A Survey of Indoor Spaces at Elderly Welfare Facilities in Japan on How to Reflect Elders' Behavior Using a Checklist

- Focused on 5 elderly welfare centers in Tokyo -

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Abstract: With the overall revision of the Welfare of the Aged Act in 1997, elderly welfare facilities have developed differently according to the size of locality, capacity, and social and economic characteristics. In response to the problem, various plans are being executed for expanding services and facilities for the aged. However, such efforts by the government have been focused on quantitative increase rather than on qualitative improvement, and there are not many high-quality elderly welfare facilities that meet the needs of the consumers, namely, the aged. In contrast, elderly welfare centers in Japan began to be founded from the 1960s and increased significantly from the 1970s and, as a result, 2,214 elderly welfare centers were in operation in 1995, maintaining a high level in quantity as well as in quality.

Therefore, the present study surveyed using a checklist how elderly welfare centers in Japan, which are playing central roles in welfare facility services for the aged in Japan, design their indoor spaces reflecting elders' behavior and characteristics and, based on the results of the survey, classified spaces into shared spaces and individual service spaces and analyzed the spaces of each center using the checklist. The results from this case study will be used as basic data to establish standards for the space composition of elderly welfare facilities in Korea, which has 10 years' short history of elderly welfare facilities.

Keywords: Japan, elders' behavior, indoor space checklist

1. Introduction

1-1. Objectives and meanings

In the 21st century, our society is experiencing the decrease of population due to the low birth rate and the rapid expansion of the aged population due to people's aging. In foreign cases, the number of elders receiving services at paid or free elderly welfare facilities in Japan was 310,000 or 1.7% of 18,230,000 elders aged over 65 in 1995, and in the U.S. it was 5.1% of the aged population in 1993. In comparison, the

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number in Korea was only 8,996 or 0.35% of 2,900,000 elders aged over 65 in 1997.[1] What is more, with the increase of the aged population with economic power and high academic qualification and the change of value system, there are an increasing number of elders who want to enjoy leisure life actively as a way of reestablishing their identity more than living a healthy and safe life in a simple residential space. In response to such a demand, the Welfare of the Aged Act was revised entirely in 1997 and elderly welfare facilities have been developed differently according to the size of locality, capacity, and social and economic characteristics. To cope with the problem, various plans are being executed for expanding services and facilities for the aged. However, such efforts by the government have been focused on quantitative increase rather than on qualitative improvement, and there are not many high-quality elderly welfare facilities that meet the needs of the consumers, namely, the aged. In contrast, elderly welfare centers in Japan began to be founded from the 1960s and increased significantly from the 1970s and, as a result, 2,214 elderly welfare centers were in operation in 1995, maintaining a high level in quantity as well as in quality.

Therefore, the present study purposed to survey and analyze using a indoor space checklist how elderly welfare centers in Japan, which are playing central roles in welfare facility services for the aged in Japan, design their indoor spaces reflecting elders' behavior and characteristics. Based on the results, in addition, we aimed to provide basic data and make suggestions for indoor space design that can improve the quality of elderly welfare and leisure when planning elderly welfare facilities in Korea.

1-2. Subjects and methods

The subjects of this study were five elderly welfare centers in Tokyo, Japan and the researcher visited them in person during the period from July 28 to August 6, 2005. Before visiting the welfare centers, we reviewed the concept and standards of elderly welfare centers using literature published by the Six Codes of Laws on the Aged of the Bureau of Health and Welfare in the Japanese Ministry of Health, Labor and Welfare. In visiting each welfare center, we collected facility-related information through interview with the director or staff of the facility. To make a checklist[2] for evaluating the design of indoor space for the aged, we examined the principles of universal design based on the theories of Lawton and Regnier & Pynoos. With the results and through theoretical literature review and analysis, we selected seven criteria for analysis according to elders' behavior, and prepared an indoor space checklist using the criteria. Based on the checklist, we classified spaces into shared spaces and individual service space, and investigated each

1) Yoo Eun-yeong, A Study on Indoor Space Plans for Elderly Welfare Facilities Reflecting Elders' Behavior Characteristic, thesis for a doctoral degree at Konkuk University, 2006, p1.

