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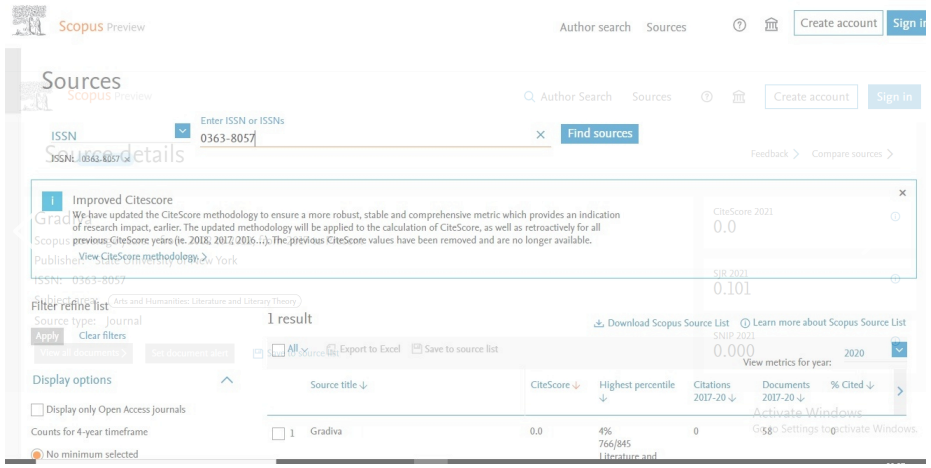

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Haptic and Kinesthesia Sensory Based Wayfinding for Elderly in Urban Public Space, *Case Study Kota Tua Jakarta*

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Abstract: *One of the actions in the program is the National Programs for Age-Friendly Cities and Communities (AFCC) is to support all elderly people enjoying independence and good health. To enhance independence, an elderly-friendly environment needs to pay attention to the elderly-friendly wayfinding aspect to help the process of achieving and moving activities independently. However, elderly wayfinding have not been studied in a lot. The wayfinding process is influenced by the individual's sensory abilities and the condition of the physical setting (environment). The physical condition of the elderly continues to decline with increasing age. The research question from the problem above is what is the role of physical settings on sensory in elderly wayfinding. The purpose of this study is to obtain a picture of the influence of physical settings on the sensory abilities of the elderly in wayfinding patterns particularly responded by kinesthesia and haptic sensory. The method in this study aims to obtain a picture of the physical environment responded by kinesthesia and haptic sensory that is friendly to the elderly in supporting independence. The research method used in this study is a quantitative method. This method uses a study approach to the Jakarta History Museum and Fatahillah Park Kota Tua in the old city area of Jakarta. The research method is carried out by observing the relationship between sensory abilities in a particular setting in the wayfinding process. The quality of the path texture influences the wayfinding considerations, which are responded to by the haptic sense. Age friendly physical setting character responded to by haptic sensors need to be a flat counter path, pavement surface and a comfortable texture size (not slippery). Responded to by kinesthesia sensors, needs to install adequate railing, when needed for safety, it is important to consider the availability of transit stops for short breaks during their mobility in walkability distance <400m. Male and female have no significant differ in their path choices, particularly in their responses to haptic and kinesthesia sensors*

Keywords: ***Wayfinding, Elderly, Physical Setting, Sensory, Kinesthesia, Haptic***

1. INTRODUCTION

The global elderly population continues to grow for people aged 60 years and over. The demographic proportion of the global elderly population will double from 11% in 2006 to 22% in 2050. By that time, there will be more elderly people than children (ages 0–14 years), and this will be the first time in human history [1]. Research on wayfinding in the elderly has been done, but most of them studied elderly people who need assistive devices and have memory loss [2][3][4][5]. This paper examines elderly people who are able to mobile independently. Enjoying independence to access environment is important according to the WHO program in the National Programs for Age-Friendly Cities and Communities (AFCC). An age-friendly environment can increase this independence [6]. To increase elderly independence, an age-friendly environment needs to pay attention to the age-friendly wayfinding aspect. But elderly wayfinding has not been studied in a lot. This study is to fulfill the theoretical gap regarding elderly wayfinding within the scope of public space. This study is how to find out the influence of certain physical setting on the sensory abilities of the elderly in wayfinding process. This research objective is to obtain an overview of the sensory abilities of the elderly in responding to physical settings in the wayfinding pattern of the case study of the Jakarta History Museum in Kota Tua. The results of the study are expected to be useful in the process of solving related problems. Through this paper will be useful for the field of architectural science and for practitioners and regulators in providing input to complete the existing standard operating guidelines.

1.1. Elderly Characteristics

The elderly have special characteristics that distinguish them from non-elderly people in general. The health quality of the elderly generally decreases, this is influenced by internal

and external factors. [7][8][9][10]. The characteristics of the elderly are a decrease in functional status which is a person's ability to carry out daily activities. A decrease in functional status causes geriatric patients to be in a state of immobilization which results in dependence on others. In dividing the elderly age group, it can be done into two categories of the elderly, namely the chronological age category and the biological age category. If you look at the biological category, what is seen is the physiological ability that is not divided into regular year intervals. Biological age division can be divided into: a. Elderly: 61 -73 years b. Old: 73 -85 years c. Very Old> 86 years [11].

1.2. Wayfinding

The term 'wayfinding' describes the process humans go through to find their way around an environment. This desire of seeking orientation is the natural instinct that in humans since ancient times [12]. The wayfinding process is essentially problem solving and is influenced by many factors. How people percept their environment, the information available, their skill to navigate themselves spatially, and the mental image (cognitive) and decision-making processes they go through all influence finding their way [13]. The knowledge, experience and abilities of the traveler influence what decisions they will make and how easily they will find their way. Wayfinding is a human process of navigating and orienting themselves in physical space. The process includes the efforts to obtain, establish and find some of paths that will be taken to get from one point to another place.

Kevin Lynch in his book The Image of the City, 1960, spatial orientation in urban scale, using the concept of spatial orientation and cognitive maps. This concept is aimed at the ability of lay people to describe the physical environment through their minds. The 5 elements of spatial orientation consist of path, edge, district, node, and landmark elements [14]. In its development in the 1970s, the concept of spatial orientation that relies on navigational ability experienced a conceptual shift by cognitivists. Among them were Rogers Downs and David Stea [15] added his idea to Lynch's argument that basic processes such as environmental perception, decision-making processes in determining direction must be considered in the success of spatial orientation. They argue that understanding the movement of wayfinding facility users in complex environments can add to the argument of the definition of wayfinding. Wayfinding is a dynamic process, ongoing, to find problem solving along the route.

Tabel 1. Differences between spatial orientation and wayfinding

Spatial Orientation	Wayfinding
- Depend on the ability to form Enviromental Image from cue (immediate sensation + memory in the past) - Depend on the ability to navigate	- Has a dynamic relationship with the environment. - Continues problem solving in the decision process (decision making, decision executing, decision process) - Influenced by past experiences - Reads and evaluates the environment - Attempts to understand the character of the physical setting - Reads instructions and information - Considers time, safety, and security factors.

.1.3. Wayfinding Factors

A large number of factors influence how easily people find their way. These factors can generally be grouped into three types – human factors, environmental factors, and information factors. All of these factors can affect a person’s ability to find their way to a destination, and just as importantly, know that they have arrived [13]. Nowadays, technological developments can also assist the wayfinding and navigation process. This is what then adds a wayfinding factor, namely the ‘tool’ factor [16]. From another theory, the

factors that influence Wayfinding are user ability factors and environmental quality factors. Wayfinding is an interplay interaction between individual (user) conditions such as age, gender, cognitive ability, perceptual ability, spatial ability, mental condition and physical condition. While environmental characteristic factors such as physical conditions of the environment, lighting conditions, signs, and legible circulation articulation [17]. There are also interactions between individual characteristics (e.g., age and gender affect spatial and cognitive abilities) and environmental characteristics (luminosity can change the effectiveness of signage). In environments such as transportation hubs, the diversity of users present increases the complexity of wayfinding.

