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Design & Health
13TH WORLD CONGRESS & EXHIBITION
REVITALIZING HEALTH BY SALUTOGENIC DESIGN
Healthy environment | Healthy people

Effects of neighborhood environment on people with cognitive impairments

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Lian's research interests follow three main themes: inclusive physical environment, evidence-based design, and architectural programming, especially focus on supportive and healing environments for people with cognitive impairments.

Duty of academic organizations:

- 2023～present, Board member, the Asia Chapter of the International Academy of Design & Health (IADH)
- 2023～present, Board member, Chinese Expert Committee on Active Ageing and Age-Friendly Cities, United Nations International Institute on Ageing (UN-INIA)
- 2021 ～ present, General Secretary General , Committee on Environment-Behavior, the Architectural Society of China (CEB-ASC)
- 2021～present, Deputy Secretary General , Extension Engineering Specialized Committee, Chinese Association Of Artificial Intelligence
- 2020～present, Fellow, Committee on Ageing Architecture, the Architectural Society of China
- 2023～present, Co-researcher, Neuroscience Optimised Virtual Environments Living Lab (NOVELL), Melbourne, Australia
- 2017～present, Adjunct researcher, Institution of Extennics and Innovation Methodology, Guangdong University of Technology, China

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- **Introduction**
- Methods & Samples
- Results & Discussion

Cognitive Impairment (CI)

Mild dementia：memory decrease，independent living；

Moderate dementia：memory impairment，partly effect independent living；

Severe dementia：Severe mental and physical impairment，need to be taken care of

People with cognitive impairment in China

- One person develops cognitive impairment less than every 3 seconds.
- In 2020, the cognitive-impaired population is projected to be 16.93 million.
- At least 1 in every 36 Chinese will have cognitive impairment in 2050.

The general characteristics of the population with cognitive impairment in China:

- **huge** and **growing very fast**
- An considerable amount of **recessive population exists**, which is caused by no clear clinical-manifestation or low screening coverage.
- Beside a minority of people who are generally in a severe condition and unattended, **most of the cognitive impaired would live at home**.
- They would also have the **empty-nested problem** as other elder people do.

Aim of Study

The study aims to investigate how people with cognitive impairments in China participate in and utilize the outdoor environments, and what are the differences of people-environment interaction, compared with other elderly individuals.

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Data collection

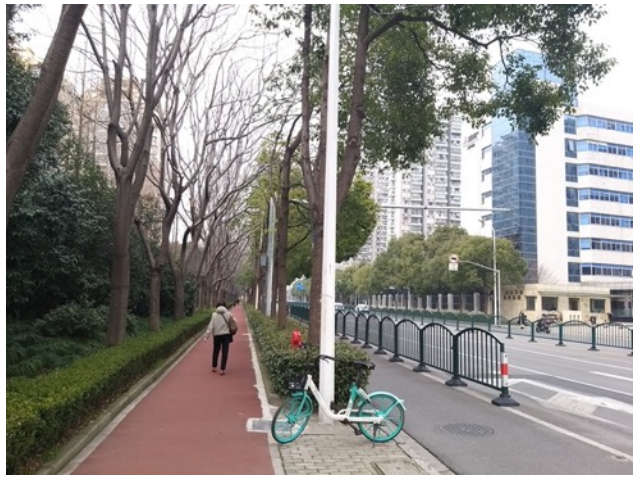
The on-site study includes two steps:

➢ **Semi-Structured Interviews** (N=47):

- **one-on-one / one-on-two** face-to-face interviews
- Each interview lasted between **20 to 35 minutes** (mean value=26).
- Some (N=3) took place at the **participants' homes**, while others (N=22) were conducted at **community centers**. Additionally, a portion of the interviews (N=21) occurred in **outdoor public spaces**.
- Each interview was audio-recorded and transcribed verbatim.

➢ **Environmental survey**:

Photographs were taken to document the surroundings of the neighborhoods where the interviewees are located.



