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Comparative Study of Normal and Blind People's Understanding of City: Opportunities for Multisensory Architecture; Case Study: Sara Park Located in Kashani Boulevard, Tehran

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ABSTRACT

Most spaces are designed and created based on the visual perception of humans, and blind people are less able to use such spaces. The abundance of formalism in works, educational systems, and architectural presentation methods practically indicates the specific focus on the architects' eyesight. Indeed, in contrast to this perspective - with people like Schultz and Pallasmaa - a phenomenological perspective was proposed, which does not reflect objectivism and one of its important functions, eyesight dominance. Accordingly, in order to approach the required context for multisensory design and phenomenology, which is considered a departure from eyesight-orientation in architecture, the current study aims to answer the question that whether blind people have more active senses in comparison with normal people to be able to guide the multisensory design. The research hypothesis is considering the stimuli of the recipient organ in non-visual perceptual systems that can have a positive effect on achieving the above goal. The descriptive-analytical method and SPSS software were used for ANOVA and Tukey tests. In this regard, three groups of 12 blind people, normal people with open eyes, and normal people with closed eyes (36 in total) were studied in Tehran. This study investigated the multisensory perception difference in four components of "Navigation", "Hearing", "Sense of Touch", and "sense of smell and taste" by observation while moving and mapping on the map. The results indicate the obvious difference in the activity of the non-visual perception systems of the blind people in comparison with other groups. Also, the findings show that the understanding of blind people of the city can have active participation in evaluating the site, as a significant introduction to the multisensory designs, through perceiving more than three senses of "touch", "hearing", "smell, and taste", respectively.

Keywords: Architecture for the Blind, Phenomenology, Multisensory Perception.

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1. INTRODUCTION

Extreme functionalism and one of its consequences, vision-driven, are the manifestation of the modern era. What has been obtained is the empty spaces, although they have existed at the highest degree of the technological facilities, are spaces created for passing and not pause, travel and not civilize, and separation and not familiarity and acquaintance. Therefore, in this era, the meaning crisis in the urban and architectural spaces and the deficiency of the quantitative approach to reach the sense of place and familiarity with it were the reasons for returning to the qualitative and phenomenological approaches (Partovi, 2014). Therefore, in modern architecture, under the influence of vision-driven, architects look at it as outside observers, and their criterion is the abstract beauty of images (isolated from human understanding) reflected on the surface of the retina of their eyes (Porteous, 2011). Under the light of such perspective, consequently, the blind will not be able to use these spaces as a group of society due to being deprived of eyesight.

Thus, what has been realized is different from the fact that humans have various tools to perceive the realities and their environment's effects. Different senses of humans, including eyesight, hearing, taste, and smell are the tools that facilitate understanding the phenomena, environment, and the space around the human (Shahcheraghi & Bandarabad, 2017). However, due to the facilitation, speed, and various eyesight capabilities, the human uses this sense first. Thus, an individual loses the attention and skill regarding using other senses over time and evolving the eyesight. In this regard, perceiving the environment by non-visual senses and perception of senses in the blind are considered, and the actual recognition context, and consequently, the phenomenology will be provided. Schultz and Pallasmaa are among the most prominent theorists of architecture who attempt to solve the vision-driven by emphasizing place, and multisensory perception, respectively.

In this regard, some studies addressed the vision-driven in architecture and presented solutions from various aspects while pointing out the damages of neglecting it. Gholipour points out multisensory design necessity and argues the pedestrian's high capabilities comparing to the vehicle (Gholipour Gashninani, 2014). Lotfi et al. state how to achieve the sensory landscape or multisensory design. They argue the necessity of preparing invisible maps (i.e., based on the non-visual senses) to improve the sense of place, in addition to the sensory richness (Lotfi, Hariri, & Shahabi Shamiri, 2017). In addition to mentioning the lack of a sense of place, Lotfi and Zamani point out the lack of inclusiveness of the current spaces, i.e., neglecting the disabled (including the blind). They conclude that sense of time, tactility, smell, taste, audio, and, eventually, eyesight indices are inflectional by studying the indices affecting the environmental quality (Lotfi & Zamani, 2015). Similarly, Salehinia and Niroumand mention neglecting the disabled in addition to the lack of sense of place. They consider the touch, hearing, taste, smell, and eyesight indices influential in improving this deficiency in the design, respectively (Salehiniya & Niroumand Shishavan, 2018). Changing the balance to the indices with higher priority in the sensory aspect is the necessity of continuing studies in this regard. A new aspect in the current study is including the active role of the blind in preparing the invisible map of the site.