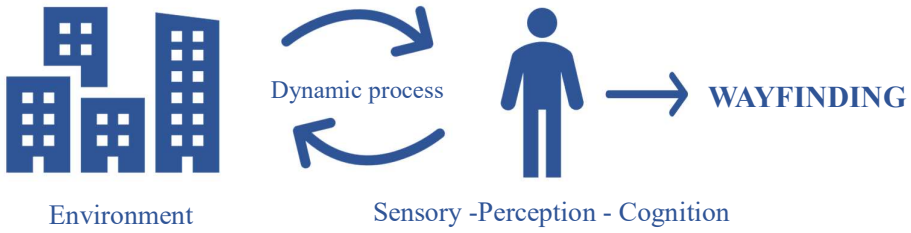


Figure 1. Wayfinding Factors, *Source: Author*

1.4. Human Sensory System

Wayfinding is a multisensory task. When people navigate their way to a destination, they use their senses to varying degrees and sometimes unconsciously. If environments take into account the need for people to use all their senses when finding their way, they can improve the effectiveness of their wayfinding systems. Senses are intertwined with memory. The brain fires neurons, prunes synapses, and forms pathways. Thus, meaning and memory are formed. Senses move us through space and place [18]. We spend our lives in a sea of sensory stimuli: light, gravity, electric current, vibration, time. Our survival depends on our ability to perceive, interpret, and respond to these signals. The human sensory system consists of the following eight subsystems:
1. Visual system (Sight), 2. Auditory system, 3. Somatosensory system **(Haptic),** 4. Gustatory system, 5. Olfactory system, 6. Vestibular system (Balance), 7. Proprioception /Movement/Sense of Muscle and Joints **(Kinesthesia),** 8. Interoceptive system (Interoception is a collection of senses that provide information to the organism about the internal state of the body. This can occur consciously and unconsciously) 9. Taste [19]

Haptic System
The wayfinding process is not only through visuals, but also by multisensory ways, one of which is haptic touch. Touch (haptic) feels different sensations that are communicated to the brain through special neurons in the skin. The source of the sensation can be from Pressure, temperature, light touch, vibration, pain, and other sensations that are responded to by the sense of touch and are all associated with different receptors in the skin [20]. Haptic touch by pedestrians through foot haptic touch [10]. Environmental factors, such as changes in internal floor texture and external pathways to distinguish different areas, are useful for all users. Everyone uses their sense of touch to help them find their way, but those with visual impairments rely heavily on tactile wayfinding aids.

Proprioception: you are moving (Kinesthesia)
Proprioception is another big word, meaning the feeling of muscles and joints. This sense tells you where and how your body is moving. It tells you what your arms, legs, torso and neck are doing. If you close your eyes, you can probably still touch your nose with your finger. This is because your sense of proprioception tells your shoulders, arms, hands and fingers how much to move to reach your nose. We don't see it move, we don't hear it move

and only feel it when our fingers touch. Some people really like to move, others don't like to move at all. Indoor mini trampolines are popular with people of all ages who like to move. Kinesthesia sensory abilities can be developed into adulthood but will continue to decrease with age [21]. This sensory also responds to human ability to travel distance. In the existing theory, it is stated that the comfortable walkability distance is 400m [22][23][24].

1.5. Physical Setting Factors

Passini (1984) mentioned that there are three types of environmental information in wayfinding :

- Architectural Wayfinding Element. Architectural wayfinding elements can be grouped as follows: 1. Visual Identity, 2. Landmark, 3. Well-ordered Plan, 4. Long sight line
- Signage System, which is integrated with the built environment is needed to help the wayfinding process. Passini (1984) mentioned three types of sign systems that need to be present, namely:1. Directional Signs (Direction/Department Markers), 2. Identification Signs (Place Identification Markers), 3. Reassurance Signs (Security Signs)
- Other Sensory Information or sensors or information stimuli in other forms.

From another theory, physical settings to support wayfinding from Hunter's explanation in Center for IDEA (2010) [25] The important components of the Wayfinding and Orientation System according to Arthur and Passini (1992) can be described in the following : Architecture, Circulation, and Signage.

2. RESEARCH METHOD

This method uses a built environment case study approach that can stimulate sensors in the wayfinding process. The environment taken has diverse spatial characters, has outdoor and indoor environments. The case study taken is the old city area of Jakarta Kota Tua. The study aims to provide an in-depth description of the research object. The research method used is by observing the relationship between sensory abilities in a particular setting. The research variables for this research study are determined based on theories that are relevant to the wayfinding theme and their relationship to human responses to environmental information. The biggest factors influencing wayfinding are human ability factors and the quality of the existing physical setting environment [17] The physical setting studied in this study is in the Old City area of Jakarta which is currently undergoing pedestrianization with the LEZ (Low Emission Zone) concept [26], so the variables taken must be relevant to the walkability criteria.

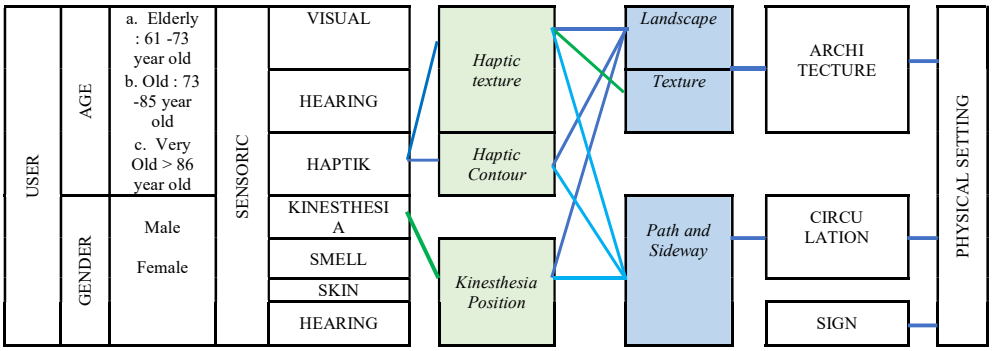


Figure 2. Relevance wayfinding variable based on haptic dan kinesthesia sensory,
Source : [17]

2.1. Population and sample

The population in this study were people who visited the Kota Tua Jakarta. The limitation of people surveyed was 60 years of age and over. The selection of the case study in Kota Tua was because the level of people who came for the first time for treatment was quite large. A sample is part of the population used to obtain an overview of the characteristics of the population, while sampling is the process of determining the part of the population studied. To determine the number of samples in this study, the researcher used the Simple Random Sampling technique. The reason for using this sampling method is the number and type of population that is already clear.

2.2. Data Collection Method

The primary survey was conducted to determine the condition of Kota Tua and respondents' views on wayfinding based on environmental information. The form of the primary survey was a questionnaire, cognitive map making, and field observation and documentation. The physical setting delineation studied in this study is in the Kota Tua area of Jakarta which is currently undergoing pedestrianization with the LEZ (Low Emission Zone) concept (ITDP, 2022). The research period is the period of time needed by researchers to conduct observations and data collection while in the field. The length of the research period is determined by a researcher according to their needs. Meanwhile, this research was conducted for approximately two months, namely from April 1, 2025 to May 30, 2025. This was done so that researchers could obtain more data while obtaining the latest data regarding the research object. Starting from determining the research object, observation, data collection at the research location, to data processing. The selection of primary survey hours was carried out at - Hours: 10.00 - 02.00l - Days: Every day. - Conditions: Bright weather (sunny) and no rain

3. RESULT AND DISCUSSION

3.1. Research Location

Kota Tua Jakarta area is located in two municipalities, namely West Jakarta and North Jakarta. Kota Tua as the forerunner of Jakarta holds a lot of history regarding old cultural heritage buildings which are relics of the past from the Dutch colonial era. The following are the boundaries of the research area conducted in the Old City of Jakarta. The physical setting is divided into 6 Zones, namely: Zone 1: Jl. Lada and Jl. Ketumbar, Zone 2: Taman Stasiun Kota and Jl. Pintu Besar Utara, Zone 3: Taman Fatahillah, Zone 4: Jl. Kali Besar Timur and Jl. Kali Besar Barat, Zone 5: Jl. Kali Besar Timur 3, Zone 6: Jl. Kemukus

3.2. Physical Setting Parameter

Table 2. Physical setting parameter

INDICATOR	PARAMETER
Texture *Responded by* *Haptic Texture*	Texture size for convenience Interval Scale . The area covered with materials, and flat surface : 3 = Texture wave length <0,5mm, 2 = Texture wave length 0,5mm-5mm 1= Texture wave length >5mm
Contour *Responded by* *Haptic Contour*	Gradient convenience Interval: 1 = Gradient <1:10, 2 = Gradient 1:10 - 1:12, 3 = Gradient 1:12 - 1:20 4 = Gradient > 1:20
Position Distance *Responded by* *Kinesthesia*	Walkability Distance Interval 1 = Distance<100m, 2 = Distance 100-300m, 3 = Distance 300 -400m 4 = Distance >400m

This parameter table is used to identify the physical setting characteristic.