Data analysis

Thematic analysis

➢ **Data analysis was carried out by 3 researchers**:

- **Researcher A:** transcribing audios verbatim and removing any information related to participants 'personal identities.
- **Researcher B&C:** coding, compiling into themes, and drawing connections.
- **Researcher A:** reviewing the final codes and themes.

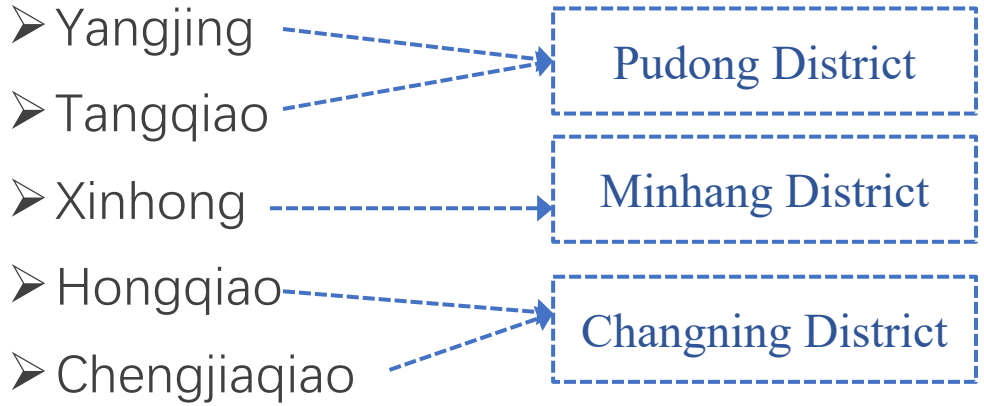
➢ Throughout this process, the **constant comparison method** was used to maintain a close connection between the data, codes, and themes.

Sample

Neighborhoods:

In 2019, **Shanghai** launched the *Pilot Project on Dementia-friendly Communities for the Elderly* to develop a community care service system that includes publicity and education, risk assessment, early intervention, family support, resource linkage, and platform construction.

5 neighborhoods in Shanghai



Sample

Participants:

- **22 cognitively impaired individuals**: MoCA scores ranged from 19 to 26.
- **25 older adults without CI:** served as a control group, scoring above 26 on the MoCA.

Participants aged between 65 and 85 years.

		the cognitive impairment group	the non-cognitive impairment group
Average age		78	72
Gender ratio（Female：Male）		16：6	21：4
Living condition	Living alone	6	2
	Living with family	16	23

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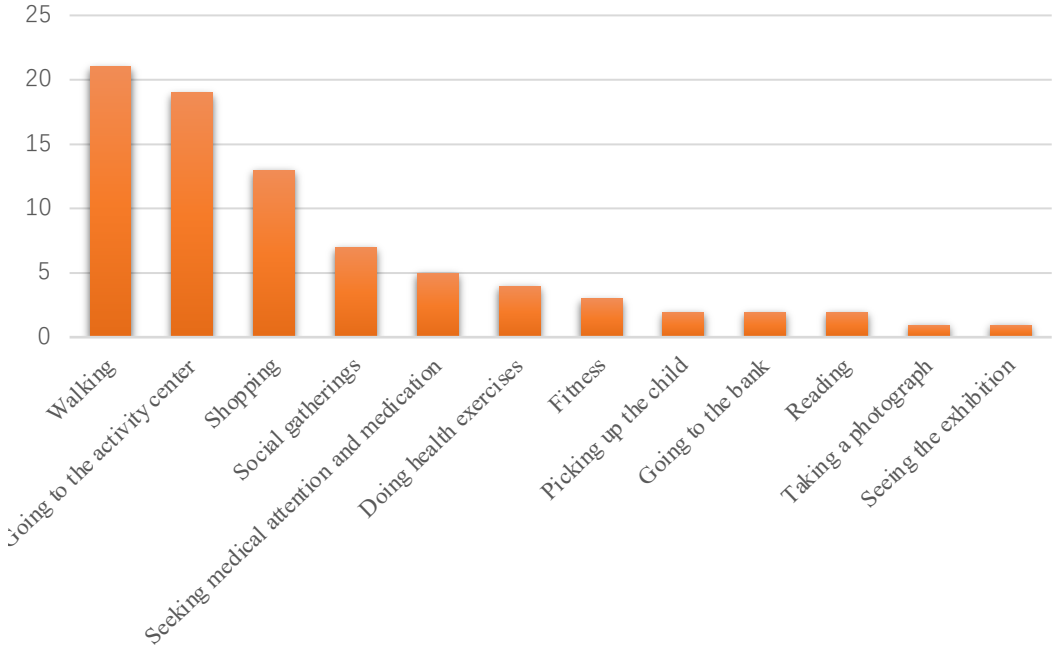
Theme 1. Use of outdoor environment

