Inclusive Design Thinking for Accessible Signage in Urban Parks in Taiwan

Ko-Chiu Wu(✉) and Hsuan Wang

National Taipei University of Technology, Taipei, Taiwan (R.O.C.)
kochiuwu@mail.ntut.edu.tw, hsuanwang@ntut.edu.tw

Abstract. Taiwan is rapidly becoming an aged society, which has led to a focus on the changing needs of the public. One of these is the renovation of urban parks. To make these facilities more accessible, developers must reconsider wayfinding systems and signage design. A questionnaire was distributed among 347 participants to gauge opinions of the following dimensions of park signage systems: mind-map recognition, general needs & safety, sign layout & design, capabilities & perception. Statistical analysis was then conducted to discover how perspectives differ among age groups and people with differing disabilities. The results indicate that elderly and disabled groups were most concerned with the dimensions of general needs & safety and capabilities & perception. This evidence allows for the consideration of the nuanced needs of varying demographics, thereby satisfying user needs and removing constraints. This study serves to add to the body of work on inclusive design and identifies the union of sets where optimal solutions are found to meet user expectations.

Keywords: Inclusive design · Park planning · Aged society · Wayfinding · Barrier free · Autonomous access

1 Background

Lower fertility rates and increased life expectancies have resulted in a demographic shift in Taiwan. This has given rise to a cluster of social care issues associated with an aged society which have not yet received wide attention. An increasing number of senior citizens are being forced to adapt quickly to an independent lifestyle whether they are seriously failing in physical and mental capabilities or not. In 2016 Taiwan's population presented an even distribution among age groups: ages 0–19/19.5%, ages 20–34/21.3%, ages 35–49/24.1%, ages 50–64/22.0%, ages over 65/13.1% [1]. It is therefore important that we start to pay attention to inclusive design as opposed to designs specific to select groups of physically or mentally challenged individuals.

Aging trends have been reflected in urban planning policy in the government's emphasis on the optimization of public facilities. Between 2001 and 2010 urban park area increased from 2,635 to 4,428 hectares [2]. Policy has further reflected the needs of a diversifying population (in 2016 the disabled and elderly populations made up 4.94% and 13.13% respectively of the total population). Focus has been placed on altering standardized designs to cater to those with special needs. Figure 1 presents a schema for product design catering to users of different ages and capabilities.

M. Antona and C. Stephanidis (Eds.): UAHCI 2017, Part III, LNCS 10279, pp. 335–347, 2017.
DOI: 10.1007/978-3-319-58700-4_28

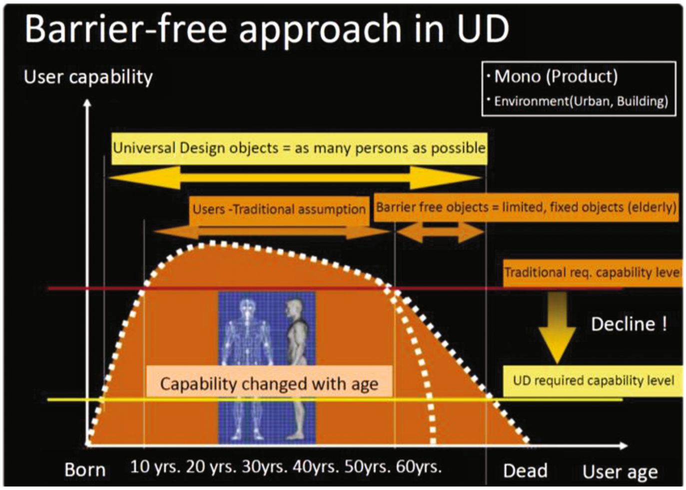

Fig. 1. Barrier-free approach in UD [3]

For example, barrier-free regulations have been promulgated to increase access for the disabled to public facilities. Inclusive design satisfies the needs of assorted user groups, including senior people. It requires an in-depth understanding of the specific needs of differing groups.

Kitchener et al. [4] pointed out that while older adults with physical disabilities made up 58% of Medicaid's HCBS waiver programs, this sector only benefited from 24% of total expenditures. Kane et al. [5] suggested that adults with similar degrees and types of disabilities but of different ages must be treated differently in terms of options for service and budget allocations, emphasizing that "fairness need not mean one size fits all" (p. 278). A one-size-fits-all approach hinders the development of more appropriate strategies to mediate the impact of disabilities in these various groups. This approach also lacks sufficient evidence related to the usefulness versus cost-effectiveness of different strategies. This highlights the subtleties involved in the design of universal public services that reasonably meet the specific needs of mixed groups.