3.3. Physical Setting Identification

Table 3. Physical Setting Characteristic

VARIABEL	INDICATOR	DESCRIPTION					
		ZONE 1	**ZONE 2**	**ZONE 3**	**ZONE 4**	**ZONE 5**	**ZONE 6**
Landscape	**Texture** *Responded by Haptic Texture*	Texture in Zone 1 : 1. 3 2. 2 3. 1	Texture in Zone 2: 1. 2 2. 3	Texture in Zone 3: 1. 2 2. 3	Texture in Zone 4: 1. 2	Texture in Zone 5: 1. 3 2. 2 3. 1	Texture in Zone 6: 1. 2
	Contour *Responded by Haptic Contour*	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10
	Position Distance *Responded by Kinesthesia*	2 = Distance 100-300m	3 = Distance 300 -400m	2 = Distance 100-300m	3 = Distance 300-400m	3 = Distance 300-400m	3 = Distance 300-400m
Texture	**Texture** *Responded by Haptic Texture*	Identifying TEXTURE in Zone 1: 1. 3 2. 2 3. 1	Identifying texture in Zone 2: 1.2 2.3	Identifying texture in Zone 3: 1.2 2.3	Identifying texture in Zone Zona 4 1.2	Identifying texture in Zone 5 1.2	Identifying texture in Zone 6 1.2
Path and Sideway	**Texture** *Responded by Haptic Texture*	Identifying PATH texture in Zone 1: 1.3 2.2 3.1	Identifying PATH texture in Zone 2: 1. 2 2. 3	Identifying PATH texture in Zona 3: 1. 2 2. 3	Identifying PATH texture in Zone 4: 1. 2	Identifying PATH texture in Zone 5: 1. 3 2. 2 3. 1	Identifying PATH texture in Zone 6: 1. 2
	Contour *Responded by Haptic Contour*	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10
	Texture *Responded by Haptic Texture*	2 = Distance 100-300m	3 = Distance 300 -400m	2= Distance 100 -300m	3= Distance 300 -400m	3= Distance 300 -400m	3= Distance 300 -400m

There are 6 zones, divided according to their physical characteristic. From the Table 2, shows that the surface conditions of the zones have both similar and different characteristics. However, the contour conditions are relatively flat. Walkability distances vary, with the shortest distance in Zone 3 and the longest in Zone 5.

3.4. Result Analysis

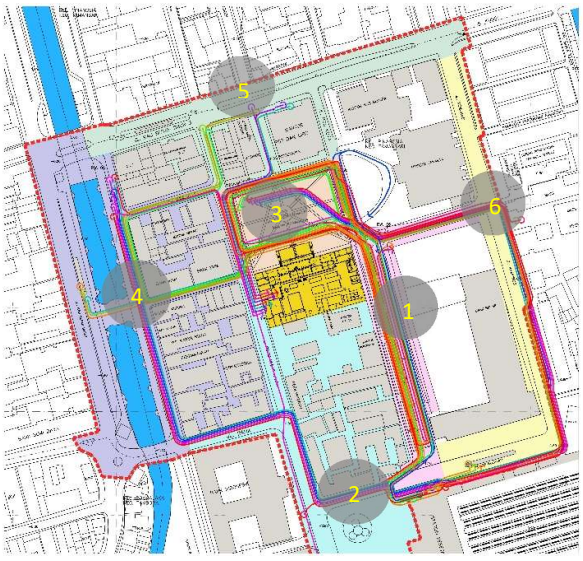


Figure 3. Sampe Route, *Source : Author*

The number of samples was 32 respondents. The most frequently visited zone was Zone 3, and least frequently zone was zone 5

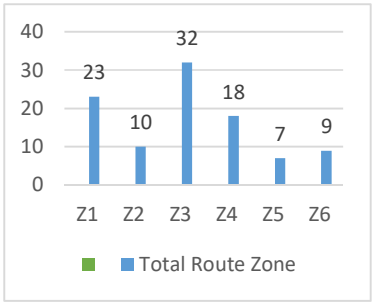


Figure 4. Total route zone diagram, *Source : Author*

The most frequently visited Zone 3 (Fatahillah Square) had 32 samples. This means that all samples passed through this zone. Zone 3 is a fairly large plaza and the center of the Old Town area. This zone has a walkability distance of 115m. The surface is paved and flat. The texture characteristics are 3 (Texture wave length <0,5mm) and 2 (Texture wave length 0.5mm-5mm). The least traveled zone is Zone 5 the north side of Kota Tua, with 7 visits. Zone 5 has a walkable distance of 390m. Some areas, the path is discontinuous. The path is paved with varying textures, but some areas are uneven. Some areas lack pedestrian's walkway and have potholes.

Table 4. Sample data, route, and responded sensorics

SAMPLE (n)	AGE	GENDER	ZONE ROUTE	SENSORIC		
				Haptic Texture	*Haptic Contour*	*Kines thesia*
n1	78	Male	1,2,3,	2	0	0
n2	65	Male	1,2,3,4	0	0	0
n3	62	Male	1,3,4,5	3	0	0
n4	65	Male	1,3,4	2	0	0
n5	75	Male	1,3	3	0	0
n6	70	Male	1,3,4	3	0	0
n7	82	Male	1,3	3	0	1
n8	65	Male	3,5	0	0	0
n9	60	Male	2,3	3	0	0
n10	80	Male	3,4	3	0	2
n11	63	Male	1,3,4	0	0	0
n12	67	Male	1,3,4	3	0	0
n13	65	Male	3,4,5	3	0	1
n14	77	Male	3,4,5	3	0	1
n15	65	Male	3,4,5	3	0	1
n16	62	Male	1,2,3,4,6	3	0	1
n17	73	Male	1,2,3,4,6	3	0	1
n18	62	Male	1,2,3,4,6	3	0	1
n19	61	Male	1,2,3,4,6	3	0	1
n20	75	Male	1,2,3,4,6	3	0	1
n21	95	Male	1,3	0	0	1
n22	65	Female	1,3,6	3	0	0
n23	65	Female	1,3,6	3	0	0
n24	62	Female	1,3,6	3	0	0
n25	60	Female	1,3	1	1	1
n26	71	Female	1,3	0	0	1
n27	87	Female	3,5	0	0	1
n28	80	Female	1,3	3	0	1
n29	65	Female	3,5	0	0	0
n30	69	Female	3,4	3	0	2
n31	67	Female	1,3,4	3	0	0
n32	75	Female	1,2,3,4,6	3	0	1

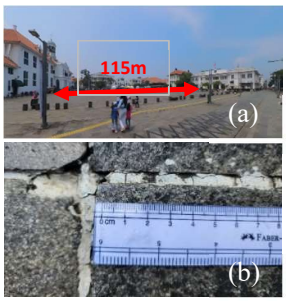


Figure 5. (a) Zone 3 walkability distance (b) Texture wave length 0,5mm-5mm in Zone 3, *Source : Author*

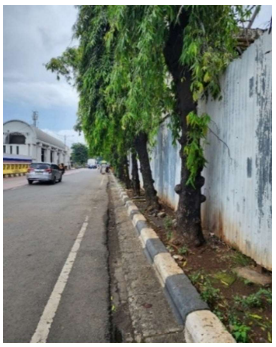


Figure 6. Uneven pavement in Zone 5, *Source : Author*

Respondents who responded with haptic-texture were 25 samples, haptic-contour was 1 sample and those who responded with sensory kinesthesia were 15 respondents. From the data above, it can be read that zone 3 is the most frequently traveled zone because it is influenced by the physical setting character with a flat path surface condition and a texture size that is comfortably responded to by haptic sensors (not slippery), responded to by haptic sensors with flat contours, This is in accordance with the theory of age-friendly communities by WHO [6], [27], [28]. Zone 3 has the shortest walkability distance (115m) which is responded to by kinesthesia sensors.