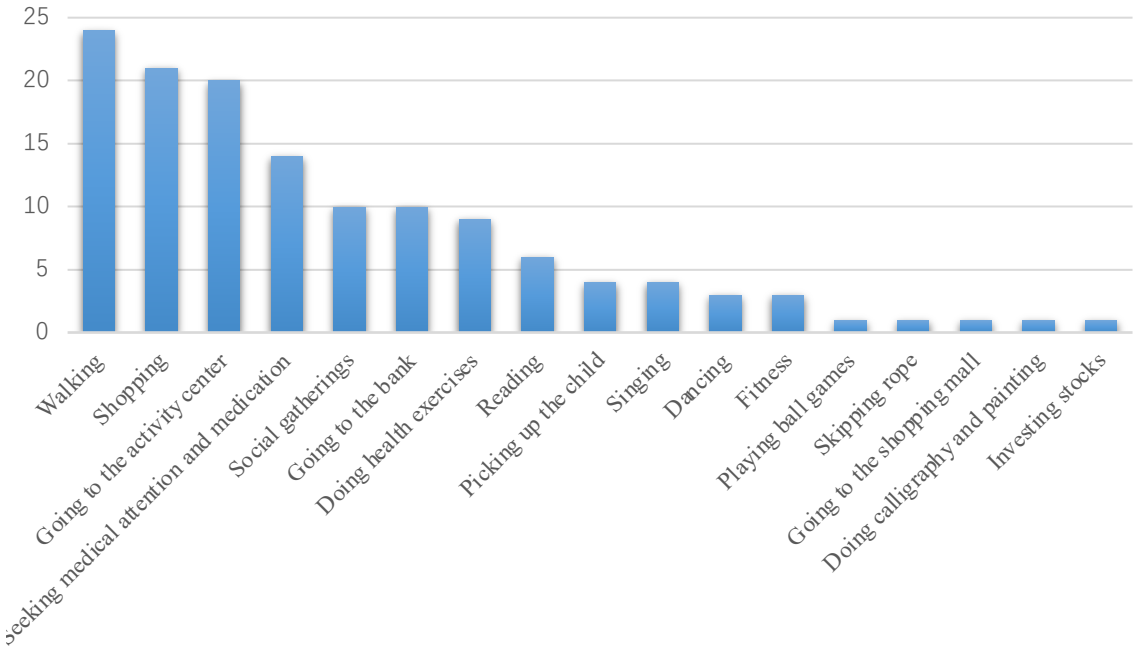
Participation in outdoor activities:

In general, the CI group engages in fewer types of activities.