2) Yoo Eun-yeong, A Study on the Current State of Indoor Environment of Elderly Welfare Facilities Reflecting Elders' Behavior – Focused on elderly welfare centers in Gwangju, Korea Society of Design Science, Serial No. 61, Vol.18 No.3 p184-185, requoted

center using the indoor space checklist.

The results from this case study will be used as basic data to establish standards for the space composition of similar elderly welfare facilities in Korea, which has 10 years' short history of elderly welfare facilities.

2. Analysis and development of basic materials on elders' behavior[3]

2-1. Development of basic materials in consideration of elders' behavior characteristic

This study needs to create first a checklist in order to determine whether an indoor space has been properly designed in consideration of elders' behavior characteristic. To make a checklist, we reviewed considerations for the design of elderly welfare facilities mentioned by gerontological scholars such as Lawton, Regnier and Pynoos[4] who studied architecture for elders in consideration of elders' behavior. Next, we made [Table 2-1] based on the 4 principles and the 7 principles of universal design,[5] which are used as the theoretical base of design environment evaluation.

2-2. Base for the analysis of indoor space design

Criteria for analysis according to elders' behavior were presented in [Figure 1] based on the 4 principles and 7 principles of universal design. Safety as one of the criteria is a common element for considering elders' sensory organs, supporting their physical functions, and maximizing tolerance to troubles caused by elders' degenerated sensory organs and their unexpected actions. Flexibility is to improve management, adaptability and fair use in response to various changes. Sociality is an issue researched by gerontologists, providing elders with opportunities for social contacts. Path finding is an information element that helps users recognize spaces and promotes simple and intuitive use.

Pleasantness is an element for maintaining psychological, functional and aesthetic comfort. Autonomy is to give choices to individuals so that they can control their life. Based on these contents, seven common criteria were selected. [Figure 2' shows the contents of the criteria included in the analysis frame.

The seven analysis criteria according to elders' behavior – safety, accessibility, flexibility, sociality, path finding, pleasantness and autonomy – and the indoor space checklist to be applied to elderly welfare centers were summarized into the indoor space checklist in [Table 2-2]

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3) Yoo Eun-yeong, A Study on the Current State of Indoor Environment of Elderly Welfare Facilities Reflecting Elders' Behavior – Focused on elderly welfare centers in Gwangju, Korea Society of Design Science, Serial No. 61, Vol 18 No.3 p184-185, requoted

4) Lee Gwan-yong, Architecture for the Aged, Sesin-sa, 2003, p177-214 The reason for choosing gerontologists for this study was to collect basic data for evaluating elders' behaviors and environmental psychology from elders' position.

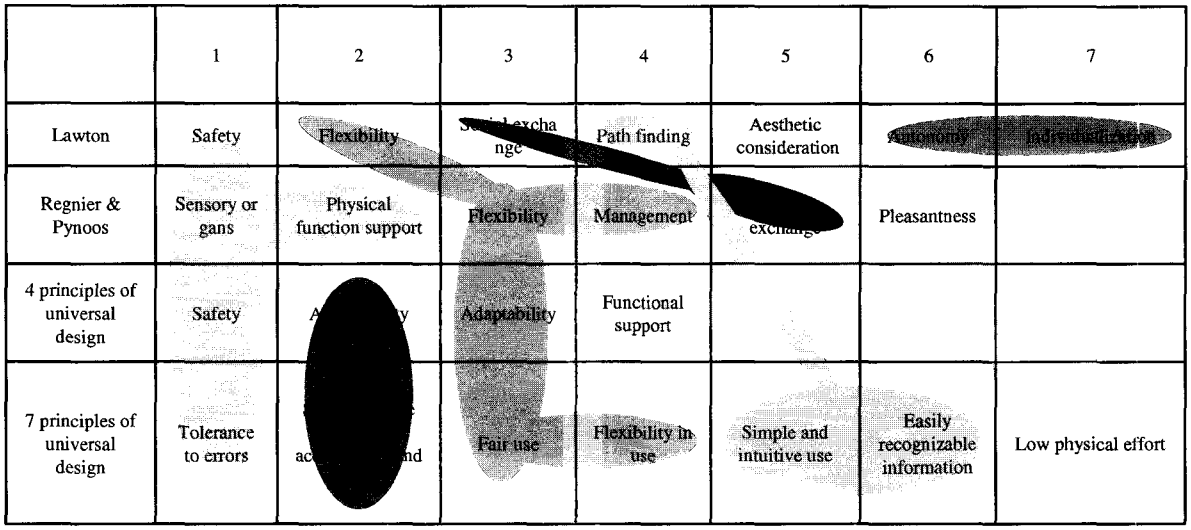
5) Universal design means providing spaces for all people including the aged, the disabled, physically handicapped persons by accidents, those with acquired disabilities and children to live a comfortable life. As it can improve space accessibility for every person considering demands from all potential users by expanding the consideration of accessibility in living environment, which has been focused on the aged and the disabled, universal design is rising as a key issue among architects, designers and in construction-related laws. Lee Jeong-sook, A Study on the Concept and Introduction of Universal Design – Focused on elderly residential facilities, thesis for a master's degree at Myongji University, 1999