In its campaign for healthy cities, with the aim of providing healthier, more comfortable human environments, the World Health Organization (WHO) sought out sufficient information and conducted extensive planning in order to ensure equity and fairness in its implementations and to optimize limited resources [6]. This model demonstrates the necessity of first identifying user needs. Ritsatakis [7] found cities in phase IV continue to focus on vulnerable groups rather than the full social gradient. More attention must be given to evaluating the effectiveness of actions aimed at enhancing local governance of health, and to improving the knowledge base for monitoring progress and avoiding health inequalities related to a greater part of the socioeconomic gradient. Taiwan is a member of the Healthy City Network in the West Pacific. It is necessary for the authorities in these cities to examine data related to the allocation and effectiveness of resources in order to ensure fair use of available budgets for the creation of an elderly- and disabled-friendly city.

A primary concern for age-friendly cities is autonomous access for all city-dwellers to urban parks. Davis and Weisbeck [8] pointed out that “the ability to find one’s way, known as wayfinding, is essential for maintaining independence in the world” (p. S118). Carefully designed signage is therefore key to ensuring accessibility for people with different types of disabilities. The present study conducted a survey among a diversified group of visitors to urban parks. This research forms part of a greater effort to make Taiwan a senior-friendly country. It simultaneously improves the allocation of resources within public facilities through the formulation of policies regarding urban green spaces.

2 Objectives

2.1 Aging in Place and Accessibility to Open Space

Domestic settings have a significant effect on the wellbeing of the elderly [9]. The use and accessibility of urban facilities helps strengthen senior people’s engagement in social activities, thereby helping them maintain an active lifestyle [10]. Satariano et al. [11] proffered that mobility disability affects senior people’s daily activities such as shopping and walking, which in turn causes physical weakness. Sugiyama and Ward Thompson [12] investigated constraints associated with walking by the elderly. They found that walking for recreation is aided by the pleasantness of open space and lack of nuisances, whereas walking for transport is aided by good paths and good facilities. Rosenberg et al. [13] examined the requirements of middle-aged and older adults with mobility disabilities to identify the barriers affecting participants’ access to outdoor environments. In terms of the interplay among mobility, built environments, and health, “studies that focus more broadly at relating built environment features to various types of mobility among older adults with mobility limitations are needed” (p. 277). Bosch and Gharaveis [14] reviewed literature focusing on the means by which older adults experiencing visual or cognitive decline recognize wayfinding signs, concluding that future efforts should center on technology-based solutions, facility planning and the design of strategies to improve navigation. de Paolis and Guerini [15] focused on the role of design in the fruition of territories and cultural development, with particular emphasis on accessibility and orientation in paths and places by people with different abilities. Thus, one of the objectives of this study is to investigate how people of different ages and disabilities navigate autonomously in urban parks.

2.2 Wayfinding by Elderly Park Users

Urban parks are shared spaces utilized by individuals wishing to engage in outdoor leisure activities. Several factors, such as age [16], accessibility [17], and mobility [18], have an impact on the use of urban parks. Identification of these factors positively impacts park design, construction, and development. Hashim and Said [19] investigated visitors’ wayfinding behavior in a theme park, using the Rasch Measurement

Model to analyze tourists' wayfinding performance and their perception of the surroundings in four dimensions: space, spatial, color, and quality of experience. Dong and Siu [20] explored how visitors' predispositions affect their views of the rendition of services in a theme park. Variables comprised substantive staging of servicescape, communicative staging of servicescape, desire for active participation, fantastic imaginary orientation, service experience evaluation, experience intensification, and experience extension. Wu and Song [21] proposed that future research on inclusive design include the interrelated, multi-faceted needs of all users, and that each category of park design should have different loading values for motion, sensory, and cognitive capability. There exists an obvious gap in the literature in terms of research into the wayfinding behavior of mixed-age groups, and those with different types and degrees of disabilities in urban parks.

3 Methods

3.1 Concepts

The signage system of barrier-free facilities typically displays wayfinding information. This study categorizes individuals into young and old (by 55 years old), and able-bodied and disabled groups. Participants comprised people with visual impairments, hearing impairments, extremity disabilities, and multiple disabilities. Questionnaires were distributed at college gates, parks, medical clinics and hospitals, department stores, and juridical associations related to the physically or mentally disabled.