The current study is an attempt to avoid the vision-driven in architectural design. Thus, a comparison has been conducted between the normal people and blind people's understanding of the city. This research has been done in two main parts: based on the theoretical framework and field study. In the first part, the components of the non-visual perceptual systems based on the phenomenology and its relation with the senses and perception answer this question that what are the components of the "system of non-visual perceptions"? in the second part, after describing the applied details in the field study, the comparative analysis of the activity of the non-visual perceptual systems conducted among three groups of the blind, normal people with open eyes, and normal people with closed eyes and data obtained from the analysis address that What is the level of ability of the non-visual perception system among blind people, normal with open eyes and normal with closed eyes?

2. THEORETICAL FRAMEWORK

The research hypothesis is that the non-visual perception systems of the blind are stronger than the normal people. Also, the non-visual perception systems are more active in normal people with closed eyes in comparison with open eyes. Thus, it is expected that by comparing the visit of the normal people with open eyes of the site and mapping its effects, considering the stimuli of the non-visual perceptual systems in the site can provide a different map and guide to avoid the vision-driven architecture and with the help of the blind and normal people with closed eyes.

2.1. Phenomenology and Multisensory Architecture

Phenomenology is a combination of phenomenon or feature, and logy means recognition (Husserl, 2008). Phenomenology is a philosophical term meaning the recognition of the phenomena and things and what is manifested in our experience. The history of using this term dates back to the philosophers such as Lambert, Herder, Kant, Fichte, and Hegel. This concept found its place in the works of Husserl, Heidegger, Sartre, Merleau Ponty, and others in the twentieth century (Smith, 2016). Husserl introduced this concept as a kind of philosophizing (Shirazi, 2011), and developed it in

a new way. He was named the father of philosophical phenomenology. The origin of phenomenology was Germany in the twentieth century. However, the thinkers' opinions, such as Suhrawardi and Mullasadra, indicate the origin of this philosophy in Iran (Partovi, 2014).

Phenomenology studies the conscious experience of what a person perceives. In other words, phenomenology includes the structure of different kinds of experience, perception, thinking, reminding, imagination, affection, desire, will, and practice. Thus, the conscious experience is the starting point of phenomenology. However, the experience turns into phenomena gradually that are less obviously conscious (Stern, 2002). The conscious experience includes unique features. A person lives, does, or experiences the phenomena out of consciousness rather than habit. Therefore, there might be other things in the world that a person observes or considers but does not experience. The phenomenology approach means facing the nature of the phenomena, and its main purpose is facing the most honest and purest possible form of reality of the phenomena. According to this philosophical approach, the human directly perceives the phenomena and environment by being in the environment and through his/her senses. Then, the perception occurs during some mental process, and the brain receives the information. Eventually, the recognition is achieved (Fig. 1). This recognition is followed by the behavior and function in the environment. Therefore, phenomenology leads to recognition, and consequently, creating a sense of belonging in any place (Pakzad & Bozorg, 2013).

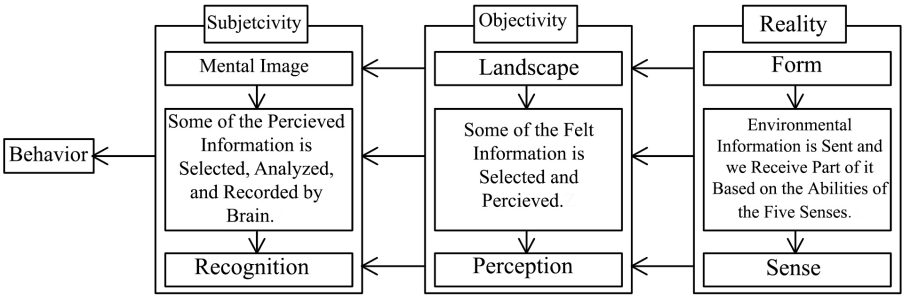


Fig. 1. Process of Human-Environment Interaction
(Pakzad & Bozorg, 2013)

