the form of a "line" within the street space as a "surface". According to the research results, 15% per 100 meters of highlight space is considered a moderate type of color visual space, while more than 15% is considered as a dense highlight space. The calculation of the highlight space refers to the calculation of greenness.

(3) building stick line rate of 60% 100% 90% 80% 70% | | | |

The setting of the building line rate refers to the previous literature review, and the virtual reality model is established according to the possible form of the street line rate level.

(4) the underlying building along the street transparency | | | | 75% 70% 65% 60% 80%

The different levels of transparency of the ground floor building along the street are determined by the degree of shading of the glass of the street space by the signboard facilities such as shops and advertising. When the degree of shading of the glass of the street space is high, the transparency of the ground floor building along the street is low, and vice versa.

(5) interface aspect ratio greater than 1 1 | | less than or equal to 1

With reference to the summarized calculation method of the aspect ratio of the interface, combined with the existing research, the height of the surrounding buildings is limited, that is, the height of the buildings is no more than 100m. According to the surveyed street width and the D/H formula, the aspect ratio of the interface is regulated.

(a) Green vision rate 0% (b) green vision rate 15% (c) green vision rate 25% (d) green vision rate 35%

ISSN:2790-1688 DOI: 10.56028/aetr.3.1.440

(e) Rectangle with long side (f) Rectangle with short side (g) Walking width of 1.5m (h) walking width of 2.5m

(i) 3.5m walking width (j) No game space (k) with game space (l) No color highlights (m) Moderate color highlights

(n) Dense color highlights (o) short side shorter rectangle (p) Walk width 1.5m (q) walk width 1.5m (r) walk width 1.5m

(s) Long rectangle with long side (t) Short rectangle with short side (u) Walking width 1.5m (v) Walking width 1.5m (n) Walking width 1.5m

FIG. 7 Level comparison of independent variables of factors influencing safe evacuation zone (Photo credit: Self-drawn by the author)

3.4 Experimental procedures and measurements

Forty subjects were randomly recruited for the formal study. The subjects were children and parents. Before the experiment began, the participants were asked to participate in a virtual street experience experiment centered on the walking space of a primary school. The first group of participants wore VR glasses, and the specific process of the experiment was recorded by the camera.

After the device was put on, the subjects were given a five-minute break, which allowed them to gather their rest before the experiment began. During the process, the researchers had participants close their eyes and wear noise-reducing headphones to reduce the influence of the outside world. The subjects were then trained to operate a virtual reality device. After the training, the subjects were asked to complete the first part of the questionnaire, which recorded their personal information and indicated whether they could adapt to the virtual experiment. Rest for 5 minutes after this to make sure their physiology is relatively stable.

Conduct a formal experiment, randomly select the experimental group, and ensure that each subject extracts 6 groups of experimental models. Based on the perception of the sense of security and comfort in the walking space of primary school students, the subjects selected a subjective preference scene with a high sense of security or comfort in each group of experimental models. In the extraction process of the experimental group, the extraction object is controlled to ensure that the scenes of the two sections are extracted as much as possible. At the beginning of the formal experiment, the subjects would appear at the school gate and carry out virtual perception in the designated walking area of the primary school in accordance with the usual habit of picking up and dropping off children. Before the experiment began, the subjects were reminded that they could relax and experience the surrounding environment during the walking process, simulate the daily habit of leaving school, and have a roaming experience in the designated direction of the school path. After the first experiment, the subjects were asked to fill in the SP questionnaire, select a preferred scenario, and collect the skin electrocardiogram and ECG data of the subjects. After the six groups of experimental models were roaming and the SP questionnaire was filled out, the experiment was over. The full experience time of each scene is 2-4 minutes.

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4. Virtual perception experiment results

4.1 Sense of security and walkable space

The safety perception of parents and children was analyzed in the safe evacuation section. The analysis of parents' SP preference data shows that the two factors, walking space width and buffer space form, are significant at the confidence level, while the significance of green vision rate is relatively low, indicating that parents' cognition of green vision rate is fuzzy, and the influence of other factors on children's sense of security is weak. The results show that several coefficients pass the significance test at different levels.

(1) Parent data

The width of the walking space and the form of buffer space had the most significant influence on the preference degree of parents, passing the test at the significance level of 0.05. In the element of walking space width, select the virtual scene with 3.5m walking space and set it as the reference. The variable coefficient value of the virtual scene with a walking space width of 2.5m is positive, and the variable coefficient value of the virtual scene with a walking space width of 1.5m is negative. The effect of each virtual scene on parents was 2.5m > 3.5m > 1.5m ($pr < 0.05$). It means that when other conditions are the same, the utility of walking space with a width of 1.5m is negative for parents, which means that compared with the space with a width of 3.5m, parents' sense of security is reduced. The scene with a walking width of 2.5m had the highest parental preference, and the highest positive effect on all groups, and the subjects had the strongest sense of security in this space.

Among the elements such as buffer space form, the P value of middle-aged men with buffer space form as long side rectangle is taken as reference, and the P value of middle-aged men with buffer space form as short side is greater than 0.05, which is not considered. For females, the P value was 0.0000. Through the significance test, the coefficient of the variable was negative. All the P values of the elderly parents pass the test, and the variable coefficients are negative, which proves that the setting of the preschool area with short buffer space has a negative effect on the parents and proves that the children and their parents have the lowest sense of security in the walking space of primary school at this level.