3.2 Survey

The major aim of this questionnaire was to determine if current signage systems meet the needs of both senior citizens and disabled people, specifically whether these designs provide sufficient information for users to smoothly navigate public spaces in a convenient, safe, effective way. The scale is a five-point Likert scale: totally agree (5) to totally disagree (1). The questionnaire covered four dimensions: mind-map recognition, general needs & safety, sign layout & design, capabilities & perception. There were 23 questions in total which were developed by investigating current park conditions (see Fig. 2) and revised by two expert meetings. Ten pretests were conducted in northern Taiwan on Sept. 17, 2016. Based on these results, we revised the questionnaire (see Table 1), and then distributed it in northern Taiwan during the period of Sept. 30 to Oct. 23, 2016.

3.3 Statistical Analysis

For statistical analysis, we used *t*-tests to discriminate users with different types of disabilities and their opinions of park facilities and signage planning. We used confirmatory factor analysis (CFA) to confirm these second-order factors (four dimensions)

1) Facility maps should provide sufficient information for users to form a mind-map of the area.

2) Difficult paths or routes should be clearly marked.

3) Signal words can be marked on the road for users with low vision.

4) The height & angle of the signboard should be user-friendly for people in wheelchairs.

5) International symbols of access should be used in regulatory signs for the convenience of people with hearing impairments.

6) Large graphics with sharp color contrasts on the outside walls of a restroom help people with weak eyesight.

7) Regulatory signs should convey basic information with simple, easy-to-understand wording.

8) A sign that indicates barrier-free parking should be erected near the entrance of a park or plaza, so other vehicles will not park in this area.

Fig. 2. Signs in urban parks in Taiwan

Table 1. Observed (OB)/Latent Variables and questionnaire

OB.	Questions
Latent Variable-Mind-map recognition (MR) – Attention (AU)	
au1	When I go to a park to exercise, I pay more attention to directional signs
au2	When I visit a park for recreational purposes, I pay more attention to eye-catching signs
au3	When I find myself strolling in a large park with complicated facilities, I feel a sense of uncertainty
Latent Variable-Mind-map recognition (MR) – Map (MP)	
mp1	When I find myself in an unfamiliar place, I check available maps
mp2	Facility maps should provide sufficient information for users to form a mind-map
Latent Variable-General needs & safety (NS) – Safety (SC)	
sc1	Regulatory signs should convey basic information with simple, easy-to-understand wording
sc2	I think recognizable signs, touch screens or sound technology should be set up at dangerous places so as to warn the disabled of the impending danger
sc3	A sign that indicates barrier-free parking should be erected near the entrance of a park or plaza, so other vehicles will not park in this area
Latent Variable-General needs & safety (NS) - Needs (NE)	
ne1	Signs that indicate barrier-free facilities should be set up to meet the needs of individuals with different capabilities
ne2	I think the signs in a park should clearly indicate the location of barrier-free facilities
Latent Variable-Sign layout & design (SD) – Layout (LO)	
lo1	The layout and size of words in a sign should vary according to frequency of use, direction and speed of reading among users
lo2	For senior people to comprehend instructions and access emergency buttons in a large park, relevant signs should be incorporated into park facilities
Latent Variable-Sign layout & design (SD) – Entrance (ER)	
er1	Difficult paths or routes (such as slope of ramps higher than 1/20) should be marked on a map representing the surrounding area of a park or plaza
er2	I think a tactile map is necessary at the entrance of any building for the convenience of the visually impaired
er3	A tactile map (with a touch-screen) should mark out exit, entrance, and positioning signs
Latent Variable-Capabilities & perception (CP) - Hearing-impaired (HI)	
hi1	International symbols of access should be used in regulatory signs for the convenience of people with hearing impairments
hi2	An easy-to-follow, unified signage system can help hearing-impaired people to quickly find their way
Latent Variable-Capabilities & perception (CP) - Visually-impaired (VI)	
vi1	Considering that the visually-impaired have a poor ability to discern colors, a single color or red/green hues should be avoided in signage systems
vi2	A barrier-free signage system should be put up in convenient locations and provide digital devices to help the visually-impaired in navigation

(*continued*)

Table 1. (*continued*)

