

## Physical Barrier for Low Vision Pedestrian in Bandung Open Public Space

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**Abstract :** Low vision is a kind of sight limitation as part of visual impairment. People with low vision have a tendency to fail or get an accident in wayfinding tasks because they mostly do not have skill-training related to their disability. Most of them feel uncomfortable when they enter many open public space in Bandung because of their lack of existing condition. As well known that the characteristics of space relate to accessibility issue in designing the inclusive public space. This study will explore the kinds of physical barriers while they were experiencing open public space so they move therein independently. Kinaesthetic motion difference between totally blind and low vision person is a result from differences in visual abilities that possessed between them. Because of that differences, data is collected by interviewing low vision pedestrian and participant observation.

**Keywords:** low vision, physical barrier, open public space

### INTRODUCTION

People with low vision as visual impairment needs a set of concept capability to see, to hear and to move therein. Visual impairment requires extensive storage of information regarding their environment because they cannot rely on vision to understand the spatial organization of their environment and visually update online the spatial coordinates of objects outside their reach. The study by Ludt (2002) evaluated the ability of visual impairment who did not need training in detecting hazards. In that study, Ludt stated that low vision may encounter hazardous condition such are undetected curbs, drop-off, objects on the floor or walkway and overhang at head height. This study will describe many kinds of physical barrier of visual impairment in Bandung, Indonesia while exploring a public space. Individuals have varying kinds of physical barrier and spatial ability depends on their willing to experience an open public space. The purpose of this paper is to find out what kinds of physical barrier related with limitation of visual impairment's movement. It deals with some constraint in collecting data especially with respect to individual differences of ability and experience.

### Physical Barrier In Open Public Space

Low vision is part of visual impairment that caused functional or disability where :

1. Low vision cannot be corrected with interference of medical or surgical means or refractive error correction.
2. Part of visual impairment which loss of visual acuity, contrast sensitivity, peripheral vision or central blind spots.

Low vision is linked with functional finite such are reading, mobility, the activity of visual motor or interpretation to environment information (Stubbs, 2015)

Open public space was a linear or square-shaped space , limited natural or artificial elements that have dynamic and static principles as a means of social interaction, activities and movement of people. Open public space should be accesible for all social group and many kind of abilities. Everyone needs recreation, fulfill their daily need so most of people use sidewalk or walkways as primarily high intensity rute. was a linear or square-shaped space, limited natural or artificial elements that have dynamic and static principles as a means of social interaction, activities and movement of people. Open public space should be accesible for all social group and many kind of abilities. Everyone needs recreation, fulfill their daily need so most of people use sidewalk or walkways as primarily high intensity rute. Physical barrier relates with spatial ability that means as a concept of individu as spatial and visual orientation and a way to characterize the ability of a person in exploring the open pubic space. Spatial cognition relates with how people knows, organize, store, select and remember information about the location of physc environment. Spatial cognition uses schema to understand the relations of space and the objects contained therein (Saab, 2003). However spatial cognition differs from perception though linked or influenced by perception. In representing experience of space, visual impairment especially low vision uses haptic, pictorial and transperceptual spaces. Haptic is experiential space and constrained by sensory perception such as the rest of sight, sound, smell, taste and touch (Pallasmma, 2005). And when one of the sensory is absence, there will be possibly

sensory substitution (Proulx, 2007) so they always be able to accept, adapt and respon the richness of stimulation or information from their environment.

In rehabilitation process, the development and spatial ability are given as daily orientation and mobility exercise. Development of spatial ability influences spatial cognition of visual impairment. The ability of orientation and mobility for each different visual impairment either has differences. The totally blind in the early exercise use white cane to define space boundaries they are passing through. The spatial bound of their movement usually has lower high-lines (shoreline) or wall, texture differences or floor material, landmark and clue. They are all has pertained with cane or their touch. Every touching experience of architecture is multi-sensory. Gibson in Pallasmma (2005) describes the senses represent existensial experience such as eye, ear, nose, skin, tongue, skeleton and muscle. Pallasmma (2005) categorizes all senses as visual, auditory, taste-smell system, basic orienting and haptic system. For those people with low vision, a shadow object can still be seen even with a different level of clarity for low vision even far and near. Position responses that they made usually egocentric to respect to their own body. They internalize their experience by using themselves as central point if reference in defining position and direction. Each of them has different ways to learn and understand location in space therein.