Since the late 1970s, the phenomenological approach has entered the specialized fields of urban planning and architecture with the translation of the works of Martin Heidegger and Gaston Bachelard and has received much attention (Partovi, 2014). Many prominent scholars have argued about phenomenology in architecture. Juhani Pallasmaa addressed the phenomenological issues in a paper entitled "Geometry of Feelings" in 1985. Then, he introduced phenomenology and the inexperienced architecture of the senses, which criticized the vision-driven approach and emphasized the necessity of considering other sensory perceptions in recognizing the phenomena's nature (Shirazi, 2011; Pallasmaa, 2005; Norberg-Schultz, 2010). He is influenced by Merleau Ponty and his perception philosophy as well as Bachelard's "Pure Attitude to Phenomena". He also considers Husserl and Heidegger. According to him, it is phenomenology that approaches his concept to Husserl. However, his perception of participation of all the senses in the perceptual process, the body's centrality in perceiving the environment, and motion role in it is adapted from Merleau Ponty's attitude. Considering Merleau Ponty's philosophy, which considers the human body as the experience center of the world and a heart in the organism's body, Pallasmaa states that the sensory experiences are received by the body and inform humans about the environment. Bachelard's thoughts directly affect Pallasamaa's thoughts, especially by emphasizing imagination, memory, and the significance of the touching sense. According to Bachelard, illusion, and imagination are more related to darkness than light (Shirazi, 2011). It implies the advantage of the non-visual senses in imagination and mental visualization. Also, Bachelard states that hands help us understand the intrinsic nature of the material. Therefore, Pallasmaa was also affected by Bachelard's thoughts. "Multisensory Architecture" can be obtained from Pallasmaa's phenomenology features: "Multisensory architecture" emphasizes the sensory perceptions to establish a close relationship with the environment and understand and recognize the environment and architecture (Pallasmaa, 2005).

Thus, for Pallasmaa, eyesight can be a veil for multisensory perception and phenomenology as each architectural space is heard. Each building has its own sound and voice, depending on people's activities in that space, materials of the pavement of the movement walkways, and the height of the buildings. Architectural space is touched, and the coldness and hotness of the flooring of the movement paths, walls, and facades influence the human body. Architectural space is also smelled, and air's smell and its heaviness or lightness, the odor of flowers and plants fall on the body. Every building is tasted, and its sweetness or bitterness is remembered. Thus, each architectural space is perceived by the participation of the senses and our body. The difference between the various architectural spaces is in their multisensory perception. The human

body is aware of these differences (Brink, Bruns, Tobi, & Bell, 2017). Thus, the more sensory the architectural spaces, the easier and more possible their perception. Since the blind evaluate their environment by other senses because of depriving of eyesight and do not have the visual background of the environment (especially when they are blind since childhood), they can have a specific relationship with the phenomenology in architecture.

2.2. Blindness and Architecture

From a medical perspective, in classical definitions, visual impairment causes more disability than any other disability. The presence or defect of one or more sensory organs is blindness. A blind person is a person whose vision in the superior eye is less than 10.1 or 200.20, despite having medical technology. A blind person is someone who is deprived of light and visual experience in the process of biological, cognitive, personal, and social development (Afrouz, 2009). Various words are used to describe the students with visual impairment in the education area that are as follows: 1. Partial blindness, which forces the individual to use special educations. 2. Low vision, implying severe visual damage and not necessarily the limit in the visual distance. This term is used for people who cannot read a newspaper from a normal distance, even with airs such as eyeglasses or contact lens. 3. Legally blind person who has less acuity in one eye or both eyes with the help of 200.20 or 10.1 aids. 4. Total blindness refers to students whose education is through brail and other non-visual aids (Afrouz, 2009). People might have congenital blindness or be blind due to some accidents during their lives (Keller, 2014). The difference between the two latter groups is that the first group has not experienced any visual imagination and cannot have any presumption of visual perception. Following this difference, it is common to acknowledge the obvious difference between visual and non-visual perceptual systems in the second group. Among them is the retelling of Chris Downey's experience at the 2013 Ted Conference (Downey, 2013). He is an architect who went blind in the middle of his life and addresses the social relations of the blind with the city and their non-visual perceptual system in architectural understanding and design. According to Table 1, his experience was summarized and implemented from his speech at the TED conference in 2013, and his considered social relations were analyzed. Downey speaks of a parallel world that the total blind people (people with congenital blindness) and normal people have not experienced. Based on the analysis of Downey's experience, three approaches can be classified for blind people. First: ignoring the blind people, which has been improved by technological applications to improve their lives. Second: It is mainly a compassionate and supposedly capable look at the disabled, which is regarding the adaptation of the environment for them (Fig. 2). Third: It is an attempt to avoid a compassionate attitude to the blind, which has led to a minimal adaptation of the city and buildings for them. Thus, they will be able to play their different role not only as a consumer but also to improve the urban quality.