OB.	Questions
vi3	It is better to use large graphics with sharp color contrasts on the outside wall of a restroom for the convenience of people with weak eyesight
Latent Variable-Capabilities & perception (CP) - Sign perception (SP)	
sp1	The height and angle of the signboard should be user-friendly for people in wheelchairs
sp2	Signal words can be marked on the road for users with low vision
sp3	If there is an information kiosk in a park, I try to find it to locate the facilities I am looking for

and first-order factors (attention, map, safety, needs, layout, entrance, hearing-impaired, visually-impaired, sign perception) and their weights. The 1st order CFA, 2nd order CFA and *t*-test were combined to describe the differing needs of users of different ages and types of disabilities.

4 Result

4.1 Participants

400 questionnaires were distributed, and we obtained 347 effective returned questionnaires, representing a return rate of 86.75%. There were 170 males and 177 females (see Table 2). Of the 347, 229 were individuals with mental or physical disabilities (Table 3).

Table 2. Crosstabs of sex and various educated participants

	Primary school/under	Junior high school	Senior high school	Undergraduate	Graduate school/above	Total
Male	10	7	26	93	34	170
	5.9%	4.1%	15.3%	54.7%	20.0%	100.0%
Female	19	8	19	98	33	177
	10.7%	4.5%	10.7%	55.4%	18.6%	100.0%
Sum	29	15	45	191	67	347
	8.4%	4.3%	13.0%	55.0%	19.3%	100.0%

4.2 Confirmatory Factor Analysis

Figure 3 shows the results of Second Order CFA, in which the *t*-value for all paths reached a level of significance. This confirms model aggregation, which can be further divided up into four 2nd order factors: mind-map recognition (MR), general needs & safety (NS), sign layout & design (SD), capabilities & perception (CP) and nine 1st order factors: AU, MP, SC, NE, LO, ER, HI, VI, and SP. RMSEA = 0.077, the model is acceptable.

Table 3. Crosstabs of aged and various disabled participants

	None	Physically disabled	Hearing-impaired	Vision-impaired	Cerebral palsied	Cognitive disorder	Multiple obstacles	Other disabled	Total
Under/&55ys.	78	36	31	20	12	6	20	35	238
	32.8%	15.1%	13.0%	8.4%	5.0%	2.5%	8.4%	14.7%	100.0%
Over 55ys.	40	47	7	5	1	1	5	3	109
	36.7%	43.1%	6.4%	4.6%	0.9%	0.9%	4.6%	2.8%	100.0%
Sum	118	83	38	25	13	7	25	38	347
	34.0%	23.9%	11.0%	7.2%	3.7%	2.0%	7.2%	11.0%	100.0%