The present study adopted the principles of universal design, which include convenience, safety and aesthetics for elders, as basic materials of case study on elderly welfare centers.

[Table 2-1] Considerations in designing spaces reflecting elders' behavior

	Design consideration	Contents
Lawton	Safety	Prevent safety accidents caused by elders' degenerated sensory organs, and design safely stairs and bathrooms where safety accidents happen frequently.
	Flexibility	Design from elders' viewpoint.
	Path finding	Due to their degenerated sensory organs, elders have poor spatial cognition abilities and memory. Thus, it is a very crucial design element to help users find and recognize paths to spaces.
	Autonomy	Autonomy is giving choices to individuals so that they can control their own life.
	Individualization	Individualization is giving choices to individuals so that they can control their own life.
	Social exchange	Social exchange has positive effects on elders' physical and mental health, and is an important indicator to their quality of life.
	Aesthetic consideration	Stress from psychological impacts or functional discomfort should be reduced, and comfort should be maintained.
Regnier & Pynoos	Pleasantness	Privacy, independent life, autonomy or self-regulation abilities
	Social exchange	Maintain adequate and free interpersonal relations, and provide opportunities for structured social contacts
	Management	Self-regulation abilities
	Sensory organs	Functions such as eyesight, hearing, the sense of touch and cognition are degenerated, and accidents like falling and sliding begin to happen.
	Physical function support	Elders' physical reflex action is much poorer than young people, so the possibility of safety accidents in physical environment is quite high.
	Flexibility	Various changes should be accepted flexibly.
4 principles of universal design	Functional support	Functional helps should be provided, but such helps should not cause any unnecessary burden to the users.
	Adaptability	'Adaptable' means that a product or environment should adapt itself to people's differently changing needs.
	Accessibility	'Accessibility' means a state free of obstacles. In general, it is attained by removing hindrances or risks from physical environment.
	Safety	Safety is considered to solve or remove existing problems like safety accidents or prevent them. Safety includes psychological welfare, a sense of belonging, self-evaluation, self-value, etc.
7 principles of universal design	Fair use	Abilities should be useful and sellable to others.
	Flexibility in use	Individuals' various tastes and abilities should be accommodated broadly, selection, change and adjustment should be possible, and changes in users' abilities over time should be reflected.
	Simple and intuitive use	Design outputs should be easily understandable regardless of the users' experience, knowledge, linguistic abilities, and concentration.
	Easily recognizable information	Information about design outputs should be easily recognizable regardless of the users' attention and cognitive abilities.
	Tolerance to errors	Minimize disadvantageous results and troubles caused by unintended behavior. Focus on prevention of the consequences of errors and failures.
	Low physical effort	Allow the users to use efficiently while minimizing fatigue.
	Size and space for high accessibility and usability	Design size and space so that the users can access regardless of their height, posture or movement and can use and manipulate easily.