Meanwhile Zone 5 is the least traveled because it is influenced by the physical setting character of the existing path surface which is uneven and not continuous.

3.5. Comparative analysis of male and female

Comparative analysis of male and female in the wayfinding process seen from the aspect of haptic and kinesthesia sensory abilities. The total sample for male are 21 respondent and female are 11 respondents.

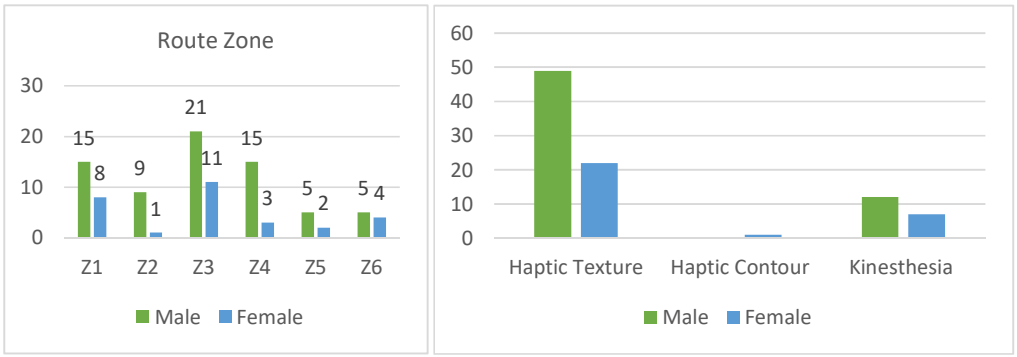
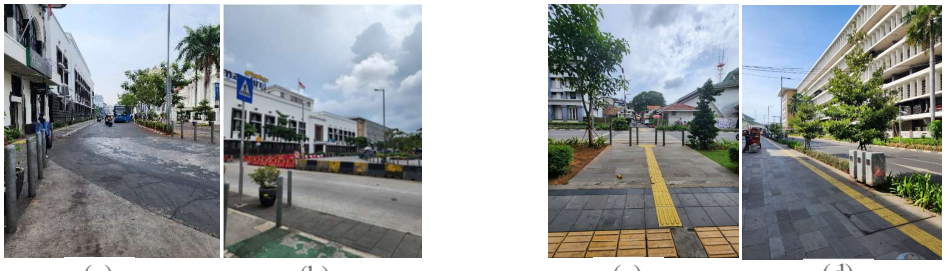


Figure 7. Comparative route zones and sensorics of male and female

The most frequently visited zone for both of gender was Zone 3 (Fatahillah Square). The frequently visited for male were zone 5 and zone 6. The feast frequently visited for women was zone 2. The physical setting characteristics of zone 3 and zone 5 have been discussed in sub-chapter *3.4. result analysis*.

Zone 2 was the least traveled by female respondents. The physical setting characteristics of zone 2, there is a plaza in front of the Kota Tua train station, the sidewalk pedestrian path, and the road used by cars. The pedestrian path is separated from the road, but at some crossings the barriers prevent pedestrians to cross. This zone has a walkability distance of 365m. The walkway's surface is paved and flat. The texture characteristics are 3 (Texture wave length <0,5mm) and 2 (Texture wave length 0.5mm-5mm). Zone 2 was the least frequently visited by female respondents, influenced by its location on the southern edge of the Kota Tua area. This zone serves only as a transit, requiring a road crossing for mobility. Both up and down-level crossings are responded to using haptic contour sensors. Other factors influenced by the presence of road barriers and motorized vehicle traffic on the road.

Zone 6 was also the least traveled by male respondents. The physical setting characteristics, there is sidewalk pedestrian path, and the road used by cars. The pedestrian path is separated from the road. This zone has a walkability distance of 300m. The walkway's surface is paved and flat. The texture characteristics are 3



(a) (b) (c) (d)

Figure 8. (a)(b) Zone 2 the least female route. (c)(d) Zone 6 the least male route
Source : Author

(Texture wave length <0,5mm) and 2 (Texture wave length 0.5mm-5mm). The zone 6 location is on the eastern edge of the Kota Tua area. This zone serves supporting zone for parking, requiring a road crossing for mobility. Both up and down-level crossings are responded to using haptic contour sensors.
The data above shows that male and female have no significant differ in their path choices, particularly in their responses to haptic and kinesthesia sensors. A difference was found in women has difficulty for contour fluctuations (*Haptic Contour*), while men's not.

3.6. Comparative analysis of age group

Table 5. Sample data, route, and responded sensorics according to the age group

SAMPLE (n)	AGE	GENDER	ZONE ROUTE	SENSORIC		
				Haptic Texture	*Haptic Contour*	*Kines thesia*
n9	60	Male	2,3	3	0	0
n25	60	Female	1,3	1	1	1
n19	61	Male	1,2,3,4,6	3	0	1
n3	62	Male	1,3,4,5	3	0	0
n16	62	Male	1,2,3,4,6	3	0	1
n18	62	Male	1,2,3,4,6	3	0	1
n24	62	Female	1,3,6	3	0	0
n11	63	Male	1,3,4	0	0	0
n2	65	Male	1,2,3,4	0	0	0
n4	65	Male	1,3,4	2	0	0
n8	65	Male	3,5	0	0	0
n13	65	Male	3,4,5	3	0	1
n15	65	Male	3,4,5	3	0	1
n22	65	Female	1,3,6	3	0	0
n23	65	Female	1,3,6	3	0	0
n29	65	Female	3,5	0	0	0
n12	67	Male	1,3,4	3	0	0
n31	67	Female	1,3,4	3	0	0
n30	69	Female	3,4	3	0	2
n6	70	Male	1,3,4	3	0	0
n26	71	Female	1,3	0	0	1
n17	73	Male	1,2,3,4,6	3	0	1
n5	75	Male	1,3	3	0	0
n20	75	Male	1,2,3,4,6	3	0	1
n32	75	Female	1,2,3,4,6	3	0	1
n14	77	Male	3,4,5	3	0	1
n1	78	Male	1,2,3,	2	0	0
n10	80	Male	3,4	3	0	2
n28	80	Female	1,3	3	0	1
n7	82	Male	1,3	3	0	1
n27	87	Female	3,5	0	0	1
n21	95	Male	1,3	0	0	1

For the age group (a), group (b), group (c), the most passed through route is Zone 3.The least passed through zone for age group (a), group (b), is Zone 5. The physical setting characteristic of zone 3 and zone 5 have been discussed in sub-chapter *3.4. result analysis.* The route for the age group (c) were zone 1, 3, and 5.

The age group (a) responded to sensory : Haptic Texture, Haptic Contour, Kinesthesia .
The age group (b) responded to sensory : Haptic Texture, Kinesthesia.
The age group (c) responded to sensory : only Kinesthesia

Respondent data related to sensory kinesthesia revealed that some participants in age group (a), Sample No. 16 (male, 62 years old) and No. 17 (male, 73 years old) stated that a distance of <400m was still comfortable. Meanwhile, Sample No. 28 (female, 62 years old) stated that they could not travel a distance of <400m and had great difficulty on uphill and downhill path. In age group (b) Participants No. 7 (male, 82 years old) and No. 10 (male, 80 years old) stated that the distance was too far but

manageable. Meanwhile in age group (c) Participants No.27 (female, 87 years old) said that the distance could still be covered on foot, but sometimes she needs help with a handrail to walk so she doesn't fall. The oldest participant No.21 (male, 95 year old) said the he could walk independently without guidance. The response data revealed a variety of responses based on age. Some in group (a) had difficulty responding with kinesthetic and haptic responses to ascending and descending paths, while others in group (c) had no difficulty responding with kinesthetic. Respondent data also revealed that elderly people require assistance with railings, especially on ascending and descending paths.