For those especially who have limitation of abilities, most experiences they remembered could refer to barriers they have found. Physical barrier as stated in Golledge (1998) and Jacobson (1997) are :

- Pavement furniture
- On street parking
- Unability to read visual clue
- Under construction/maintenance
- Discontinuity, irregularity or broken pavement
- Crowded of people
- Steps
- Non audio traffic lights/pedestrian sequence
- Weather
- The lack of railing
- Unconscious broken kerb
- Distance
- Unstandardized equipment
- Texture of surface
- Signs hanging over the head, vegetation and cable
- Uniform space
- Gradient

## **DATA**

### **1.1. Wyata Guna as Rehabilitation foundation for Visual Impairment People**

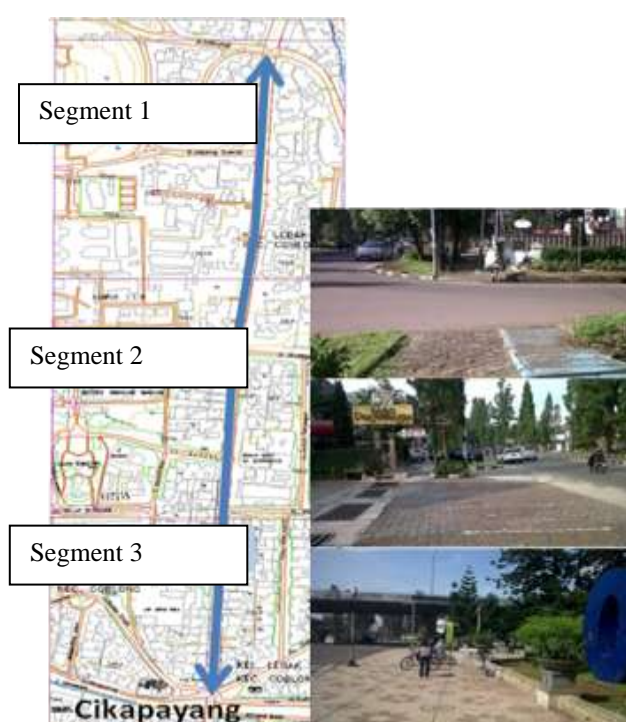
Wyata Guna is social institution under the auspices of Social Department at Pajajaran Street, Bandung. Wyata Guna is a set of function consist office buildings, rehabilitation classroom, dormitories, mosques, dining room, massage room, auditorium, daily activities function and activity support such sports grounds. This social institutions is divided into formal and informal program. Formal program provides education equally to each student's education level such elementary school to highschool and informal program provide massage skills and music. Most of the students come from outside the island of Java. The occupants of Wyata Guna is ranging from elementary school students to about forty years old. Some students who was in nonformal program continue their advance education at Universitas Pendidikan Indonesia and Universitas Islam Nusantara, Bandung. Partially those disabled from outside of Java continue their education to some college. Based on observation, most of the students of Wyata Guna who continue education to college is male.

All students of Wyata Guna spend most of their time in weekdays to attend school activities, massage skill and rehabilitation. Classes are started at 7 (seven) to 12 (twelve) noon for the formal classroom while after the lunch break, nonformal classes massage skills program continued until 2 pm. After that, some student take a rest in their dormitory rooms, sit or chat in the common room or in front of the terrace. In the afternoon, they often gather and chat with their fellow or play tennis. At weekend, they sometimes go walking with their friends or stay in dormitory to do their homework. In exploring public space, they often walk or use public transport. Some participants were interviewed about their experiences while exploring some open public space in Bandung. People interviewed are those low vision who still have visual ability (visual acuity and visual field) and 19 to 30 years old. The criterias of some participants in this study are that they could reveal their experiences and use Bandung open public space a few times in a week. Most of all have blurred vision but there is one visual impairment has both blurred and like-chimney vision. They organize all information from physical environment by such linear or sequential movement.

This representation of the environment can be different between male and female in some aspect of spatial cognition. The participants of Wyata Guna which are mostly of all participants were equipped by theory and practising orientation and mobility techniques for safe travel except 2 (two) participants are not. Orientation and mobility techniques are learned by visual impairment in their rehabilitation theoretically and practically but each person use different cognitive strategies. Through the varied stimulation from the environment that comes to their senses, they will know about the place they live within.

## 1.2. Research Area

In this study, sidewalk or walkways is the highest intensity rute that they use in their daily acitivities and unfamiliar space such are Dago street is determined as research area. In familiar space, most of them rarely use trailing technique and white cane as assisstive device but in unfamiliar space, they spontaneously trail to feel the texture of the surface. White cane for a few participants is only for the ease of some facilities such as retribution, accesibility etc. In this paper, The research area location of Dago is bounded from Simpang Dago segment to Cikapayang street segmen (see figure 1).