[Figure 1] Seven analysis criteria based on [Table 2-1]



[Figure 2] Development of criteria for analyzing elderly welfare centers based on [Table 2-2]

Lawton	Regnier & Pynoos	Analysis criteria	4 principles of universal design	7 principles of universal design
Safety	Sensory organs Physical function support	Safety	Safety	Tolerance to errors
-	-	Accessibility	Accessibility	Size and space for high accessibility and usability
Flexibility	Flexibility Management	Flexibility	Adaptability	Fair use Flexibility in use
Social exchange	Social exchange	Sociality	-	-
Path finding	-	Path finding	-	Simple and intuitive use Easily recognizable information
Aesthetic consideration	Pleasantness	Pleasantness	Functional support	Low physical effort
Autonomy Individualization	-	Autonomy	-	-

based on the 4 principles and the 7 principles of universal design, reflecting the results of a questionnaire survey of elders who were using a welfare center, their demands, inconveniences in using the facility, and possible accidents caused by the inconveniences. When classified using the indoor space checklist,[6] spaces are divided into shared spaces and individual spaces. First, they are divided into shared spaces demanded by all users (dining hall, hallway, bathroom, etc.), social education spaces (auditorium, lecture hall, fitness room, etc.) and medical rehabilitation spaces (physiotherapy room, spa, etc.). Indoor space checklist for each type of spaces is presented in [Table 3-3,3-5].

6) The indoor space checklist was created with contents fit for elderly welfare centers based on a questionnaire survey of users, design considerations for elders and the contents of universal design.

[Table 2-2] Indoor space planning criteria and indoor space checklist reflecting elders' behavior

	Contents	Indoor space checklist
Safety	- Recognize and prevent physical risks such as safety accidents. - Prevent the consequences of errors and failures	- Remove doorsills - Install handrails on walls - Use non-slippery materials - Make hallways at least 1.5m wide - Install handrails around toilet bowls and urinals - Secure a large space in front of toilet bowls - Install bells for notifying emergencies - Prevent collision against the edge of walls - Install power outlets around 10cm higher
Accessibility	- Provide size and space accessible, reachable and usable regardless of the users' body size, posture and movement	- Make a space for the knees below washing stands - Make lighting bright, and entrance and hallways wide. - Remove any obstacle to the use of a wheelchair or walking aid
Flexibility	- Accommodate individuals' various tastes and abilities, allow selection, change and adjustment, and reflect users' abilities changing over time	- Use furniture with flexibility - Install thick sliding doors - Prepare various forms of seats - Install button-type faucets
Sociality	- Maintain adequate and free interpersonal relations, and provide opportunities for structured social contacts	- Set TVs and radios - Prepare spaces for large events - Plan a computer room for the use of the Internet
Path finding	- Enable users to recognize necessary information regardless of surrounding condition or the users' cognitive abilities	- Design consistently to help path finding - Use large letters for the signs on room doors - Put signs at a height of elders' eyes - Deploy landmark elements appropriately - Plan windows at the end of hallways to prevent dazzling - Use contrasting colors for the background and letters of signs
Pleasantness	- Give a sense of belonging, self-evaluation, self-value, etc. or opportunities to handle them - Give beauty, individuality and comfort	- Use finishing materials that produces home atmosphere, and display decorations - Set TVs and radios - Plan windows at the end of hallways to prevent dazzling - Decorate walls with familiar old photographs - Use soft materials and warm colors - Make window sills low and broad for easy looking out
Autonomy	- Compromise between individuals' autonomy and others' intervention	- Reflect elders' opinions through regular meetings - Allow elders to propose and choose service programs

3. Case study of Japanese elderly welfare centers

3-1. Outlines of surveyed facilities

The surveyed elderly welfare facilities are located in Tokyo, Japan and were established between 1972

and 2004. Their floor space ranges between 1,242 ㎡-3,431 ㎡ with 2~7-story buildings. They are all situated in residential areas for elders' easy access. We surveyed and analyzed each center using the indoor space checklist that checks the seven analysis criteria - safety, accessibility, flexibility, sociality, path finding, pleasantness, autonomy – according to elders' behavior. Spaces were classified into shared spaces and individual service spaces. Shared spaces were again divided into dining hall, hallway and bathroom, and individual spaces into social education spaces and medical rehabilitation spaces.