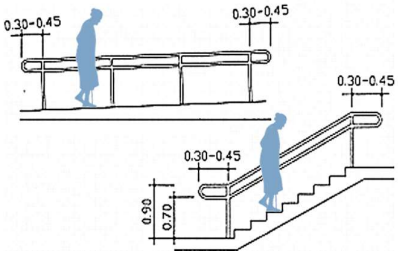


Figure 9. Safety railing for Elderly, Source: UN.ORG/DESA (2003)

UN.ORG/DESA (2003) states that attention needs to be paid to the elderly. To install adequate railing, when needed for safety, especially those with mobility problems. To facilitate use by ambulant elderly people, handrails should be mounted between 0.85 m and 0.95 m above the finished floor level. A contrasting color is also needed for handrails to alert people. For the elderly, it is important to consider the availability of transit stops for short breaks during their mobility in walkability distance <400m. Age-friendly pavements has an impact on the ability to walk. Pavements with narrow path, uneven, cracked, have high curbs, have obstructions present potential hazards and affect the ability of older people to walk around.

Generally, the physical setting that are considered for public space to be age-friendly responded bay haptic and kinesthesia are: elevators and escalators (if needed), comfortable ramps, wide passages, separated path with the other vehicle (car, motor, bike) for safety, suitable stairs (not too high or steep) with railings, non-slip flooring, transit areas with comfortable seating, adequate signage with contrast and large text, public toilets with handicap access [28].

4. CONCLUSION

Environmental quality influences wayfinding decisions. This is especially necessary for the elderly to support them in maintaining independence and preventing disability. From the study above it can be shown the most frequently traveled zone because it is influenced by age friendly physical setting character with a flat path surface condition and a texture size that is comfortably responded to by haptic sensors (not slippery), responded to by haptic sensors with flat contours. This zone also has the shortest walkability distance which is responded to by kinesthesia sensors. Meanwhile the least traveled because it is influenced by the physical setting character of the existing path surface which is uneven and not continuous. Comparative analysis of male and female shows that men and women have no significant differ in their path choices, particularly in their responses to haptic and kinesthesia sensors. A difference was found in women has difficulty for contour fluctuations (*Haptic Contour*), while men's not. Comparative analysis of age group

needs to install adequate railing, when needed for safety, especially those with mobility problems. A contrasting color is also needed for handrails to alert people. For the elderly, it is important to consider the availability of transit stops for short breaks during their mobility in walkability distance <400m.

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Haptic and Kinesthesia Sensory Based Wayfinding for Elderly in Urban Public Space, *Case Study Kota Tua Jakarta*

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Abstract: *One of the actions in the program is the National Programs for Age-Friendly Cities and Communities (AFCC) is to support all elderly people enjoying independence and good health. To enhance independence, an elderly-friendly environment needs to pay attention to the elderly-friendly wayfinding aspect to help the process of achieving and moving activities independently. However, elderly wayfinding have not been studied in a lot. The wayfinding process is influenced by the individual's sensory abilities and the condition of the physical setting (environment). The physical condition of the elderly continues to decline with increasing age. The research question from the problem above is what is the role of physical settings on sensory in elderly wayfinding. The purpose of this study is to obtain a picture of the influence of physical settings on the sensory abilities of the elderly in wayfinding patterns particularly responded by kinesthesia and haptic sensory. The method in this study aims to obtain a picture of the physical environment responded by kinesthesia and haptic sensory that is friendly to the elderly in supporting independence. The research method used in this study is a quantitative method. This method uses a study approach to the Jakarta History Museum and Fatahillah Park Kota Tua in the old city area of Jakarta. The research method is carried out by observing the relationship between sensory abilities in a particular setting in the wayfinding process. The quality of the path texture influences the wayfinding considerations, which are responded to by the haptic sense. Age friendly physical setting character responded to by haptic sensors need to be a flat counter path, pavement surface and a comfortable texture size (not slippery). Responded to by kinesthesia sensors, needs to install adequate railing, when needed for safety, it is important to consider the availability of transit stops for short breaks during their mobility in walkability distance <400m. Male and female have no significant differ in their path choices, particularly in their responses to haptic and kinesthesia sensors*

Keywords: ***Wayfinding, Elderly, Physical Setting, Sensory, Kinesthesia, Haptic***

1. INTRODUCTION

The global elderly population continues to grow for people aged 60 years and over. The demographic proportion of the global elderly population will double from 11% in 2006 to 22% in 2050. By that time, there will be more elderly people than children (ages 0–14 years), and this will be the first time in human history [1]. Research on wayfinding in the elderly has been done, but most of them studied elderly people who need assistive devices and have memory loss [2][3][4][5]. This paper examines elderly people who are able to mobile independently. Enjoying independence to access environment is important according to the WHO program in the National Programs for Age-Friendly Cities and Communities (AFCC). An age-friendly environment can increase this independence [6]. To increase elderly independence, an age-friendly environment needs to pay attention to the age-friendly wayfinding aspect. But elderly wayfinding has not been studied in a lot. This study is to fulfill the theoretical gap regarding elderly wayfinding within the scope of public space. This study is how to find out the influence of certain physical setting on the sensory abilities of the elderly in wayfinding process. This research objective is to obtain an overview of the sensory abilities of the elderly in responding to physical settings in the wayfinding pattern of the case study of the Jakarta History Museum in Kota Tua. The results of the study are expected to be useful in the process of solving related problems. Through this paper will be useful for the field of architectural science and for practitioners and regulators in providing input to complete the existing standard operating guidelines.

1.1. Elderly Characteristics

The elderly have special characteristics that distinguish them from non-elderly people in general. The health quality of the elderly generally decreases, this is influenced by internal

and external factors. [7][8][9][10]. The characteristics of the elderly are a decrease in functional status which is a person's ability to carry out daily activities. A decrease in functional status causes geriatric patients to be in a state of immobilization which results in dependence on others. In dividing the elderly age group, it can be done into two categories of the elderly, namely the chronological age category and the biological age category. If you look at the biological category, what is seen is the physiological ability that is not divided into regular year intervals. Biological age division can be divided into: a. Elderly: 61 -73 years b. Old: 73 -85 years c. Very Old> 86 years [11].

1.2. Wayfinding

The term 'wayfinding' describes the process humans go through to find their way around an environment. This desire of seeking orientation is the natural instinct that in humans since ancient times [12]. The wayfinding process is essentially problem solving and is influenced by many factors. How people percept their environment, the information available, their skill to navigate themselves spatially, and the mental image (cognitive) and decision-making processes they go through all influence finding their way [13]. The knowledge, experience and abilities of the traveler influence what decisions they will make and how easily they will find their way. Wayfinding is a human process of navigating and orienting themselves in physical space. The process includes the efforts to obtain, establish and find some of paths that will be taken to get from one point to another place.

Kevin Lynch in his book The Image of the City, 1960, spatial orientation in urban scale, using the concept of spatial orientation and cognitive maps. This concept is aimed at the ability of lay people to describe the physical environment through their minds. The 5 elements of spatial orientation consist of path, edge, district, node, and landmark elements [14]. In its development in the 1970s, the concept of spatial orientation that relies on navigational ability experienced a conceptual shift by cognitivists. Among them were Rogers Downs and David Stea [15] added his idea to Lynch's argument that basic processes such as environmental perception, decision-making processes in determining direction must be considered in the success of spatial orientation. They argue that understanding the movement of wayfinding facility users in complex environments can add to the argument of the definition of wayfinding. Wayfinding is a dynamic process, ongoing, to find problem solving along the route.

Tabel 1. Differences between spatial orientation and wayfinding

Spatial Orientation	Wayfinding
- Depend on the ability to form Enviromental Image from cue (immediate sensation + memory in the past) - Depend on the ability to navigate	- Has a dynamic relationship with the environment. - Continues problem solving in the decision process (decision making, decision executing, decision process) - Influenced by past experiences - Reads and evaluates the environment - Attempts to understand the character of the physical setting - Reads instructions and information - Considers time, safety, and security factors.