**Figure 1.** Dago sidewalk as research area

This area is dominated by the growth of factory outlets along the Dago and cafes so it causes the increasing of infrastructure needs such as car parking. Green open space area changed into pavement in order to accomodate cars parking beside sidewalk or on street. The implication is that the catchment area is also reduced due to the expansion of the area of pavement in most areas. The congestion is often happened everyday and caused by on-street parking along Dago street. During weekend and vacation, Dago become major tourist destination especially from outside area of Bandung. The congestion was inevitable so the car free day program was initiated to reduce the impact of congestion. Car free day program is held from 6 am until 11 noon, enlivened by a crowd of people and street vendors from Simpang Dago street to Cikapayang street and some of the building plaza is used for music performances staged event.

**By participant observation, the characteristics of sidewalk related to physical barrier as physical comfort were described below:**

- 1) Slope, width and length of ramp. There are significance differences between Simpang Dago to Dago Park and Dago Park to Aceh street. The Sidewalk of Simpang Dago to Dago Park segment is generally quite well-designed. The pavement width is approximately 1-1,5 meters. The lane this segment is divided to pedestrian and bike paths. At certain place along the sidewalk, there are many holes and broken pavement that cause accidents for totally blind person or a few low vision.

- 2) Dimension of sidewalk. Some point above should be designed ergonomic and low physical effort for visual impairment. This is important to support mobility of visual impairment daily activities in using open public space or incidental (sidewalks, parks, etc).
- 3) Safety edge in Dago sidewalk is greenery along the street by the range of width 1- 3 meter. Varieties of vegetation serve as shade, aesthetic and barrier between vehicle and pedestrian pathways.
- 4) Motive and texture flooring as environmental information. Sidewalk of Dago consists of bicycle or wheelchair user and pedestrian path with different texture in some segment but still with the same color. At the congestion time, the sidewalk near light intersection is often used as motorcycle trajectory so that pedestrian rights have no place. Some visual impairment recognize that the row and varieties of trees in Dago are different typical with other stripes. They also recognize by its atmosphere
- 5) Architectural wayfinding system. Wayfinding system relates to the elements used by people to determine and follow a path. They consist architectural, graphic, audible and tactile communication. The landscape elements such as shelter, street lamp, bench and trash can or vegetation could become wayfinding elements for those visual impairment. Architectural element could mean signage system and certain landmark such as sculpture, building, or another element. Low vision still recognize these element by its color and shape. Generally, street furniture has dual function, for instance, trash as support element can be functioned as signage by its color. Graphic, audible and tactile communication are hard to find in the open public space in Bandung. If there is graphic sign, then main function is as a billboard and does not interfere with their movement. By definition, it is not communicative but as signage, it is flexible and easy to understand for low vision. Some front page of building use water element. For visual impairment, this is quite efficient and communicative for their sensor capabilities.

## II. DISCUSSION

Low vision pedestrians have difficulty to recognize space because their loss of visual field, peripheral field or contrast sensitivity. They only can see the object from certain distance and periphery. As totally blind person, they also move by trailing technique. The low vision pedestrian takes trailing technique which use tactile or touch as a way in spatial task primarily in unfamiliar space. Trailing technique for few low visions were sometimes used to convince themselves of the place identity.

Development of spatial ability influences spatial cognition of low vision pedestrian. In rehabilitation process, the development and spatial ability are given as daily orientation and mobility exercise. The ability of orientation and mobility for each different visual impairment either has differences. In fact, the ability of totally blind kinaesthetic is better than low vision person. The totally blind in the early exercise use white cane to define space bound they are passing through. The spatial bound of their movement usually has lower high-lines (shoreline) or wall, texture differences or floor material. They are all has pertained with cane or their touch. For those people with low vision, a shadow object can still be seen even with a different level of clarity for low vision both far-sight and near-sight. The color difference is determined by the level of glare that received by their vision. The objects that they see in the orientation can be different for each individual. This difference in perception distinguished to typology and vocabulary in a space they enter. Although they can recognize most elements in an open public space, they sometimes bring the cane so sighted people outside could identify them as a person with special abilities.

Based on in-depth interview and analysed datas, low visions in Bandung confront some obstacles in Bandung open public space instead somekind of physical barriers become orientation. Some experiences could be such as bad experience for low vision because of their limitation. The slope, trees, the height of sidewalk or street furniture could be part of their bad experience when they use Bandung open public space. By in-depth interviewed, the lists of physical barriers that are generally faced by low vision in open public space described in table 1 below.