[Table 3-1] Outlines of surveyed facilities

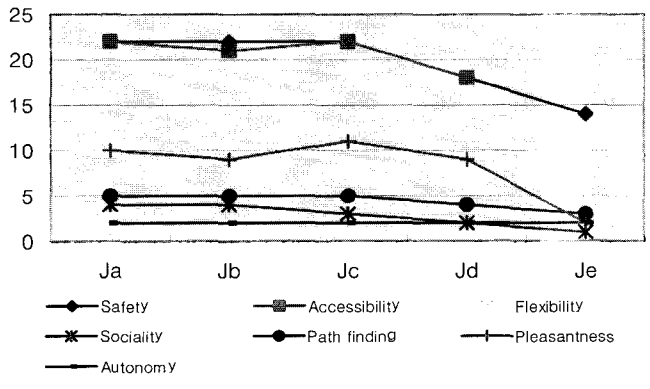
	Ja	Jb	Jc	Jd	Je
External appearance					
Location	練馬區 豊玉中 3-3-12	台東區 東上野 2丁目 25番 12号	中野區やよい町 3丁33番 8号	千代田 神田神保町 2-20	文京區 おとばれ 1-22-14
Date of establishment	October, 2004	November, 2000	March, 1990	April, 1975	June, 1972
Land area	1,662.22 ㎡	871.99 ㎡	507 ㎡	424.71 ㎡	679.79 ㎡
Floor space	1,242.89 ㎡	1,311.48 ㎡	1,323 ㎡	2,094.79 ㎡	3,431.30 ㎡
Height	2 stories above ground	5 stories above ground	3 stories above ground	7 stories above ground	7 stories above ground
Qualification for membership	Age over 60				

3-2. Case study of the surveyed facilities using the indoor space checklist

1) Current state of spaces in the surveyed facilities according to the analysis criteria

According to the result of analyzing the elderly welfare centers using the indoor space checklist, the score was high in order of Ja>Jc>Jb>Jd>Je, and the score of the analysis criteria was high in order of safety>accessibility>pleasantness>path finding>flexibility>sociality>autonomy. It was found that Ja, Jb and Jc were similar in the seven analysis criteria, and the frequencies of safety, accessibility and

[Table 3-2] Current state of spaces



	Ja	Jb	Jc	Jd	Je	Total
	EA	EA	EA	EA	EA	EA
Safety	22	22	22	18	14	98
Accessibility	22	21	22	18	12	95
Flexibility	4	4	3	3	1	15
Sociality	4	4	3	2	1	14
Path finding	5	5	5	4	3	22
Pleasantness	10	9	11	9	2	41
Autonomy	2	2	2	2	2	10
Total	69	67	68	56	35	-

pleasantness were highest. Jd was generally poor in safety, accessibility and pleasantness, and Je, which was the oldest facility, was very poor in all the seven analysis criteria although it had remodeled.

2) Analysis of shared spaces using the checklist

According to the results of analyzing the shared spaces of the centers using the indoor space checklist, the score was high in order of Jc>Ja>Jb>Jd>Je. The score of the analysis criteria was high in order of safety>pleasantness>path finding>pleasantness>sociality>flexibility>autonomy. The details of shared spaces analyzed using the indoor space checklist are as follows. In each center, the dining hall considered safety and accessibility by removing door sills and installing handrails on the walls. In addiction, except Je, all the centers designed their spaces adequately

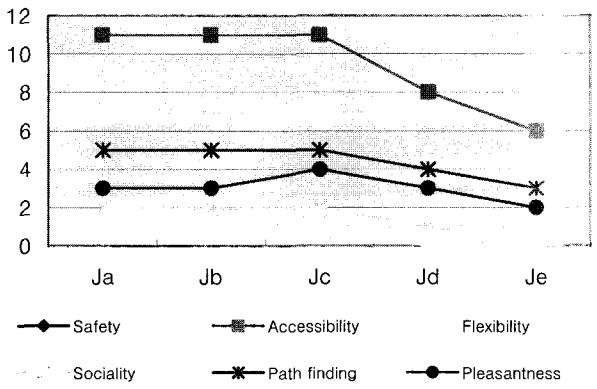
[Table 3-3] Analysis of the surveyed facilities using the indoor space checklist