Fig. 2. Right: Ignoring the Blind. Left: Adjustment for the Blind, Which Is Inefficient
(Sattarzadeh, 2018)

Table 1. Implementation and Analysis of Downey's Speech about the Blind's Experience of the City and Its Social Meaning

Downey's Speech	Analysis Based on the Conceptual Framework
"In 2009, I went to the hospital for surgery [...] Two days later, my visual impairment started slowly. On the third day, I became completely blind ... Immediately, I had an incredible feeling of fear, anxiety, and vulnerability. [...] Within six months, I was back at work. My training had begun. "It was hard work and time-consuming."	Inadequate adaptation of blind people to a city based on visual dominance.
"But what I did not anticipate during that rapid transformation was the extraordinary experience of facing my visual experiences with the experiences of our blindness from the same places and the same people in such a short time. [....] In fact, cities are interesting places for the blind, and I was also surprised by the city's willingness to be kind and caring, while they made no difference to me. Eventually, I realized that the blind seem to have a positive effect on the city itself. It seemed a little strange to me."	Different types of experiences that blind people have. Existence of parallel worlds of ordinary and blind people.

Downey's Speech	Analysis Based on the Conceptual Framework
"A new world of emotional information opens up for you. The harmony of all the precise sounds around me in the city really amazed me. The sounds you hear and use to understand where you are, how you need to move, and where you need to go, so you can only feel the different textures of the earth beneath your feet through the perception that the cane gives you. And gradually you build a pattern to understand where you are and where you are going. Just as the sun shines on one side of your face or the wind blows around your neck about your position and how far you have come in a block and your movement in time and space guides you. Also, the sense of smell of some areas and cities has its own smell, as are the places and things around you, and if you are lucky, you can get your nose right and get to the new bakery you were looking for."	Multi-sensory perception and that some points are less considered by normal people. For example, the type of sunlight on the neck and the relationship it can have with navigation, and consequently the perception of the universe.
"As I walked along the Broadway, they prayed for me step by step. 'God bless you, sir.' "You can, brother." "God bless you." I did not hear these words when I had eyes. I know these problems bother some blind friends, I am not the only one. It is often thought that this is a feeling that comes from pity. I want to imagine that it comes from a sense of humanity, of being together, and I think it is great."	Feeling pity for the blind. Expressing the inappropriateness of cities for the blind.
"Among the disabled, they say that in reality there are only two types of people: some are people with disabilities, and some are not yet fully aware of their disability. The blind should be considered as residents of the city, not as people who are only thought of after the overall shape of the city has been laid [....] The distance between buildings and people and cars is well regulated. [...] What good is a car? [...] New jobs are created, all jobs. In fact, the city is becoming more inclusive, fairer, and more equal for everyone. And based on my past visual experiences, I think it will be a great city, it doesn't matter if you are blind, disabled, or still not aware of your disability.	Talk about another parallel and fascinating world in which blind people can see and ordinary people are blind. Therefore, the overlap of two parallel worlds can create a window of unknown possibilities.

(Downey, 2013)

2.3. Non-Visual Perception System

In a general classification that is confirmed by many experts, the human's perceptual systems are classified into five groups. These five classes include "navigation", "Hearing", "Touch", "Taste-Smell", "eyesight" (Khodapanahi & Iravani, 2016; Shams Esfandabad, 2017; Shahcheraghi & Bandarabad, 2017; Shafiee & Sharifi Daramadi, 2007; Gholipour Gashniani, 2014; Lotfi, Hariri, & Shahabi Shahmiri, 2017; Lotfi & Zamani, 2015; Salehiniya & Biroumand Shishavan, 2018). As previously mentioned, these systems are ways to acquire information from the world, and often overlay their activities, and receive and analyze the information with each other's help. Since it is required to compare the blind and normal people, of the five perceptual systems, the visual system is excluded, and the characteristics of non-visual perceptual systems are compiled, according to Table 2.