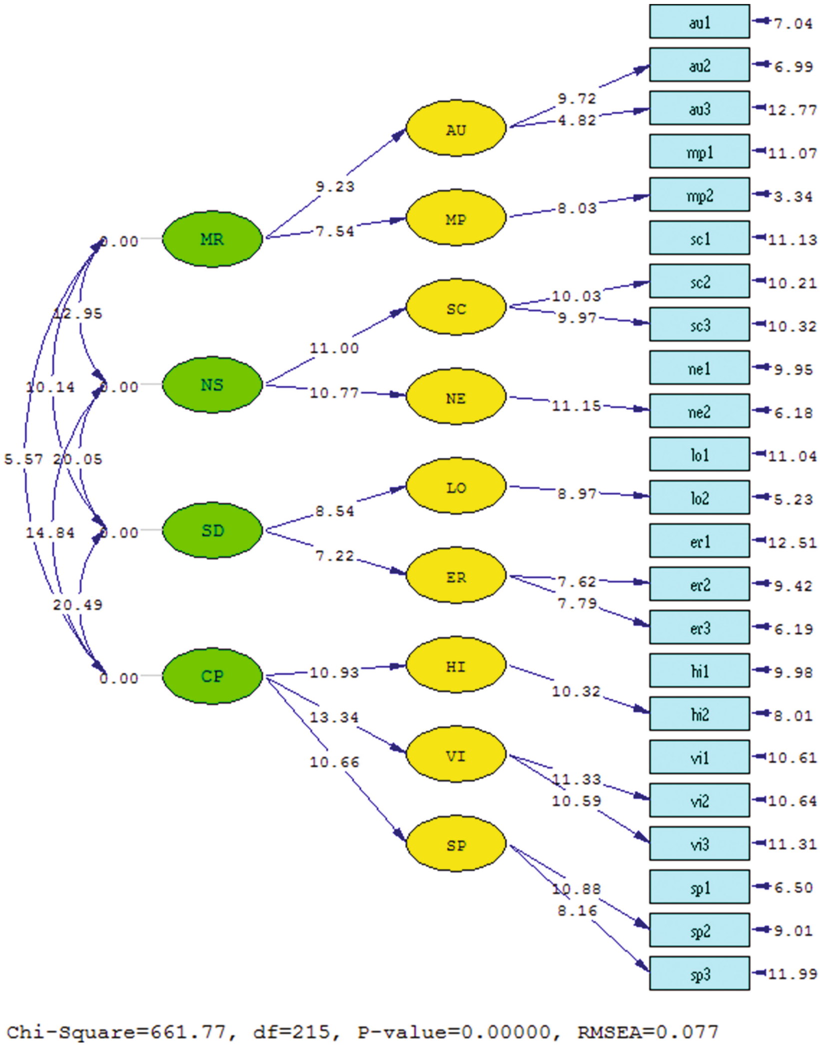

Fig. 3. Second Order CFA

A *t*-test was conducted to evaluate how users of different ages and with different types of disabilities view the 23 questions. Table 4 shows that significant differences occur in mp2, sc1, sc2, sc3, ne1, ne2, lo1, er3, vi1, vi2, hi1, hi2, sp1, sp3 among young people with disabilities (N = 188), elderly people with disabilities (N = 41), young able-bodied people (N = 93), and elderly able-bodied people (N = 25).

Table 4. *t*-test for different aged and disabled/able-bodied group

Variables	Group-Mean (SD)		*p(F*-test*)*	*p(t*-test*)*
mp2	Elderly disabled-4.12 (.714)	Young able-bodied-4.51 (.524)	.338	.001
	Young able-bodied-4.51 (.524)	Young disabled-4.22 (.801)	.010	.002
	Young able-bodied-4.51 (.524)	Elderly able-bodied-4.24 (.723)	.479	.041
sc1	Elderly disabled-4.37(.662)	Young able-bodied-4.68 (.514)	.005	.009
	Young able-bodied-4.68 (.514)	Young disabled-4.39 (.755)	.000	.000
	Young able-bodied-4.68 (.514)	Elderly able-bodied-4.44 (.507)	.395	.042
sc2	Young disabled-4.34 (.774)	Elderly disabled-4.05 (.669)	.329	.050
sc3	Elderly disabled-4.05 (.669)	Young able-bodied-4.44(.650)	.095	.002
	Young disabled-4.36 (.683)	Elderly disabled-4.12 (.678)	.023	.010
	Young able-bodied-4.44 (.650)	Elderly able-bodied-4.08 (.759)	.448	.019
ne1	Elderly disabled-4.12(.678)	Young able-bodied-4.41 (.576)	.898	.013
	Young disabled-4.39 (.606)	Elderly disabled-4.12 (.678)	.429	.013
ne2	Elderly disabled-4.20 (.782)	Young able-bodied-4.47(.563)	.007	.044
	Young disabled-4.39 (.649)	Elderly able-bodied-4.08 (.493)	.000	.008
	Young able-bodied-4.47 (.563)	Elderly able-bodied-4.08 (.493)	.000	.001
lo1	Elderly disabled-4.02 (.612)	Young able-bodied-4.34 (.759)	.002	.011
	Young disabled-4.31 (.711)	Elderly disabled-4.02 (.612)	.002	.010
er3	Elderly disabled-4.07(.721)	Young able-bodied-4.41 (.755)	.241	.018
hi1	Elderly disabled-4.05(.669)	Young able-bodied-4.47 (.618)	.100	.000
	Young disabled-4.45 (.640)	Elderly disabled-4.05 (.669)	.027	.001
	Young able-bodied-4.47 (.618)	Elderly able-bodied-4.12 (.600)	.027	.013
	Young disabled-4.45 (.640)	Elderly able-bodied-4.12 (.600)	.008	.015
hi2	Elderly disabled-3.98 (.758)	Young able-bodied-4.47 (.618)	.943	.000
	Young disabled-4.40 (.634)	Elderly disabled-3.98 (.758)	.935	.000
vi1	Elderly disabled-.380 (.558)	Young able-bodied-4.15(.884)	.001	.007
	Young disabled-4.29(.740)	Elderly able-bodied-3.96(.676)	.023	.032
	Young disabled-4.29 (.740)	Elderly disabled-3.80 (.558)	.001	.000
vi2	Young disabled-4.31 (.717)	Elderly disabled-3.95 (.705)	.076	.004
sp1	Young disabled-4.36 (.750)	Elderly disabled-4.05 (.705)	.017	.015
sp3	Elderly disabled-3.37 (1.318)	Young able-bodied-4.03(.994)	.007	.005
	Young disabled-3.89 (1.051)	Elderly disabled-3.37 (1.318)	.015	.021