Space			Contents of analysis	Analysis criteria																																			
				Safety					Accessibility					Flexibility					Sociality					Path finding					Pleasantness					Autonomy						
				Ja	Jb	Jc	Jd	Je	Ja	Jb	Jc	Jd	Je	Ja	Jb	Jc	Jd	Je	Ja	Jb	Jc	Jd	Je	Ja	Jb	Jc	Jd	Je	Ja	Jb	Jc	Jd	Je	Ja	Jb	Jc	Jd	Je
Indoor space checklist	Shared space	Dining hall	Remove doorsills	v	v	v	v	v	v	v	v	v	v																										
			Install handrails on walls	v	v	v	v		v	v	v	v	v																										
			Use materials of ordinary residential buildings for finishing the ceilings	v	v	v			v	v	v																												
			Use non-slippery materials	v	v	v	v			v	v	v																												
			Set TVs and radios																v	v	v							v	v	v									
			Use finishing materials that produces home atmosphere																									v	v	v	v								
			Install indoor lighting bright	v	v	v	v	v	v	v	v	v	v															v	v	v	v	v							
			Use furniture with flexibility											v	v	v																								
		Hallway	Install handrails on both sides of hallways	v	v	v	v	v	v	v	v	v	v																										
			Make hallways at least 1.5m wide	v	v	v			v	v	v																												
			Design consistently to help path finding																					v	v	v	v	v											
			Put signs at a height of elders' eyes																					v	v	v													
			Use large letters for the signs on room doors																																				
			Use contrasting colors for the background and letters of signs																					v	v	v	v	v											
			Plan windows at the end of hallways to prevent dazzling																					v	v	v	v												
			Deploy landmark elements appropriately																					v	v	v	v	v											
			Decorate walls with familiar old photographs																												v	v	v						
			Prepare resting spaces by installing couches																v	v	v	v																	
		Bathroom	Install handrails around toilet bowls and urinals	v	v	v	v	v	v	v	v	v	v																										
			Secure a large space in front of toilet bowls	v	v	v			v	v	v																												
			Use non-slippery materials	v	v	v	v	v	v	v	v	v	v																										
			Make a space for the knees below washing stands																																				
			Install bells for notifying emergencies	v	v	v	v	v	v	v	v	v	v																										
			Total	11	11	11	8	6	11	11	11	8	6	1	1	1	0	0	2	2	2	1	0	5	5	5	4	3	3	3	4	3	2	0	0	0	0	0

in using materials of residential buildings for finishing the ceilings and using non-slippery floor materials. In addition, Ja, Jb and Je composed their spaces considering safety, accessibility and pleasantness by using bright lighting and selecting flexible furniture. Each center installed handrails on both sides of hallways,

and Ja Jb and Jc made their hallways at least 1.5m wide. With regard to considerations related to path finding, each center designed its spaces properly through consistent design plans, contrasting colors for the background and letters of signs, deployment of landmarks, familiar old photographs, etc. but there was no consideration for enlarging the size of signs. Moreover, in consideration of sociality, Ja, Jb, Jc and Jd deployed long couches as resting spaces. For the safety and accessibility of bathrooms, each center designed the spaces properly by installing handrails around the toilet bowels and urinals, using non-slippery floor materials, and installing bells for notifying emergencies. However, little consideration was given for a space for the knees below washing stands as an element of accessibility.

[Table 3-4] Analysis of shared spaces using the indoor space checklist



	Ja	Jb	Jc	Jd	Je	Total
	EA	EA	EA	EA	EA	EA
Safety	11	11	11	8	6	47
Accessibility	11	11	11	8	6	47
Flexibility	1	1	1	0	0	3
Sociality	2	2	2	1	0	7
Path finding	5	5	5	4	3	22
Pleasantness	3	3	4	3	2	15
Autonomy	-	-	-	-	-	-
Total	33	33	34	24	17	-

3) Analysis of individual service spaces using the checklist

According to the results of analyzing the individual service spaces of the centers using the indoor space checklist, the score was high in order of Ja> Jb, Jc> Jd> Je. The score of the analysis criteria was high in order of safety> accessibility> pleasantness> flexibility> autonomy> sociality> path finding. The details of individual service spaces analyzed using the indoor space checklist are as follows.