Table 2. Non-Visual Perceptual Systems

Perception System	Receiving Organ	Organ's Function When Receiving	Person's Function When Receiving	Stimuli Factors of the Receiving Organ	Range
Navigation	Body and Head	Balance	Navigation	- Gravity - Sunlight - Sound	Far Distance
Hearing	Ear	Hearing	Navigation and Recognition of the Environment	- Echo in Space - The Sound of Water Turbulence - The Sound of Wind Blow - People's Conversation - The Sound of Various Cultural Activities - The Sound of the Cane Hitting Different Surfaces	Far Distance
Touch	Skin	Touching	Recognizing the Phenomenon	- Texture of Materials - Light and Shade Effects of Trees - Moisture - Sunlight	Near Distance

Perception System	Receiving Organ	Organ's Function When Receiving	Person's Function When Receiving	Stimuli Factors of the Receiving Organ	Range
Taste-Smell	Nose	Smelling	Navigation	- Odor of Flowers - Smell of Grass - Smell of Various Industrial or Food Materials - Smell of Soil	Far Distance
	Mouth	Tasting	Recognizing the Phenomenon	- Smell of Different Materials in The Air Create a Specific Taste. - Smell of Grass and Moisture of the Grass	Far and Near Distance

According to the research hypothesis, although the stimuli factors of the receiving organ of the codified systems in Table 2 are common for normal and blind people, normal people understand these senses differently. Therefore, they have a different image and cognitive map of this world which is different than what normal people see. They see the other aspect of the space and create it. For instance, navigation in the space is more significant by determining the source of the sound. They can recognize the type of material and the degree of empty or mass spaces while moving on the surfaces through the echo of the sound resulted from it and the echo in the space (Grutter, 1997). It is also similar to the stimuli, such as the smell of various materials in the air and smell of grass, the moisture of the grass, and the specific taste created from the space. This is the taste that is rarely practically meaningful for the normal people in the city (Downey, 2013).

Considering the significance of the non-visual perceptual systems, especially touch, although the normal people use the taste-smell system less in recognizing the situations in common thought and touch sense control the smaller situations with more concentration, the sense of hearing works everywhere, whether in darkness or light, and eyesight can only see in the light. Also, if people gather in a place and create a sound, they all hear the same sound equally. However, this group of people sees things from different perspectives (Sharifi Daramadi, 2001).

According to Pallasama, the sense of touch is very different. The sense of touch is not located in a specific organ, such as visual and auditory receptors. It is scattered all over the body surface. The human's skin has covered all over the body and starts recognizing through touching the phenomena from the near distance in responding to the stimuli, such as sunlight, the shade of trees and buildings, wind blow, moisture, and type of different materials. Therefore, the skin system or touch receives and analyzes various feelings. Feelings, such as pressure, touch, shake muscular postural feeling, heat, coldness, pain, and transfer to the nerves through the skin. Also, considering that the receptor systems are active all over the body, they can perceive the environmental stimuli comprehensively and orient after analyzing them. The skin system is one of the first systems that help the human discover and understand the environment since birth. The human can recognize the shape, size, form, material of an object through this sense (Grutter, 1997; Pallasmaa, 2005).

3. CASE STUDY

The current research approach is explanatory, descriptive-analytical. It is descriptive as it has investigated the conditions and phenomena related to the hypothesis based on the experts' opinions. Since there is a comparison between the items indicating the non-visual perceptual systems of the blind and normal people, it is analytical. Documentation and library studies were used to collect the theoretical foundations' information regarding phenomenology and its relationship with the non-visual perceptual systems of the blind. After collecting the initial information and explaining the considered structure, a plan was prepared to survey, observe, recognize, and record the perceptions of the non-visual perceptual systems of three groups of the blind, normal people with open eyes, and normal people with closed eyes while walking in the city.

Thus, the required conditions are provided to test the research hypothesis, which indicates the difference of the sensitivity of the non-visual perceptual systems between blind people, people with closed eyes, and people with open eyes, respectively. Then, a classification on which system functions stronger is conducted. Since the number of blind is less than the normal people, and it is difficult to find them randomly and transfer them to the site to implement the field observation, a site must be selected where the blind people are more present. Also, due to the difficulty in controlling and recording the components as the first experiences in this regard, there must be a range of the pedestrian and vehicle in the selected area to perceive different stimuli from the environment. On the other hand, very crowded or solitary spaces must be avoided as the environmental stimuli should not be too less to make it hard to monitor them and must not be too much to make it impossible to record them. It can be taken into consideration in future studies using more technical and field experiences. Thus, a path was selected in Sara Park in proximity to Shahid Mohebbi Complex (Education Center for The blind), located in Ayatollah Kashani Boulevard (Fig. 3).