The results produced from the 2nd order CFA and *t*-test were combined to illustrate the differing needs of users of different ages and types of disabilities (see Fig. 4). No discernable differences were shown in mind-map recognition, general needs & safety, sign layout & design, capabilities & perception. However, the young disabled and young able-bodied people held different views in mp2 and sc1, while the able-bodied young and elderly have divergent opinions in mp2, sc1, sc3, ne2, and hi1. These variables are clustered in the dimension of general needs & safety. Divergent views are held by the elderly disabled and young able-bodied people and in mp2, sc1, sc3, ne1, ne2, lo1, er3, hi1, hi2, vi1, sp3. Divergent views are held by the disabled young and elderly in sc2, sc3, ne1, lo1, hi1, hi2, vi1, vi2, sp1, sp3, which are manifested in two dimensions: general needs & safety and capabilities & perception.

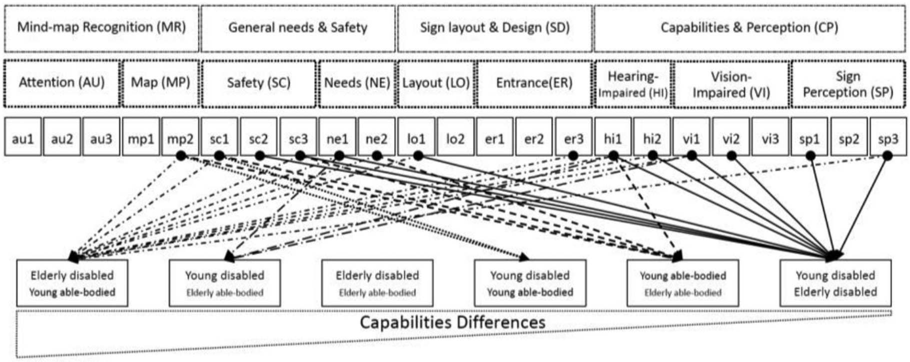

Fig. 4. Relationships among different capabilities users and signage settings at park

5 Discussion

There is a need to understand the complex relationships between mobility, the built environment, and health in an ageing society. Inclusive design mandates a close examination of mobility under different contexts. The following results were revealed: (1) Four dimensions of wayfinding behavior and users' application of the signage system are confirmed as follows: Mind-map Recognition, General needs & Safety, Sign layout & Design, Capabilities & Perception. (2) Significant differences exist in how people of differing ages and types of disabilities view the four dimensions of a signage system.

5.1 Dimensions of Wayfinding and Signage

Dong and Siu [20] investigated the needs of theme park visitors and discovered that desire for active participation and fantastic imaginary orientation affects their wayfinding experience. McCormack et al. [22] explored the use of urban parks from the perspective of users, pinpointing the attributes of safety, aesthetics, amenities, maintenance, and proximity as stimuli for visiting a park. We are convinced (by confirmatory factors analysis) that wayfinding behavior and sign planning help to facilitate the navigation process for park-goers. This study is divided into nine 1st order factors: attention, map, safety, general needs, layout, entrance, hearing-impaired, vision-impaired, and sign perception. The first four are relevant psychological factors associated with wayfinding behavior, whereas the latter five 1st order factors are sign-design factors important to users with differing types of disabilities. Our results show that Taiwan park-goers in urban areas do not stress pleasantness in the wayfinding process. Rather, they put high priority on safety of daily livings and the formulation of a useful mind-map.