.1.3. Wayfinding Factors

A large number of factors influence how easily people find their way. These factors can generally be grouped into three types – human factors, environmental factors, and information factors. All of these factors can affect a person's ability to find their way to a destination, and just as importantly, know that they have arrived [13]. Nowadays, technological developments can also assist the wayfinding and navigation process. This is what then adds a wayfinding factor, namely the 'tool' factor [16]. From another theory, the

factors that influence Wayfinding are user ability factors and environmental quality factors. Wayfinding is an interplay interaction between individual (user) conditions such as age, gender, cognitive ability, perceptual ability, spatial ability, mental condition and physical condition. While environmental characteristic factors such as physical conditions of the environment, lighting conditions, signs, and legible circulation articulation [17]. There are also interactions between individual characteristics (e.g., age and gender affect spatial and cognitive abilities) and environmental characteristics (luminosity can change the effectiveness of signage). In environments such as transportation hubs, the diversity of users present increases the complexity of wayfinding.

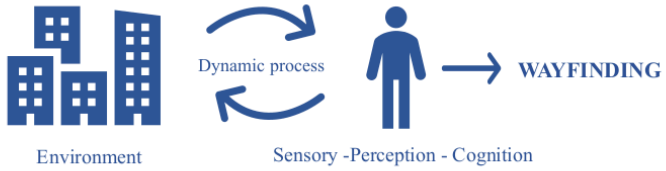

Figure 1. Wayfinding Factors, *Source: Author*

1.4. Human Sensory System

Wayfinding is a multisensory task. When people navigate their way to a destination, they use their senses to varying degrees and sometimes unconsciously. If environments take into account the need for people to use all their senses when finding their way, they can improve the effectiveness of their wayfinding systems. Senses are intertwined with memory. The brain fires neurons, prunes synapses, and forms pathways. Thus, meaning and memory are formed. Senses move us through space and place [18]. We spend our lives in a sea of sensory stimuli: light, gravity, electric current, vibration, time. Our survival depends on our ability to perceive, interpret, and respond to these signals. The human sensory system consists of the following eight subsystems:

1. Visual system (Sight), 2. Auditory system, 3. Somatosensory system **(Haptic),** 4. Gustatory system, 5. Olfactory system, 6. Vestibular system (Balance), 7. Proprioception /Movement/Sense of Muscle and Joints **(Kinesthesia),** 8. Interoceptive system (Interoception is a collection of senses that provide information to the organism about the internal state of the body. This can occur consciously and unconsciously) 9. Taste [19]

Haptic System

The wayfinding process is not only through visuals, but also by multisensory ways, one of which is haptic touch. Touch (haptic) feels different sensations that are communicated to the brain through special neurons in the skin. The source of the sensation can be from Pressure, temperature, light touch, vibration, pain, and other sensations that are responded to by the sense of touch and are all associated with different receptors in the skin [20]. Haptic touch by pedestrians through foot haptic touch [10]. Environmental factors, such as changes in internal floor texture and external pathways to distinguish different areas, are useful for all users. Everyone uses their sense of touch to help them find their way, but those with visual impairments rely heavily on tactile wayfinding aids.

Proprioception: you are moving (Kinesthesia)

Proprioception is another big word, meaning the feeling of muscles and joints. This sense tells you where and how your body is moving. It tells you what your arms, legs, torso and neck are doing. If you close your eyes, you can probably still touch your nose with your finger. This is because your sense of proprioception tells your shoulders, arms, hands and fingers how much to move to reach your nose. We don't see it move, we don't hear it move

and only feel it when our fingers touch. Some people really like to move, others don't like to move at all. Indoor mini trampolines are popular with people of all ages who like to move. Kinesthesia sensory abilities can be developed into adulthood but will continue to decrease with age [21]. This sensory also responds to human ability to travel distance. In the existing theory, it is stated that the comfortable walkability distance is 400m [22][23][24].

1.5. Physical Setting Factors

Passini (1984) mentioned that there are three types of environmental information in wayfinding :

- Architectural Wayfinding Element. Architectural wayfinding elements can be grouped as follows: 1. Visual Identity, 2. Landmark, 3. Well-ordered Plan, 4. Long sight line
- Signage System, which is integrated with the built environment is needed to help the wayfinding process. Passini (1984) mentioned three types of sign systems that need to be present, namely:1. Directional Signs (Direction/Department Markers), 2. Identification Signs (Place Identification Markers), 3. Reassurance Signs (Security Signs)
- Other Sensory Information or sensors or information stimuli in other forms.

From another theory, physical settings to support wayfinding from Hunter's explanation in Center for IDEA (2010) [25] The important components of the Wayfinding and Orientation System according to Arthur and Passini (1992) can be described in the following : Architecture, Circulation, and Signage.

2. RESEARCH METHOD

This method uses a built environment case study approach that can stimulate sensors in the wayfinding process. The environment taken has diverse spatial characters, has outdoor and indoor environments. The case study taken is the old city area of Jakarta Kota Tua. The study aims to provide an in-depth description of the research object. The research method used is by observing the relationship between sensory abilities in a particular setting. The research variables for this research study are determined based on theories that are relevant to the wayfinding theme and their relationship to human responses to environmental information. The biggest factors influencing wayfinding are human ability factors and the quality of the existing physical setting environment [17] The physical setting studied in this study is in the Old City area of Jakarta which is currently undergoing pedestrianization with the LEZ (Low Emission Zone) concept [26], so the variables taken must be relevant to the walkability criteria.

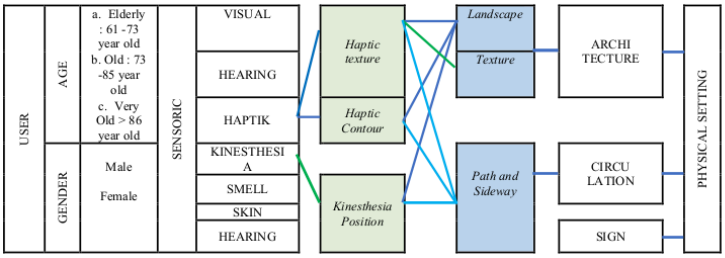

Figure 2. Relevance wayfinding variable based on haptic dan kinesthesia sensory, *Source :* [17]

2.1. Population and sample

The population in this study were people who visited the Kota Tua Jakarta. The limitation of people surveyed was 60 years of age and over. The selection of the case study in Kota Tua was because the level of people who came for the first time for treatment was quite large. A sample is part of the population used to obtain an overview of the characteristics of the population, while sampling is the process of determining the part of the population studied. To determine the number of samples in this study, the researcher used the Simple Random Sampling technique. The reason for using this sampling method is the number and type of population that is already clear.

2.2. Data Collection Method

The primary survey was conducted to determine the condition of Kota Tua and respondents' views on wayfinding based on environmental information. The form of the primary survey was a questionnaire, cognitive map making, and field observation and documentation. The physical setting delineation studied in this study is in the Kota Tua area of Jakarta which is currently undergoing pedestrianization with the LEZ (Low Emission Zone) concept (ITDP, 2022). The research period is the period of time needed by researchers to conduct observations and data collection while in the field. The length of the research period is determined by a researcher according to their needs. Meanwhile, this research was conducted for approximately two months, namely from April 1, 2025 to May 30, 2025. This was done so that researchers could obtain more data while obtaining the latest data regarding the research object. Starting from determining the research object, observation, data collection at the research location, to data processing. The selection of primary survey hours was carried out at - Hours: 10.00 - 02.00l - Days: Every day. - Conditions: Bright weather (sunny) and no rain

3. RESULT AND DISCUSSION

3.1. Research Location

Kota Tua Jakarta area is located in two municipalities, namely West Jakarta and North Jakarta. Kota Tua as the forerunner of Jakarta holds a lot of history regarding old cultural heritage buildings which are relics of the past from the Dutch colonial era. The following are the boundaries of the research area conducted in the Old City of Jakarta. The physical setting is divided into 6 Zones, namely: Zone 1: Jl. Lada and Jl. Ketumbar, Zone 2: Taman Stasiun Kota and Jl. Pintu Besar Utara, Zone 3: Taman Fatahillah, Zone 4: Jl. Kali Besar Timur and Jl. Kali Besar Barat, Zone 5: Jl. Kali Besar Timur 3, Zone 6: Jl. Kemukus

3.2. Physical Setting Parameter

Table 2. Physical setting parameter

INDICATOR	PARAMETER
Texture *Responded by* *Haptic Texture*	Texture size for convenience Interval Scale . The area covered with materials, and flat surface : 3 = Texture wave length <0,5mm, 2 = Texture wave length 0,5mm-5mm 1= Texture wave length >5mm
Contour *Responded by* *Haptic Contour*	Gradient convenience Interval: 1 = Gradient <1:10, 2 = Gradient 1:10 - 1:12, 3 = Gradient 1:12 - 1:20 4 = Gradient > 1:20
Position Distance *Responded by* *Kinesthesia*	Walkability Distance Interval 1 = Distance<100m, 2 = Distance 100-300m, 3 = Distance 300 -400m 4 = Distance >400m

This parameter table is used to identify the physical setting characteristic.