Social education spaces were divided into auditorium, lecture hall and fitness room. For auditorium, each center used bright lighting in consideration of safety and accessibility, and designed the entrance and the hallways wide and removed door sills for the use of wheelchairs

and walking aids. All the facilities except Je installed thick sliding doors, prepared various forms of seats, and selected flexible furniture in consideration of flexibility, and prepared spaces for large events in consideration of sociality. In consideration of pleasantness, all the centers

except Je used soft materials as well as warm colors. For lecture hall, safety and accessibility were considered by removing door sills, but not considered in preventing collisions against the edges of walls and installing power outputs 10cm higher. In consideration of sociality, Ja and Jb provided a computer room for the use of the Internet. In consideration of autonomy, each center designed its space so that elders' opinions could be reflected and service programs could be proposed through regular meetings. For fitness room, in consideration of safety, each center installed bells for notifying emergencies, and all the centers

[Table 3-5] Analysis of the surveyed facilities using the indoor space checklist

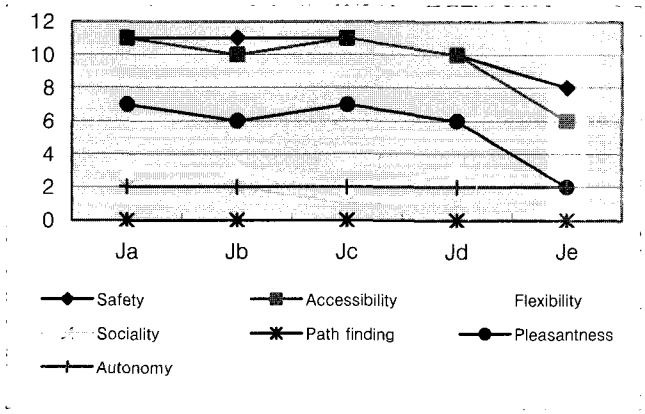
Space				Contents of analysis	Analysis criteria																																	
					Safety					Accessibility					Flexibility					Sociality					Path finding					Pleasantness					Autonomy				
					Ja	Jb	Jc	Jd	Je	Ja	Jb	Jc	Jd	Je	Ja	Jb	Jc	Jd	Je	Ja	Jb	Jc	Jd	Je	Ja	Jb	Jc	Jd	Je	Ja	Jb	Jc	Jd	Je	Ja	Jb	Jc	Jd	Je
Indoor space check list	Individual space	Social educational space	Architecture	Audit orium	Make lighting bright, and entrance and hallways wide	v	v	v	v	v	v	v	v	v	v																							
					Remove any obstacle to the use of a wheelchair or walking aid	v	v	v	v	v	v	v	v	v	v																									
					Install thick sliding do										v	v		v	v																				
					Use furniture with flexibility										v	v	v	v																					
					Prepare various forms of seats										v	v	v	v																					
					Remove doorsills	v	v	v	v	v	v	v	v	v	v																									
					Prepare spaces for large events															v	v	v	v	v															
					Use soft materials and warm colors																									v	v	v	v							
				Social educational space	Prevent collision against the edge of walls																																			
					Install power outlets around 10cm higher																																			
					Install indoor lighting bright																									v	v	v	v	v						
					Plan a computer room for the use of the Internet															v	v																		
					Select nature-friendly pictures																									v	v	v	v	v						
					Reflect elders' opinions through regular meetings																														v	v	v	v	v	
					Allow elders to propose and choose service programs																														v	v	v	v	v	
					Remove doorsills	v	v	v	v	v	v	v	v	v	v																									
				Fitness room	Make window sills low and broad for easy looking out																									v		v	v							
					Remove dazzling caused by lighting						v		v	v																											
					Consider any possible risk in the width and height of spaces	v	v	v	v	v	v	v	v	v	v																									
					Install bells for notifying emergencies	v	v	v	v	v																															
			Medical rehabilitation space	Physiotherapy room	Plan easily accessible open space without doorsill	v	v	v	v	v	v	v	v	v	v																									
					Make window sills low and broad for easy looking out																									v	v	v	v							
					Finish walls and ceilings with materials of home atmosphere																									v	v	v	v							
					Use furniture of home atmosphere																									v	v	v								
					Use non-slippery materials	v	v	v	v		v	v	v	v																										
				Spa	Use non-slippery materials	v	v	v			v	v	v																											
					Install handrails on walls	v	v	v	v	v	v	v	v	v	v																									
					Install bells for notifying emergencies	v	v	v	v	v																															
					Install button-type faucets						v	v	v	v																											
					Total	11	11	11	10	8	11	10	11	10	6	3	3	2	3	1	2	2	1	1	1	0	0	0	0	0	7	6	7	6	2	2	2	2	2	2

except Je designed the width and height of the space in a way of preventing risks. Moreover, in consideration of pleasantness, Ja, Jc and Jd designed their windows large for making it easy to look out.