5.2 Evaluations According to Age and Disability

We compared the opinions of users of different ages and types of disabilities in terms of wayfinding behavior and signage systems. Results show that among the following dissimilar groups very few differences were observed: elderly disabled vs. elderly able-bodied; young disabled vs. young able-bodied. In contrast, the following pairs of groups habited significantly different opinions in the dimension of general needs & safety: elderly disabled vs. young able-bodied; young able-bodied vs. elderly able-bodied and young disabled vs. elderly disabled. Similarly, the following pairs of groups habited significantly different opinions in the dimension of capabilities & perception: elderly disabled vs. young able-bodied; young disabled vs. elderly able-bodied and young disabled vs. elderly disabled.

With regard to the dimensions of mind-map recognition and sign layout & design, little disparity was observed among groups, whether they were highly heterogeneous or not. Clearly the majority of the participants were accepting of standardized design. However, groups with similar levels of capability (young able-bodied vs. elderly able-bodied, and young disabled vs. elderly disabled) and greatly varying levels of capability (young able-bodied vs. elderly disabled, and young disabled vs. elderly able-bodied) held differing opinions in the dimensions of general needs & safety and capabilities & perception in the design of urban parks (see Fig. 4). In Fig. 5, we see a U curve for the relationship between levels of difference in capability and variables counted (i.e. young disabled vs. elderly disabled groups had 10 significantly different perceptions). This shows that an optimal (inclusive) design requires efforts to address the various needs of each group.

Because researchers only obtain a partial result using traditional analysis of a single group of the disabled or senior citizens, in this study we made an effort to discriminate groups before exploring the applicability of inclusive design. The major contributions of this study lies in this discrimination of users with differing types of disabilities and their opinions of barrier-free facilities. These results serve as useful reference in the process of signage design. It promotes an aggregation model featuring segmented designs, allowing designers to become aware of slight differences. This enables compromise in design to allow for shared use of facilities and flexible constraints to suit the maximum range of clients. It is advised that future researchers employ different assistive devices for the disabled with differing ages and capabilities, and employ structural equation modelling (SEM) to develop causal models.

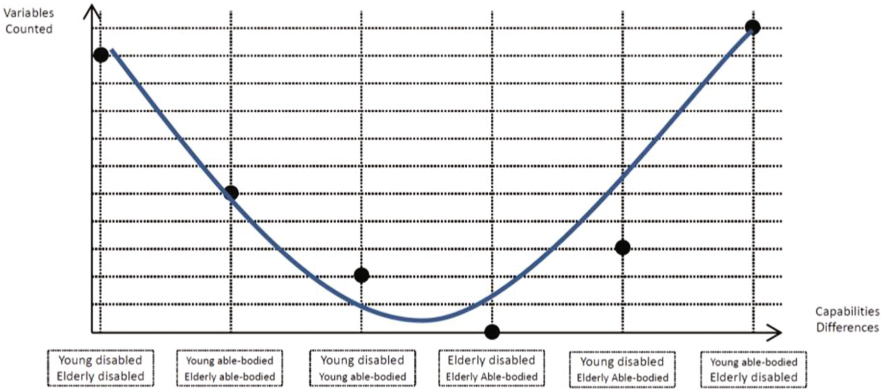

Fig. 5. U-curve of capabilities differences and variables counted

6 Conclusion

The rapidly aged society in Taiwan has prompted changes in the requirements for public facilities and positioning services. This paper conducted a survey among 347 park-goers in urban areas, and obtained the following results: (1) Four dimensions of wayfinding behavior and users' application of the signage system were confirmed as follows: mind-map recognition, general needs & safety, sign layout & design, capabilities & perception. (2) Significant differences exist in how people of similar groups view the four dimensions of a signage system.

This evidence indicates the necessity for consideration of the subtle differences among varying demographics. This study further elucidates the requirements for inclusive design, which aims to identify the union of sets where optimal solutions are found to meet user expectations.

References

1. Department of Household Registration, Ministry of Interior, R.O.C.: Statistics [Electronic data] (2016). http://www.ris.gov.tw/en/web/ris3-english/home. Accessed 21 Dec 2016
2. Directorate General of Budget, Accounting and Statistics, Executive Yuan, R.O.C.: National Statistics [Electronic data] (2016). http://www.stat.gov.tw/mp.asp?mp=4. Accessed 21 Dec 2016
3. Nitanai, S.: (似内志朗), Barrier-free approach in UD (ユーザーのためのグッドデザイン), Lecture at Hokkaido Universal Design Organization, (北海道ユニバーサルデザイン機構講演), 26 May 2004. http://www.jfma.or.jp/research/scm10/image/result10-04.pdf. Accessed 21 Dec 2016
4. Kitchener, M., Ng, T., Miller, N., Harrington, C.: Medicaid home and community-based services: national program trends. Health Aff. **24**(1), 206–212 (2005)