3.3. Physical Setting Identification

Table 3. Physical Setting Characteristic

VARIABEL	INDICATOR	DESCRIPTION					
		ZONE 1	**ZONE 2**	**ZONE 3**	**ZONE 4**	**ZONE 5**	**ZONE 6**
Landscape	**Texture** *Responded by Haptic Texture*	Texture in Zone 1 : 1. 3 2. 2 3. 1	Texture in Zone 2: 1. 2 2. 3	Texture in Zone 3: 1. 2 2. 3	Texture in Zone 4: 1. 2	Texture in Zone 5: 1. 3 2. 2 3. 1	Texture in Zone 6: 1. 2
	Contour *Responded by Haptic Contour*	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10
	Position Distance *Responded by Kinesthesia*	2 = Distance 100-300m	3 = Distance 300 -400m	2 = Distance 100-300m	3 = Distance 300-400m	3 = Distance 300-400m	3 = Distance 300-400m
Texture	**Texture** *Responded by Haptic Texture*	Identifying TEXTURE in Zone 1: 1. 3 2. 2 3. 1	Identifying texture in Zone 2: 1.2 2.3	Identifying texture in Zone 3: 1.2 2.3	Identifying texture in Zone Zona 4 1.2	Identifying texture in Zone 5 1.2	Identifying texture in Zone 6 1.2
Path and Sideway	**Texture** *Responded by Haptic Texture*	Identifying PATH texture in Zone 1: 1.3 2.2 3.1	Identifying PATH texture in Zone 2: 1. 2 2. 3	Identifying PATH texture in Zona 3: 1. 2 2. 3	Identifying PATH texture in Zone 4: 1. 2	Identifying PATH texture in Zone 5: 1. 3 2. 2 3. 1	Identifying PATH texture in Zone 6: 1. 2
	Contour *Responded by Haptic Contour*	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10	1 = Gradient <1:10
	Texture *Responded by Haptic Texture*	2 = Distance 100-300m	3 = Distance 300 -400m	2= Distance 100 -300m	3= Distance 300 -400m	3= Distance 300 -400m	3= Distance 300 -400m

There are 6 zones, divided according to their physical characteristic. From the Table 2, shows that the surface conditions of the zones have both similar and different characteristics. However, the contour conditions are relatively flat. Walkability distances vary, with the shortest distance in Zone 3 and the longest in Zone 5.

3.4. Result Analysis

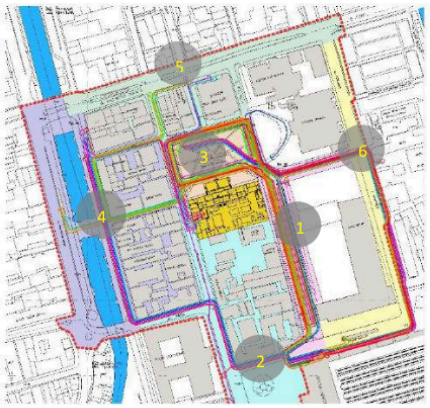

Figure 3. Sampe Route, *Source : Author*

The number of samples was 32 respondents. The most frequently visited zone was Zone 3, and least frequently zone was zone 5

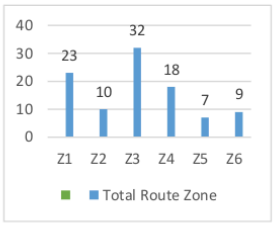

Figure 4. Total route zone diagram, *Source : Author*

The most frequently visited Zone 3 (Fatahillah Square) had 32 samples. This means that all samples passed through this zone. Zone 3 is a fairly large plaza and the center of the Old Town area. This zone has a walkability distance of 115m. The surface is paved and flat. The texture characteristics are 3 (Texture wave length <0,5mm) and 2 (Texture wave length 0.5mm-5mm). The least traveled zone is Zone 5 the north side of Kota Tua, with 7 visits. Zone 5 has a walkable distance of 390m. Some areas, the path is discontinuous. The path is paved with varying textures, but some areas are uneven. Some areas lack pedestrian's walkway and have potholes.

Table 4. Sample data, route, and responded sensorics

SAMPLE (n)	AGE	GENDER	ZONE ROUTE	SENSORIC		
				Haptic Texture	*Haptic Contour*	*Kines thesia*
n1	78	Male	1,2,3,	2	0	0
n2	65	Male	1,2,3,4	0	0	0
n3	62	Male	1,3,4,5	3	0	0
n4	65	Male	1,3,4	2	0	0
n5	75	Male	1,3	3	0	0
n6	70	Male	1,3,4	3	0	0
n7	82	Male	1,3	3	0	1
n8	65	Male	3,5	0	0	0
n9	60	Male	2,3	3	0	0
n10	80	Male	3,4	3	0	2
n11	63	Male	1,3,4	0	0	0
n12	67	Male	1,3,4	3	0	0
n13	65	Male	3,4,5	3	0	1
n14	77	Male	3,4,5	3	0	1
n15	65	Male	3,4,5	3	0	1
n16	62	Male	1,2,3,4,6	3	0	1
n17	73	Male	1,2,3,4,6	3	0	1
n18	62	Male	1,2,3,4,6	3	0	1
n19	61	Male	1,2,3,4,6	3	0	1
n20	75	Male	1,2,3,4,6	3	0	1
n21	95	Male	1,3	0	0	1
n22	65	Female	1,3,6	3	0	0
n23	65	Female	1,3,6	3	0	0
n24	62	Female	1,3,6	3	0	0
n25	60	Female	1,3	1	1	1
n26	71	Female	1,3	0	0	1
n27	87	Female	3,5	0	0	1
n28	80	Female	1,3	3	0	1
n29	65	Female	3,5	0	0	0
n30	69	Female	3,4	3	0	2
n31	67	Female	1,3,4	3	0	0
n32	75	Female	1,2,3,4,6	3	0	1

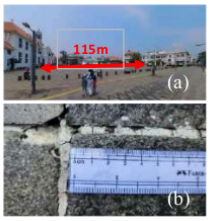

Figure 5. (a) Zone 3 walkability distance (b) Texture wave length 0,5mm-5mm in Zone 3, *Source : Author*

Figure 6. Uneven pavement in Zone 5, *Source : Author*

Respondents who responded with haptic-texture were 25 samples, haptic-contour was 1 sample and those who responded with sensory kinesthesia were 15 respondents. From the data above, it can be read that zone 3 is the most frequently traveled zone because it is influenced by the physical setting character with a flat path surface condition and a texture size that is comfortably responded to by haptic sensors (not slippery), responded to by haptic sensors with flat contours, This is in accordance with the theory of age-friendly communities by WHO [6], [27], [28]. Zone 3 has the shortest walkability distance (115m) which is responded to by kinesthesia sensors.

Meanwhile Zone 5 is the least traveled because it is influenced by the physical setting character of the existing path surface which is uneven and not continuous.

3.5. Comparative analysis of male and female

Comparative analysis of male and female in the wayfinding process seen from the aspect of haptic and kinesthesia sensory abilities. The total sample for male are 21 respondent and female are 11 respondents.