Among the factors of green vision rate, the absolute values of P-value significance are all greater than 0.05, indicating that the effect of such factors on parents of all ages and genders is not obvious, which proves that such factors have less impact on children's sense of security than the other two factors.

(2) Data of children

Green vision rate and walking space width had the most significant influence on children's preference, passing the test at the significance level of 0.05. Among the elements of green vision rate, with 35% green vision rate as the reference level, the effect of each virtual scene on children was 15% > 25% > 35% > 0% ($pr < 0.05$). All other conditions being equal, the pedestrian space reflecting no green vision rate is not popular with all children. Children prefer scenes with a green vision of 15% to 25%. As for children, boys prefer walking spaces with 25% green vision and feel more secure. This was followed by walking Spaces with a green vision of 15 percent. Girls tended to walk in Spaces with 15 percent green vision, followed by 25 percent green vision. The effect of 5% green vision rate is low in the children's safe evacuation zone, and children have a low sense of security in the space at this green vision level.

Among the elements of walking space width, with 3.5m walking space width as the reference level, the influence of each virtual scene on children was 2.5m > 3.5m > 1.5m ($pr < 0.05$). It means that when other conditions are the same, the children's preference degree is the highest in the scene with a walking width of 2.5m. This suggests that the wider the walking path and the higher the green vision rate, the greater the sense of security children experience.

The statistical P values of buffer space forms are all greater than 0.05, and the coefficient of the variable is negative. This indicates that the influence of this factor on children's sense of security is

ISSN:2790-1688 DOI: 10.56028/aetr.3.1.440
less than that of the other two factors. If the coefficient is negative, it indicates that children prefer the safety evacuation section with a long buffer space and a long rectangular shape.

The SP preference data analysis of children shows that green vision rate and buffer space form are significant at the confidence level, while the buffer space form is relatively low, indicating that children's cognition of buffer space form is fuzzy, and the impact of other factors on children's sense of security is weak, which is in line with the expected conclusion and consistent with basic common sense.

4.2 Comfort and walkable space

In the fitting of various elements of the virtual experiment in the activity-friendly section, the relationship between the positive and negative coefficients of variables of each item is basically in line with the expectation. According to the results of the polynomial Logit model constructed in this paper:

(1) In the factors of building line sticking rate, the P values of male children and female children at all levels were less than 0.05, indicating that they passed the significance test. The effect of virtual scenes with each rate of attachment on children's comfort is 70%, 60%, 80%, 90%, and 100% from strong to weak. According to the data, the building line rate has a high effect on the friendly comfort of children, and the difference is not obvious for children's gender. When the utility value is 100%, 90%, and 80%, the utility value is negative, indicating that the section space under this level is not favored by all children. The utility of walking space is the lowest when the line rate is 100%. The utility value of girls is twice that of boys at this level, and the comfort experience of children at this level is the lowest. When the utility coefficient of the effect of and 70%-line rate on children's subjective comfort preference is positive, it means that children have the highest degree of spatial preference at this level.

(2) In elements such as color vision, gender difference has a slight influence on the data. When the spatial distribution of highlights is moderate, the P values of both boys and girls are less than 0.05, and the coefficient of the variable is positive. When the spatial distribution of highlights is dense, the P value is less than 0.05, and the coefficient of the variable is positive but smaller than in the virtual scene where the highlights are always distributed.

The study shows that when the highlight space in color vision is moderately distributed, the preference degree of children is greater than others, and the positive effect on boys is the largest, indicating that boys have the highest degree of physical and mental pleasure in the environment with moderate color vision. When the highlight space distribution is dense, the preference degree of girls is higher, that is, the dense highlight space is more attractive to girls; Pedestrian areas without highlights had the lowest utility for all children, indicating that the space was generally unattractive to all children.

(3) There is no significant difference between the data of children of different genders in the transparency of ground floor buildings along the street. The P values of children at all levels were all less than 0.05, indicating that they had passed the significance test. The data show that within the range of 60-70% transparency, the higher the transparency of walking space, the higher the comfort experience of children; When the transparency of the ground floor building along the street is 80%, the variable coefficient is negative, indicating that the space at this level hurts the comfort level of children, and the space at this level has the lowest comfort level and is the most unfriendly to children.

(4) The significant value of the interface aspect ratio was greater than 0.05 in Loge tics regression, which had no mathematical logic relationship. The effect of the child-friendly section is not obvious, indicating that the influence of this element on the comfort level of children is less than other elements.

(5) For elements such as game space setting, the P value is less than 0.05, indicating that the significance passes the test. The variable coefficients of both boys and girls in this element are negative, and a negative coefficient indicates that children have a lower preference for the scene

ISSN:2790-1688 DOI: 10.56028/aetr.3.1.440

without game space Settings, and children prefer the children's activity-friendly section with game space Settings.

Conclusion

Aiming at the research perspective of the walking space of the primary school, this paper changes from the method of object analysis to the embodied perspective with children and parents as the subjects of experience, and draws the following conclusions through virtual experiments: In terms of the construction of space security, walking space width and buffer space form have the most significant influence on parents' preference degree, green vision rate and walking space width have the most significant influence on children's preference. In terms of the construction of space comfort, the space with a 70% sticking rate, 60-70% interface transparency, and moderate distribution of highlight space has the highest comfort preference for children. Studying the influence of different spatial morphological elements on children's perception can provide scientific support for the accurate optimization of such space.

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