**Table 1:** Many kinds of physical barriers according to in-depth interview (Source: Octaviana,2015).

<b>Categories</b>	<b>Kind of Element</b>	<b>Description</b>
Information System.	Pole	Low vision crashed to a pole/street signpost or injured
	Information Board	The small print of signage letter;
Infrastructure System	Open Water/Drainage	Low vision was once plunged to open water channel
	Sidewalk	Uneven surface/broken pavement or large stone

	Stairs	Stamping with no slip material
	Car parking	Barrier of their mobility
	Street vendor	Street vendor in the center of sidewalk
Weather	Rain/flood/puddles	Splashed of water due to the condition of infrastructure
Environment	New environment	Low vision pedestrian prefer to go with friends
	Crowd of people	Some noise could break low vision pedestrian's concentration

According to their experience, they generally assume that broken pavement could be the significance physical barrier for their movement. Unsafe sidewalks of Dago are also caused by discontinuities and a hole in the pavement. The other physical barriers for low vision based on in-depth interviewed and in addition that presented by Golledge (1997) and Jacobson (1998) is height differences with no differences of color/material meanwhile the street vendor was including in discontinuity of movement. The near-sight low vision (1-2 m) have less spatial ability than far low vision (more than 3 m) though the near-sight still can see shadow of the object. Some participants of near-sight low vision in direct observation got accident in front of Kartika Sari sidewalk, from Simpang Dago direction to Cikapayang. This height differences that harm low vision is described in picture 2 below.



**Figure 2.** The difference of trotoar height with no color difference or material

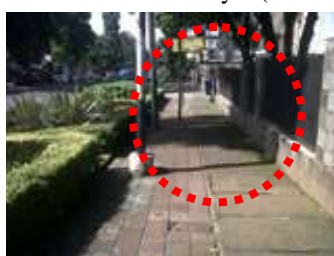
The height differences is about 20 cm with no differences of color or material. By in-depth interview, some participants assume that low vision use significant color to identificate surrounding objects as stated by stubbs (2015) that contrast is significant factor for low vision to identify the object.

Many low visions has decreased their vision by time and because of this difficulty, almost of all vision do not read the written marks in open public space. Some low vision pedestrian also assume that street furniture in the center of sidewalk in Dago such as trash bin, tree, utility and shelter as their physical barrier because of its existence (see figure 3). Especially when Dago is unfamiliar space for some low vision pedestrian. As a few of low vision pedestrian assume that new environment could be such horrible thing because they cannot imagine and describe it. For some familiar open space, they can organize the environment information and move systematically.



**Figure 3.** Street furniture as obstacles in the center on Dago sidewalk

Darkness/shadow : the difference of dark and light makes low vision takes more attention against surrounding area. Shadow of the trees could seem as a hole on the sidewalk so they have to be wary and take more attention and focus when they are passing through. As Proulx stated that neural basis attention was analogous to the changing of luminance level or contrast with fixation of the eye (Proulx, 2007) (see figure 4)



**Figure 4.** Shadow as confused space for low vision

Flood/puddles could harm low vision especially in the dark because it breaks their focus. So open water channel (drainage) (see figure 5) in Dago sidewalk that could harm visual impairment. It is more likely shadow for near- sight low vision so they could jump or avoid the obstacle.



**Figure 5.** Open water channel in Dago sidewalk

### **III. CONCLUSION**

They organize all information from physical environment including experience into their cognitive map and represent spatial description when they navigate from one point to another. The ability of totally blind kinaesthetic is better than low vision person though the possibility of accident can happen to both. The low vision pedestrian as totally blind also use their tactile in their movement especially in unfamiliar space although sometimes they recognize the space by using the rest of sight. They feel the texture, the differences of floor material or color. Some low vision also use lower high-lines (shoreline). Low vision pedestrians have to be more attentive when they enter the open public space because of their limited of sight. They have to keep balance between their continuity of movement and clarity of their sight to reference point. When they fall accidentally, they fail to keep them on. Especially also the quality of Dago sidewalk characteristic still has poor condition in many sections such as damaged sidewalks, street furniture in the center of sidewalk or open water channel.

Not all visual impairment feel convenient in crowd of people and new environment. Most of them feel sometimes lost space and consciousness because of the decreased of their spatial concentration. The most influential convenience factor is leafy and shady environment. They could not see clearly the kinds of plant but they can feel

the temperature. On other side, shadow of tree could seem as a hole or broken pavement for low vision. For many bad experiences about inconvenience of certain open public space is a difference in height especially with no significant texture, color and material. This is more likely because they still have sight.

There are past research generating statement about many kinds of physical barrier for visual impairment by Golledge (1997) and Jacobson (1998). For the developing countries with the differences of development spatial ability and character, additional obstacles for low vision arise by the condition of Bandung open public space and need more research. The condition of open public space of Bandung are still very poor especially when related to visual impairment community. The recommendation is that design solution of open public space must effectively highlight and accomodate visual impairment's characteristic, demanding as well and no harm. The elements of open public space should involve multy-sensory factors such as sight, sound, of smell, taste and touch so they could recognize each environment they enter. They also relate with experience and strategic information for visual impairment to get spatial mental and equal right of accessibility in open public space.

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