CI group: walking > going to community center > shopping



Participants with cognitive impairments

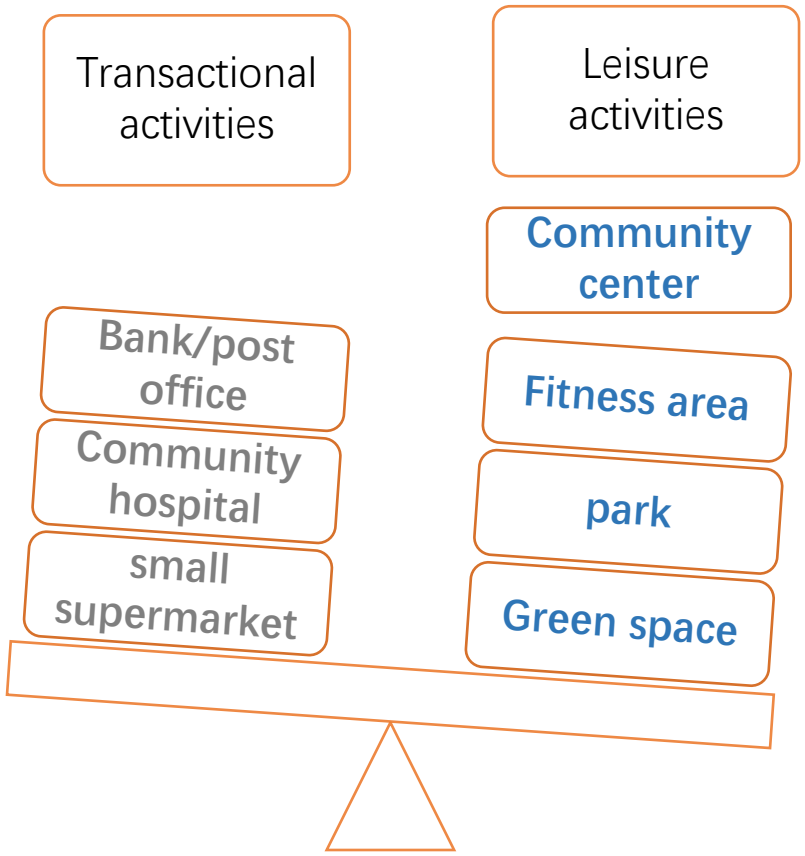


Participants without cognitive impairments

Activities to give up:

By contrast, individuals decrease transactional activities firstly after the cognition decline.

Due to the development of **online shopping**, there are participants from both groups would purchase online. 6 CI individuals mentioned that **their children often purchase groceries online for them**, which has made **going out for shopping no longer the main purpose**.

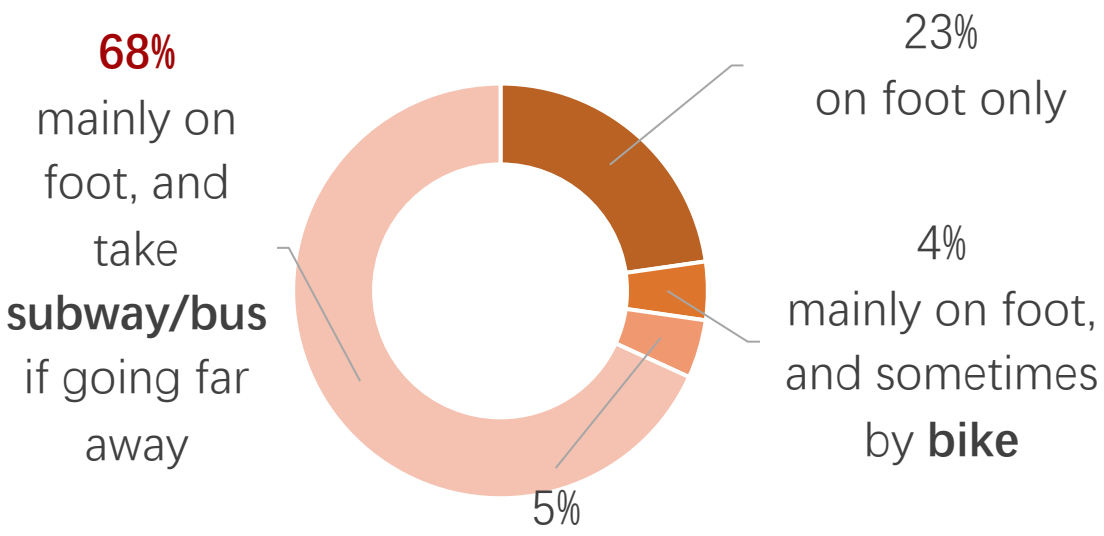


Schedule outdoor activities:

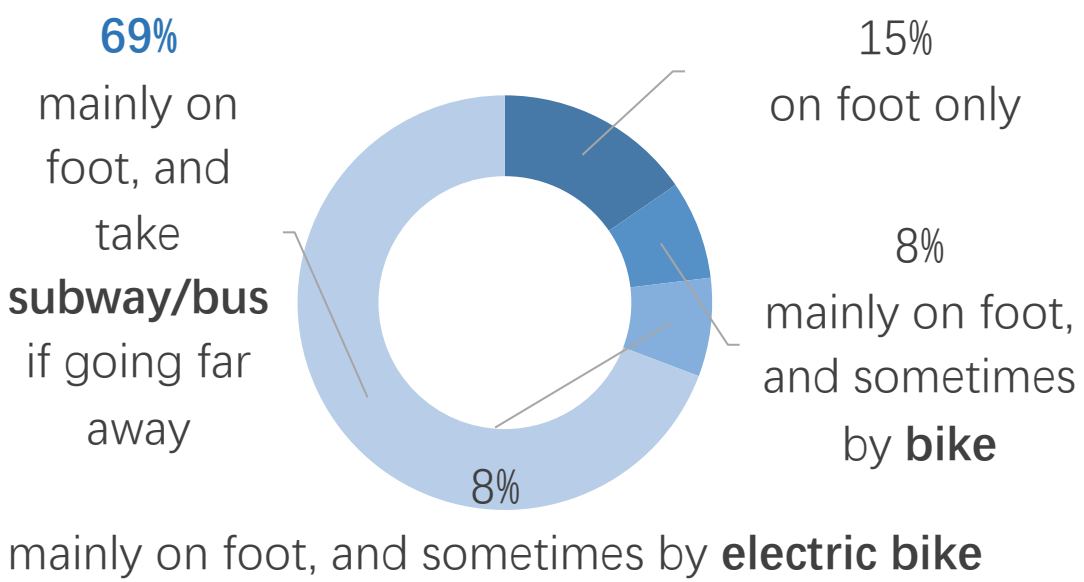
- Most participants with CI choose to going out in the morning.
- They would rarely be out alone in the late afternoon and evening, except with accompanies or friends.

Traffic tools

Both groups were able to go out alone at least once a day, with some going out two or three times a day.



Participants with CI



Participants without CI

Walking ability:

The walking data of the two groups is nearly the same, indicating that the CI group still retained good walking ability.

the largest distance on foot (evaluated by time consuming)	*Participants **with** cognitive impairments*	*Participants **without** cognitive impairments*
MIN	**15** minutes	**10** minutes
MEAN	**22** minutes	**23.4** minutes
MAX	**60** minutes	**60** minutes

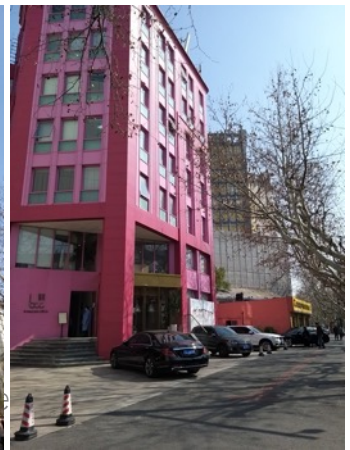
Use of environmental features in wayfinding :