5. Kane, R.L., Priester, R., Neumann, D.: Does disparity in the way disabled older adults are treated imply ageism? Gerontologist **47**(3), 271–279 (2007). doi:10.1093/geront/47.3.271. [PubMed]
6. Webster, P., Lipp, A.: The evolution of the WHO city health profiles: a content review. Health Promot. Int. **24**(S1), i56–i63 (2009)
7. Ritsatakis, A.: Equity and the social determinants of health in European cities. J. Urban Health **90**(Suppl. 1), 92–104 (2013)
8. Davis, R.L., Weisbeck, C.: Search strategies used by older adults in a virtual reality place learning task. Gerontologist **55**(S1), S118–S127 (2015)
9. Wahl, H.W., Fange, A., Oswald, F., Gitlin, L.N., Iwarsson, S.: The home environment and disability-related outcomes in aging individuals: what is the empirical evidence? Gerontologist **49**(3), 355–367 (2009)
10. Vine, D., Buys, L., Aird, R.: Experiences of neighbourhood walkability among older Australians living in high density inner-city areas. Planning Theory Pract. **13**(3), 421–444 (2012). doi:10.1080/14649357.2012.696675
11. Satariano, W.A., Kealey, M., Hubbard, A., Kurtovich, E., Ivey, S.L., Bayles, C.M., Hunter, R.H., Prohaska, T.R.: Mobility disability in older adults: at the intersection of people and places. Gerontologist **56**(3), 525–534 (2016). doi:10.1093/geront/gnu094. [PubMed]
12. Sugiyama, T., Ward Thompson, C.: Associations between characteristics of neighbourhood open space and older people's walking. Urban Forest. Urban Greening **7**(1), 41–51 (2008). doi:10.1016/j.ufug.2007.12.002
13. Rosenberg, D.E., Huang, D.L., Simonovich, S.D., Belza, B.: Outdoor built environment barriers and facilitators to activity among midlife and older adults with mobility disabilities. Gerontologist **53**(2), 268–279 (2012). doi:10.1093/geront/gns119
14. Bosch, S.J., Gharaveis, A.: Flying solo: a review of the literature on wayfinding for older adults experiencing visual or cognitive decline. Appl. Ergon. **58**, 327–333 (2017)
15. de Paolis, R., Guerini, S.: Wayfinding design and accessibility. GSTF J. Eng. Technol. **3**(2), 72–79 (2015)
16. Brajša-Žganec, A.: Merkaš., M., Šverko, I.: Quality of life and leisure activities: how do leisure activities contribute to subjective well-being? Soc. Indic. Res. **102**(1), 81–91 (2010). doi:10.1007/s11205-010-9724-2
17. Kaczynski, A.T., Potwarka, L.R., Smale, B.J.A., Havitz, M.E.: Association of parkland proximity with neighborhood and park-based physical activity: variations by gender and age. Leis. Sci. Interdiscip. J. **31**(2), 174–191 (2009). doi:10.1080/01490400802686045
18. Schipperijn, J., Stigsdotter, U.K., Randrup, T.B., Troelsen, J.: Influences on the use of urban green space – a case study in Odense, Denmark. Urban Forest. Urban Greening **9**(1), 25–32 (2010). doi:10.1016/j.ufug.2009.09.002
19. Hashim, M.S., Said, I.: Effectiveness of wayfinding towards spatial space and human behavior in theme park. Procedia Soc. Behav. Sci. **85**, 282–295 (2013)
20. Dong, P., Siu, N.Y.-M.: Servicescape elements, customer predispositions and service experience: the case of theme park visitors. Tour. Manag. **36**, 541–551 (2013)
21. Wu, K.C., Song, L.Y.: A case for inclusive design: analyzing the needs of those who frequent Taiwan's urban parks. Appl. Ergon. **58**, 254–264 (2017)
22. McCormack, G.R., Rock, M., Toohey, A.M., Hignell, D.: Characteristics of urban parks associated with park use and physical activity: a review of qualitative research. Health Place **16**(4), 712–726 (2010). doi:10.1016/j.healthplace.2010.03.003