4. Research Method

Therefore, the statistical population was selected randomly among the blind and normal people of Tehran city who commute in the area of Ayatollah Kashani Boulevard. The examination was performed during the two weeks in the mentioned place, a total of three times and in each time four people from each group of the blind, normal people with closed eyes and normal people with open eyes. Each person was asked to walk a specific 400-meter path along Sarah Park with the researcher and state their perceptions through the senses (Fig. 3). The researcher walked with the members of each group and asked them to express their senses while moving to record the information. At the same time, each person's statements about the received stimuli were identified by the researcher in the form of one of four types of "navigation", "hearing", "touch" and "smell-taste", and were recorded with four different signs on the map (approximate point of each statement to stimulus). After conducting the field study, a diagram was prepared as an abstract of the path to increase the accuracy, and the statements were recorded in four different layers and counted separately (Fig. 4). Thus, by coding the recorded statements in four classified groups in Table 2, the data were collected in an interval/ratio scale. ANOVA and Tukey tests were used to analyze in SPSS software. ANOVA is used to examine the difference, and the Tukey test is used to identify the difference distribution.

Fig. 3. The Walked Path

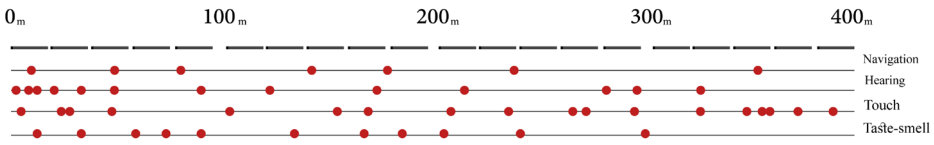


Fig. 4. Coding and Recording Data

5. Research Findings

First, the normality of data distribution was investigated in three groups to compare the mean of the frequency of mentioning each sense by groups. In this regard, the Kolmogorov-Smirnov test was used. According to this test, the collected data in each group enjoy a normal distribution. Then, an ANOVA test was used to compare the senses between three groups using the mean of the frequency of mentioning the non-visual senses. The results were presented in Table 3. According to the significance level in Table 3, it was revealed that the null hypothesis is rejected for the sum of the non-visual perceptual systems and four components of "Navigation", "Hearing", "Touch", "Taste-Smell", and the opposite hypothesis is confirmed. The null hypothesis was that the mean in the three groups is equal, and the opposite hypothesis was that the minimum mean in one of the groups is different than others.

However, since it is not determined which group is different, the Tukey test was used. Based on this test (Table 4), it was revealed that the mean of all and each of the non-visual perceptual systems have significant differences between blind people and normal people with open and closed eyes ($P < 0.50$). Except for the navigation system, in which there is a significant difference between all, except between blind and normal people with open eyes ($P > 0.50$).

Table 3. The ANOVA Results

		Total Squares	Degree of Freedom	Mean of Squares	Statistics	Significance Level
Sum of the Non-Visual	Difference between Groups	8487.500	2	4243.750	57.413	0.000
	Intragroup Difference	2439.250	33	73.917		
	Total	10926.750	35			

		Total Squares	Degree of Freedom	Mean of Squares	Statistics	Significance Level
Navigation	Difference between Groups	73.389	2	36.694	35.441	0.000
	Intragroup Difference	34.167	33	1.035		
	Total	107.556	35			
Hearing	Difference between Groups	436.056	2	213.028	59.116	0.000
	Intragroup Difference	118.917	33	3.604		
	Total	544.972	35			
Touch	Difference between Groups	2247.389	2	1123.694	34.264	0.000
	Intragroup Difference	1082.250	33	32.795		
	Total	3329.639	35			
Smell-Taste	Difference between Groups	341.056	2	170.528	42.022	0.000
	Intragroup Difference	133.917	33	4.058		
	Total	474.972	35			