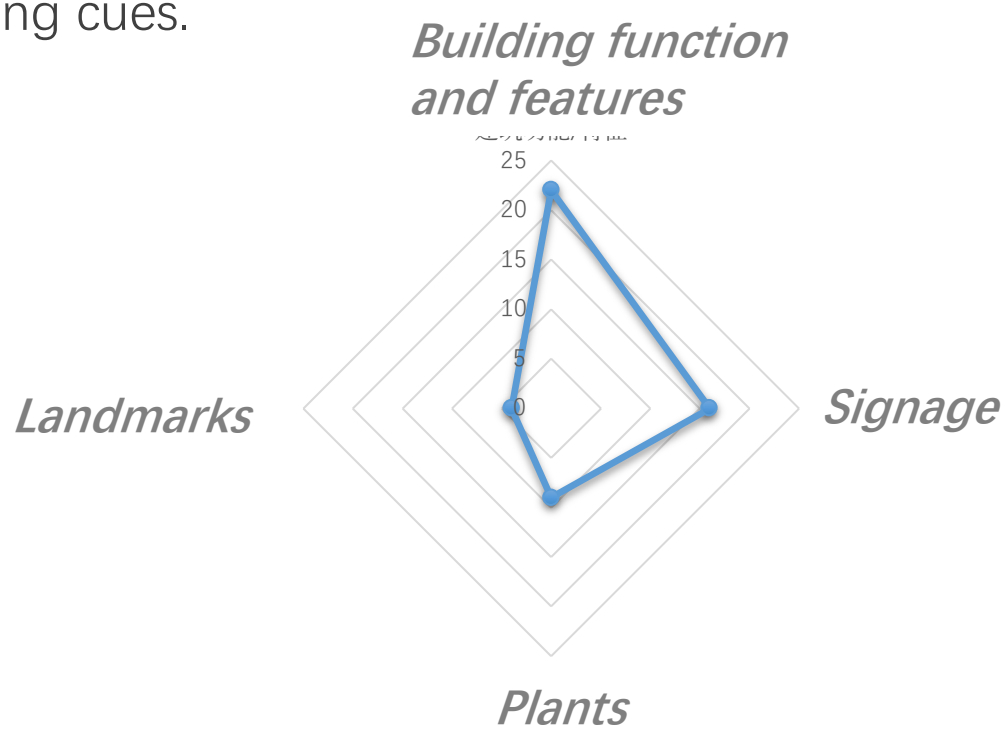
➢ **Building function** :

Commercial building, healthcare facility, care center, police station, bank, post office and **hotel** would be utilized as locating cues.

➢ **Unique architectural features**:

(10 participants with cognitive impairments + 13 participants in control group)





Use of environmental features in wayfinding :

➢ **Signage**:

(14 participants with CI + 17 participants in control group)

Street nameplate is an effective factor for orientation in unfamiliar areas.

➢ **Landmarks**:

Public art, and **street furniture** would be also utilized as orientation cues, but relatively less compared with signage.

Use of environmental features in wayfinding :

➢ **Vegetation**:

- aged trees
- flowering plants

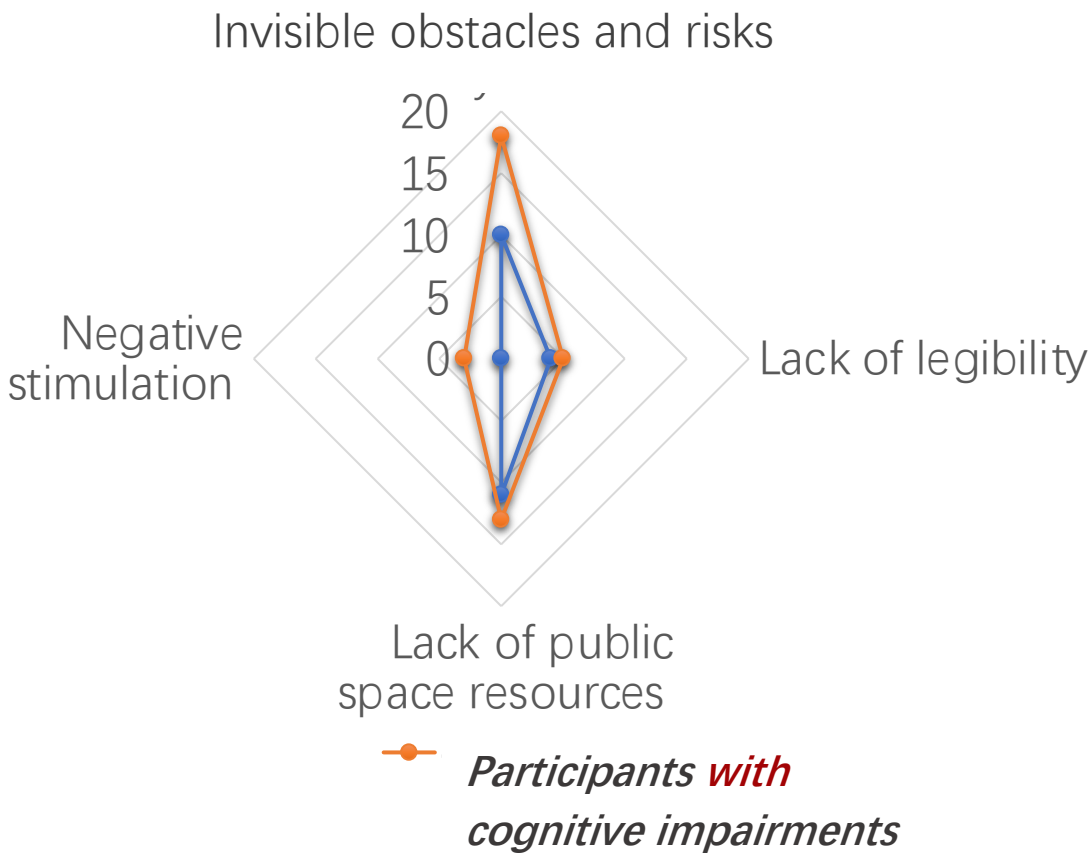
For entrances of residential building, plants play a stronger role on localization. While for street environment, buildings affect much more.