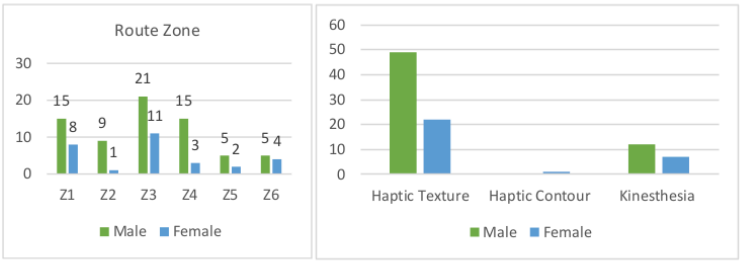

Figure 7. Comparative route zones and sensorics of male and female

The most frequently visited zone for both of gender was Zone 3 (Fatahillah Square). The frequently visited for male were zone 5 and zone 6. The feast frequently visited for women was zone 2. The physical setting characteristics of zone 3 and zone 5 have been discussed in sub-chapter *3.4. result analysis*.

Zone 2 was the least traveled by female respondents. The physical setting characteristics of zone 2, there is a plaza in front of the Kota Tua train station, the sidewalk pedestrian path, and the road used by cars. The pedestrian path is separated from the road, but at some crossings the barriers prevent pedestrians to cross. This zone has a walkability distance of 365m. The walkway's surface is paved and flat. The texture characteristics are 3 (Texture wave length <0,5mm) and 2 (Texture wave length 0.5mm-5mm). Zone 2 was the least frequently visited by female respondents, influenced by its location on the southern edge of the Kota Tua area. This zone serves only as a transit, requiring a road crossing for mobility. Both up and down-level crossings are responded to using haptic contour sensors. Other factors influenced by the presence of road barriers and motorized vehicle traffic on the road.

Zone 6 was also the least traveled by male respondents. The physical setting characteristics, there is sidewalk pedestrian path, and the road used by cars. The pedestrian path is separated from the road. This zone has a walkability distance of 300m. The walkway's surface is paved and flat. The texture characteristics are 3

(a) (b) (c) (d)

Figure 8. (a)(b) Zone 2 the least female route. (c)(d) Zone 6 the least male route
Source : Author

(Texture wave length <0,5mm) and 2 (Texture wave length 0.5mm-5mm). The zone 6 location is on the eastern edge of the Kota Tua area. This zone serves supporting zone for parking, requiring a road crossing for mobility. Both up and down-level crossings are responded to using haptic contour sensors.
The data above shows that male and female have no significant differ in their path choices, particularly in their responses to haptic and kinesthesia sensors. A difference was found in women has difficulty for contour fluctuations (*Haptic Contour*), while men's not.

3.6. Comparative analysis of age group

Table 5. Sample data, route, and responded sensorics according to the age group

SAMPLE (n)	AGE	GENDER	ZONE ROUTE	SENSORIC		
				Haptic Texture	*Haptic Contour*	*Kinesthesia*
n9	60	Male	2,3	3	0	0
n25	60	Female	1,3	1	1	1
n19	61	Male	1,2,3,4,6	3	0	1
n3	62	Male	1,3,4,5	3	0	0
n16	62	Male	1,2,3,4,6	3	0	1
n18	62	Male	1,2,3,4,6	3	0	1
n24	62	Female	1,3,6	3	0	0
n11	63	Male	1,3,4	0	0	0
n2	65	Male	1,2,3,4	0	0	0
n4	65	Male	1,3,4	2	0	0
n8	65	Male	3,5	0	0	0
n13	65	Male	3,4,5	3	0	1
n15	65	Male	3,4,5	3	0	1
n22	65	Female	1,3,6	3	0	0
n23	65	Female	1,3,6	3	0	0
n29	65	Female	3,5	0	0	0
n12	67	Male	1,3,4	3	0	0
n31	67	Female	1,3,4	3	0	0
n30	69	Female	3,4	3	0	2
n6	70	Male	1,3,4	3	0	0
n26	71	Female	1,3	0	0	1
n17	73	Male	1,2,3,4,6	3	0	1
n5	75	Male	1,3	3	0	0
n20	75	Male	1,2,3,4,6	3	0	1
n32	75	Female	1,2,3,4,6	3	0	1
n14	77	Male	3,4,5	3	0	1
n1	78	Male	1,2,3,	2	0	0
n10	80	Male	3,4	3	0	2
n28	80	Female	1,3	3	0	1
n7	82	Male	1,3	3	0	1
n27	87	Female	3,5	0	0	1
n21	95	Male	1,3	0	0	1

For the age group (a), group (b), group (c), the most passed through route is Zone 3.The least passed through zone for age group (a), group (b), is Zone 5. The physical setting characteristic of zone 3 and zone 5 have been discussed in sub-chapter *3.4. result analysis*. The route for the age group (c) were zone 1, 3, and 5.

The age group (a) responded to sensory : Haptic Texture, Haptic Contour, Kinesthesia .
The age group (b) responded to sensory : Haptic Texture, Kinesthesia.
The age group (c) responded to sensory : only Kinesthesia

Respondent data related to sensory kinesthesia revealed that some participants in age group (a), Sample No. 16 (male, 62 years old) and No. 17 (male, 73 years old) stated that a distance of <400m was still comfortable. Meanwhile, Sample No. 28 (female, 62 years old) stated that they could not travel a distance of <400m and had great difficulty on uphill and downhill path. In age group (b) Participants No. 7 (male, 82 years old) and No. 10 (male, 80 years old) stated that the distance was too far but manageable. Meanwhile in age group (c) Participants No.27 (female, 87

years old) said that the distance could still be covered on foot, but sometimes she needs help with a handrail to walk so she doesn't fall. The oldest participant No.21 (male, 95 year old) said the he could walk independently without guidance. The response data revealed a variety of responses based on age. Some in group (a) had difficulty responding with kinesthetic and haptic responses to ascending and descending paths, while others in group (c) had no difficulty responding with kinesthetic. Respondent data also revealed that elderly people require assistance with railings, especially on ascending and descending paths.

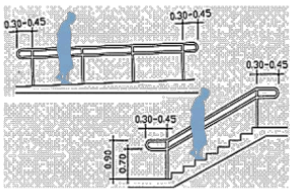

Figure 9. Safety railing for Elderly, Source: UN.ORG/DESA (2003)

UN.ORG/DESA (2003) states that attention needs to be paid to the elderly. To install adequate railing, when needed for safety, especially those with mobility problems. To facilitate use by ambulant elderly people, handrails should be mounted between 0.85 m and 0.95 m above the finished floor level. A contrasting color is also needed for handrails to alert people. For the elderly, it is important to consider the availability of transit stops for short breaks during their mobility in walkability distance <400m. Age-friendly pavements has an impact on the ability to walk. Pavements with narrow path, uneven, cracked, have high curbs, have obstructions present potential hazards and affect the ability of older people to walk around.

Generally, the physical setting that are considered for public space to be age-friendly responded bay haptic and kinesthesia are: elevators and escalators (if needed), comfortable ramps, wide passages, separated path with the other vehicle (car, motor, bike) for safety, suitable stairs (not too high or steep) with railings, non-slip flooring, transit areas with comfortable seating, adequate signage with contrast and large text, public toilets with handicap access [28].

4. CONCLUSION

Environmental quality influences wayfinding decisions. This is especially necessary for the elderly to support them in maintaining independence and preventing disability. From the study above it can be shown the most frequently traveled zone because it is influenced by age friendly physical setting character with a flat path surface condition and a texture size that is comfortably responded to by haptic sensors (not slippery), responded to by haptic sensors with flat contours. This zone also has the shortest walkability distance which is responded to by kinesthesia sensors. Meanwhile the least traveled because it is influenced by the physical setting character of the existing path surface which is uneven and not continuous. Comparative analysis of male and female shows that men and women have no significant differ in their path choices, particularly in their responses to haptic and kinesthesia sensors. A difference was found in women has difficulty for contour fluctuations (*Haptic Contour*), while men's not. Comparative analysis of age group needs to install adequate railing, when needed for safety, especially those with

mobility problems. A contrasting color is also needed for handrails to alert people. For the elderly, it is important to consider the availability of transit stops for short breaks during their mobility in walkability distance <400m.

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