Table 4. Results of the Tukey Test

			The Confidence Level of 95%				
Dependent Variable	**Type (I)**	**Type (J)**	**Mean Difference between Two Groups (I-J)**	**Standard Error**	**Significance Level**	**Lower Limit**	**Upper Limit**
Sum of the Non-Visual Perceptual Systems	The Blind People	Normal People with Closed Eyes	37.50000*	3.50991	0.000	28.8874	46.1126
		Normal People with Open Eyes	21.25000*	3.50991	0.000	12.6374	29.8626
	Normal People with Closed Eyes	The Blind	37.50000*	3.50991	0.000	-46.1126	-28.8874
		Normal People with Open Eyes	-16.25000*	3.50991	0.000	-24.8626	-7.6374
	Normal People with Open Eyes	The Blind	-21.25000*	3.50991	0.000	-29.8626	-12.6374
		Normal People with Closed Eyes	16.25000*	3.50991	0.000	7.6374	24.8626
Navigation	The Blind People	Normal People with Closed Eyes	2.58333*	0.41540	0.000	1.5640	3.6026
		Normal People with Open Eyes	-0.75000	0.41540	0.183	-1.7693	0.2693
	Normal People with Closed Eyes	The Blind	-2.58333*	0.41540	0.000	-3.6026	-1.5640
		Normal People with Open Eyes	-3.333333	0.41540	0.000	-4.3526	-2.3140
	Normal People with Open Eyes	The Blind	0.75000	0.41540	0.183	-0.2693	1.7693
		Normal People with Closed Eyes	3.333333*	0.41540	0.000	2.3140	4.3526
Hearing	The Blind People	Normal People with Closed Eyes	8.333333*	0.77498	0.000	6.4317	10.2350
		Normal People with Open Eyes	5.25000*	0.77498	0.000	3.3484	7.1516
	Normal People with Closed Eyes	The Blind	-8.3333*	0.77498	0.000	-10.2350	-6.4317
		Normal People with Open Eyes	-3.08333*	0.77498	0.001	-4.9850	-1.1817
	Normal People with Open Eyes	The Blind	-5.25000*	0.77498	0.000	-7.1516	-3.3484
		Normal People with Closed Eyes	3.08333*	0.77498	0.001	1.1817	4.9850

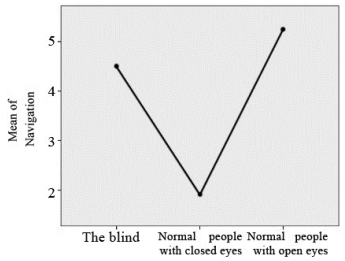
Dependent Variable	Type (I)	Type (J)	Mean Difference between Two Groups (I-J)	Standard Error	Significance Level	The Confidence Level of 95% Lower Limit	Upper Limit
Touch	The Blind People	Normal People with Closed Eyes	19.08333*	2.33793	0.000	13.3465	24.8201
		Normal People with Open Eyes	12.333333*	2.33793	0.000	6.5965	18.0701
	Normal People with Closed Eyes	The Blind	-19.08333*	2.33793	0.000	-24.8201	-13.3465
		Normal People with Open Eyes	-6.75000*	2.33793	0.018	-12.4868	-1.0132
	Normal People with Open Eyes	The Blind	-12.333333*	2.33793	0.000	-18.0701	-6.5965
		Normal People with Closed Eyes	6.75000*	2.33793	0.018	1.0132	12.4868
Taste-Smell	The Blind People	Normal People with Closed Eyes	7.50000*	0.82240	0.000	5.4820	9.5180
		Normal People with Open Eyes	4.41667*	0.82240	0.000	2.3987	6.4347
	Normal People with Closed Eyes	The Blind	-7.50000*	0.82240	0.000	-9.5180	-5.4820
		Normal People with Open Eyes	-3.08333*	0.82240	0.002	-5.1013	-1.0653
	Normal People with Open Eyes	The Blind	-4.41667	0.82240	0.000	-6.4347	-2.3987
		Normal People with Closed Eyes	3.08333*	0.82240	0.002	1.0653	5.1013

*Shows the Mean Difference of the Groups at the Significant Level of Less Than 0.05.

Navigation

Tukey HSD[a]

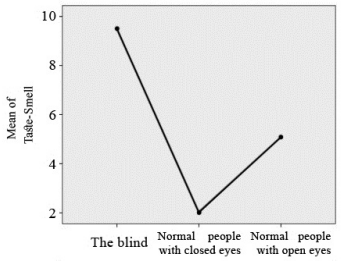
Type	N	Subset for Alpha= 0.05 1	2
Normal People with Closed Eyes	12	1.9167	
The Blind	12		4.5000
Normal People with Open Eyes	12		5.2500
Sig.		1.000	0.183



Taste- Smell

Tukey HSD[a]

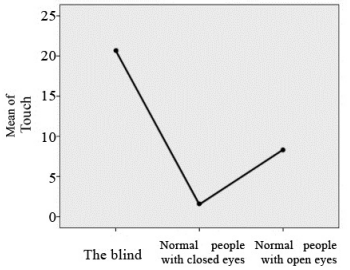
Type	N	Subset for Alpha= 0.05 1	2	3
Normal People with Closed Eyes	12	2.0000		
The Blind	12		5.0833	
Normal People with Open Eyes	12			9.5000
Sig.		1.000	1.000	1.000