Theme 2. Barriers of outdoor environment

Invisible obstacles and risks:

- **Environmental Risks**: aging pavement, unevenness, slopes, narrow path;
- **Traffic Risks**: high traffic volume, high vehicle speed, motorcycle, electric bike;
- **Risk from insufficient lightening**

More individuals with CI mentioned feeling fearful when crossing the road compared to the control group.



Lack of public space resources:

- Some individuals of both groups living in neighborhood with **cultural spaces** such as **libraries, reading rooms**, and **galleries**, and they expressed a habit of frequent visiting to these facilities.
- Interviewees residing in neighborhood without relevant cultural resources also expressed a desire to visit such spaces.
- Some individuals with CI mentioned less desire to go out as lacking **fitness sites**.

Lack of legibility:

Building façade and entrances cannot be distinguished and recognized easily to support localization and orientation.

Dwellings with a similar façade

Building with similar entrances

Negative stimulation:

- Illuminators on the ground level may cause confusion on wayfinding for individuals with CI.
- Complicated signage, such as multiple arrow marks, is also hard to understand.

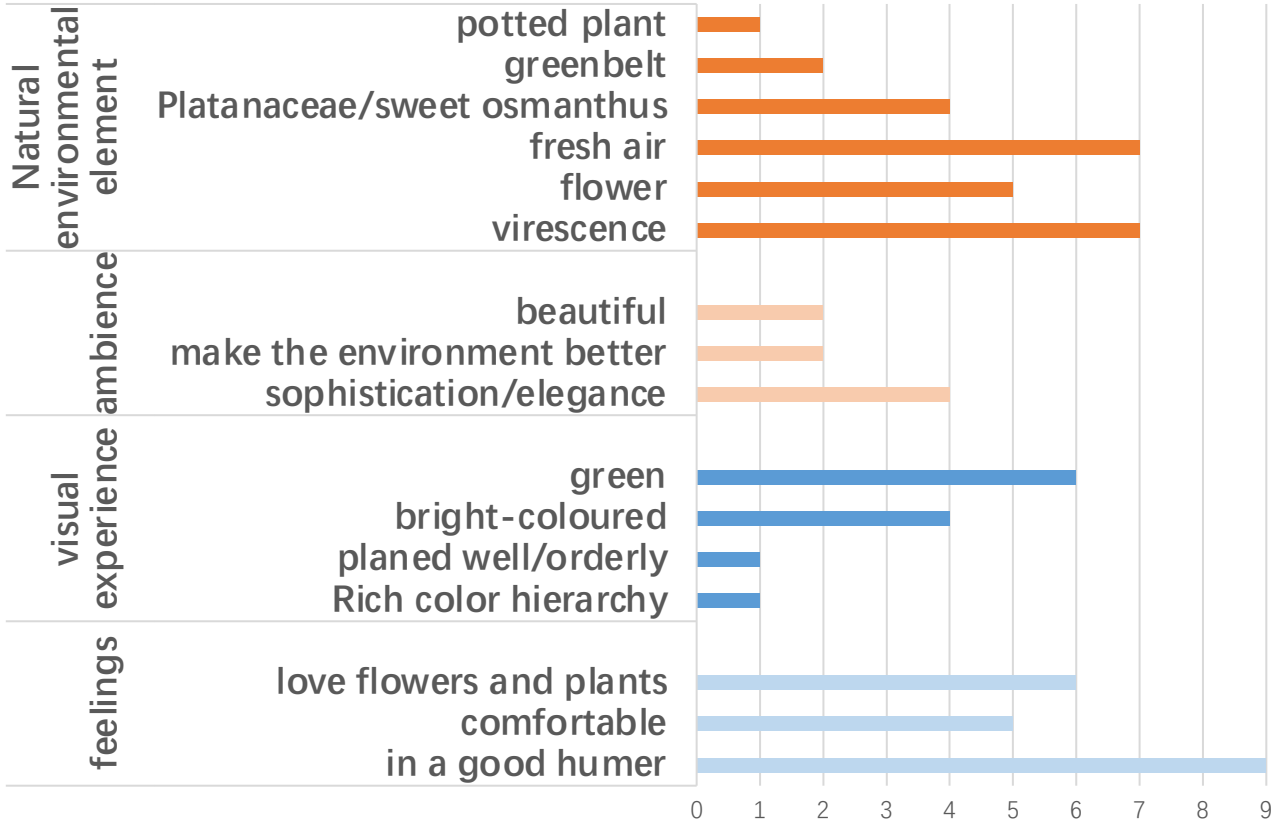
Illuminators on the ground level

Complicated signage

Theme 3. Preferences of outdoor environment

Preference of green space & landscape:

- Compared to the control group, although those with cognitive impairment engaged in fewer types of activities, they at least **maintained a habit of walking**.
- Several cognitively impaired individuals believed that, for an activity site, **greenery was more important than space scale**.
- Interaction with natural landscapes helped them to **maintain the willingness to go outside** during early and medium stages.



Word frequency on natural environment

Emphasis on safety and comfort:

- For individuals with early-stage cognitive impairment, compared to identification, the participants **emphasized more on the safety and comfort than identification**.
- Compared to the control group, **CI individuals pay more attention on safety**.
- Several participants with CI mentioned **a preference for quiet walking environment**.

Diversity preferences on size of the public space/green space :