Medical rehabilitation spaces were divided into physiotherapy room and spa. For physiotherapy room, in consideration of safety and accessibility, each center designed an open space without door sill, and used non-slippery floor materials. In consideration of pleasantness, all the facilities except Je designed the space

for good outside view, created home atmosphere, and selected adequate furniture. For spa, in consideration of safety, each center installed handrails on the walls and bells for notifying emergencies. In consideration of accessibility, all the centers except Jd and Je used button-type faucets and non-slippery floor materials.

[Table 3-6] Analysis of individual service spaces using the indoor space checklist



	Ja	Jb	Jc	Jd	Je	Total
	EA	EA	EA	EA	EA	EA
Safety	11	11	11	10	8	51
Accessibility	11	10	11	10	6	48
Flexibility	3	3	2	3	1	12
Sociality	2	2	1	1	1	7
Path finding	0	0	0	0	0	0
Pleasantness	7	6	7	6	2	28
Autonomy	2	2	2	2	2	10
Total	35	34	34	32	20	-

4. Conclusions

The present study surveyed five elderly welfare centers in Japan using an indoor space checklist, and the results were as follows.

First, the following are the results of analysis using the indoor space checklist on the spaces of each elderly welfare facility according to elders' behavioral characteristics. The functionality of spaces for elders' behaviors and resultant pleasantness of the spaces were affected most by safety and, next, in order of pleasantness, path finding, flexibility and sociality among the seven analysis criteria. The frequency of space design was particularly high in Ja, Jb and Jc.

Second, the following are the results of analyzing the indoor space checklists for shared spaces at each elderly welfare center. The frequency of the seven analysis criteria was high in order of safety, pleasantness and path finding. That is, spaces were designed with the object of safety in consideration of elders' behaviors, easy understanding of connection among spaces, and easy path finding. Among shared spaces, the dining hall considered safety and accessibility well in each center by removing door sills and installing handrails on the walls. Each center installed handrails on both sides of hallways, but improvement was required for making hallways at least 1.5m wide. Each center designed the spaces properly through consistent design plans, contrasting colors for the background and letters of signs, deployment of landmarks, familiar old photographs, etc., but there was no consideration for enlarging the size of signs. Thus, visual design in consideration of elders' behavior was required. For the safety and accessibility of bathrooms, each center designed the spaces properly by installing handrails around the toilet bowels and urinals, using non-slippery floor materials, and installing bells for notifying emergencies.

Third, as to personal service program spaces at each elderly welfare center, the seven analysis criteria were considered in order of safety, accessibility, pleasantness and flexibility for maintaining the pleasantness of

spaces according to the functional factors of spaces and leisure programs for elders. In particular, the flexibility of spaces was implemented using furniture and partitions to accommodate diverse programs in the spaces. The details of individual service spaces analyzed using the indoor space checklist are as follows.

Social education spaces were divided into auditorium, lecture hall and fitness room. For auditorium, each center used bright lighting in consideration of safety and accessibility, and designed the entrance and the hallways wide and removed door sills for the use of wheelchairs and walking aids. Each center installed thick sliding doors, prepared various forms of seats, and selected flexible furniture in consideration of flexibility, and prepared spaces for large events in consideration of sociality. For fitness room, in consideration of safety, each center installed bells for notifying emergencies, and all the centers except Je designed the width and height of the space in a way of preventing risks. Medical rehabilitation spaces were divided into physiotherapy room and spa. For physiotherapy room, in consideration of safety and accessibility, each center designed an open space without door sill, and used non-slippery floor materials. In consideration of pleasantness, all the facilities except Je designed the space for good outside view, created home atmosphere, and selected adequate furniture. For spa, in consideration of safety, each center installed handrails on the walls and bells for notifying emergencies. As to accessibility, some centers were required to improve accessibility by using button-type faucets and non-slippery floor materials.

Through the present study, we surveyed the current state of elderly welfare centers in Tokyo, Japan using a indoor space checklist that reflects elders' behaviors. The surveyed facilities except Je showed high frequency of analysis contents based on the seven analysis criteria, suggesting that their spaces were designed in consideration of elders' behaviors. The results of this study are expected to be useful as basic materials in planning the indoor spaces of elderly welfare facilities in Korea.

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