Touch

Tukey HSD[a]

Type	N	Subset for Alpha= 0.05 1	2	3
Normal People with Closed Eyes	12	1.5838		
The Blind	12		8.3333	
Normal People with Open Eyes	12			20.6667
Sig.		1.000	1.000	1.000



Hearing				
Tukey HSD[a]				
		Subset for Alpha= 0.05		
Type	**N**	**1**	**2**	**3**
Normal People with Closed Eyes	12	5.6667		
The Blind	12		8.7500	
Normal People with Open Eyes	12			14.0000
Sig.		1.000	1.000	1.000

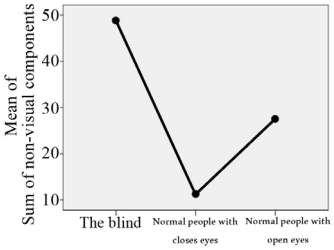


Fig. 5. The Corresponding Graph to the Tukey Test for Each Component

In the following, considering the difference between the three groups, the degree of difference was studied in Figure 5. According to Figure 5, there is no significant difference between blind people and people with open eyes in "Navigation". However, there is a significant difference between the people with closed eyes and other groups as it seemed during walking. In this component, people with open eyes were more active than blind people. Based on the other components (i.e., "smell and test", "touch", and "hearing", the blind people were more active than the people with open eyes and people with closed eyes, respectively. Meanwhile, the scores of "smell-taste", "touch", and "hearing" were 5.9, 66.20, and 14 in the blind people, respectively. Thus, the respect of the components of the non-visual perceptual systems in blind people who are more sensitive than other groups is as follows: touch, hearing, smell and taste. Moreover, according to the results of the Tukey test on the sum of the non-visual perceptual systems components (Fig. 6), in contrast to the first hypothesis that the people with closed eyes have more capabilities in the non-visual perception than the people with open eyes, it was revealed that other senses of the people with closed eyes are also reduced. It is different than the first hypothesis in terms of this aspect.

Hearing				
Tukey HSD[a]				
		Subset for Alpha= 0.05		
Type	**N**	**1**	**2**	**3**
Normal People with Closed Eyes	12	11.1667		
The Blind	12		27.4167	
Normal People with Open Eyes	12			48.6667
Sig.		1.000	1.000	1.000

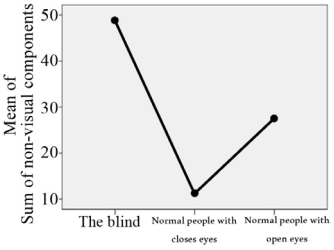


Fig. 6. The Corresponding Graph to the Tukey Test for the Sum of the Components

6. CONCLUSION

The analysis results of the degree of sensitivity of the non-visual perceptual systems in the blind people, normal people with open eyes, and normal people with closed eyes indicate that there is a significant difference between the level of sensitivity of blind people and normal people. In contrast to the initial presumption, normal people will not have a more effective non-visual perception system if they close their eyes. Also, people with open eyes function better than the closed eyes in the non-visual system. Thus, if Pallasmaa's assumption on the multisensory design and phenomenological design is considered, according to the field study, preparing the multisensory cognitive maps by the blind can reveal the latent aspects. The normal people with open eyes cannot reveal these aspects, and the people with closed eyes are not considered a substitution for them as their other senses are reduced while closing their eyes. Therefore, along with the architects and during the design and site evaluation, the blind people can have opportunities to reveal the phenomena that are not recognizable for the normal people, and can be considered in the multisensory design.

Table 5. Going Beyond the Duality of the Common Approaches in the Architecture for the Blind People

Approach	Policy	The Sensory Base for Recognition	Manifestation	Blind People's Relationship with the City
Objectivism	Removed	Visual Dominance	Arrogance	Rejecting the Blind People From the City
Phenomenology	Maintained	Multisensory	Compassion	Providing the City for The Blind People
Phenomenology in Architecture	Removed/ Maintained	The Blind People; A Gate for Multisensory Design	Compassion/ Arrogance	The Active Role of the Blind People. More Inclusive and Different Architecture Than Ever

According to the obtained results, blind people can recognize the urban phenomena differently and more sensitively than the normal people in three systems of "touch", "hearing", "smell-taste", respectively. Therefore, if the architects are able to cover a part of their blindness through the blind people, it can be hoped that a very different architecture will be created, which is more sensitive and consequently more inclusive and can be more conducive to healthy/ disabled development in the city.

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