- **Preferences for space scale varied among individuals**, with no significant differences between the two groups."



Discussion

The CI group showed a **decrease** in the types of transactional activities, high-intensity or high-coordination sports, and activities in large-scale facilities. However, being differ from previous studies, due to the concern of their children and the development of online shopping, **leisure activities** such as walking have **become the main reason for going out instead of shopping**.

The greenery/excise sites and community centers should be **evenly distributed in the community**, and the venues should be able to **support diverse types of multiple intensity exercises**.

Discussion

Nearly 70% of the cognitively impaired group still take bus and subway, which is close to the proportion of the control group, indicating **that their ability to travel long distances by public transportation was still well maintained**.

Reinforcing the support for people with CI from **public transport stations and street environments** may potentially extend and enrich their travel destinations.

Unique architectural features help to attract attention, such as the contrast of shapes, heights, and colors. But unlike the results from literature review, interviewee does not pay too much attention to the detailed structure or components of the building.

Discussion

The distribution of public space resources also affects the participation of people with CI in outdoor activities.

It is necessary to **further explore the impact of specific distance**. We could consider build small reading room, art exhibition space, etc. **inside residential compound**.

The obstacles and potential dangers of outdoor environment mainly affect the psychological security of travel.

Attention should be paid to the design and **maintenance of street paving, separating the pedestrian area, setting night illumination and traffic lights well**.

Similar-look streets, **residential buildings with identical facades**, and **a lack of distinctiveness in unit entrances** may make people getting lost and unable to locate their destination.

Limitations

- Limited by the sample scale, it may lead to results in deviation.
- Individual attributes other than the degree of cognitive impairment may influence the study results.

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THANKS FOR ATTENTION