Original Article

The Influence of the Olfaction, Audition and Tactile Senses in Mobility and Orientation of Blinds

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Objectives: The aim of this study was to evaluate the effects of olfaction, audition and tactile senses in mobility and orientation of blinds.

Methods: The statistical sample of this research included 100 blind persons aged between 16 and 75 years (61 males and 39 females) with different level of education (16 persons lower than the diploma, 26 persons diploma, 46 persons bachelor, 12 person MA), were randomly selected from most regions of the country. Analysis of obtained data were done by Friedman statistical method and using the SPSS software.

Results: It showed the close relationship between the senses, and according to the null hypothesis, based on senses role from the blind's opinion, audition sense has a highest rating and tactile sense has a lowest rating in mobility and orientation of blinds.

Discussion: Telemetry senses, especially audition, were more important in mobility and orientation of blinds. Thus, with proper training of blinds to use their existing capabilities and also with organizing the environments around in a way to increase their ability, they can have mobility and activity in environment easily.

Keywords: senses, olfaction and tactile and audition, mobility and orientation, blinds

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Introduction

The existence of a defect or a sensory organ disorder called sensory disorder. One of these disorders is blindness. Blind person is someone who, despite having medical technology, his eyesight power at the dominant eye is less than one-tenth (1). The overall prevalence of blindness in the world reported 3 percent (2). Considering that the world population which is nearly seven billion people, with the prevalence of this percentage, about 21 million people are blind in worldwide. Therefore, because of avoiding the disturbance to their lives in society, it should be a great attention to them (3). Our understanding from environment is subject to the certain processes that begins with sensory organs receiving from environment and terminate in perception. The detection range of sensory organs, abilities, personal characteristics and other factors play an important and determinant role in this feeling and perception. The purpose of the tool is natural features and human organs and In fact, that is the five senses of sight and olfaction, and so on. Five senses are operates and connects the comprehension with environment and create the fairly complete understanding of our environment (4). However, given that the blind are deprived of visual sense, we must strengthen other senses to fill these vacancies of eyesight. In this setting we refer to the theory of compensation. This theory is based on the assumption that blind persons are superior in using other senses (5). An important factor that blind persons can overcome their disabilities is their moving problems in the environment. In fact, the social activities and independence of these persons are largely depends

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on the manner of their mobility (6). Along with move freely and independently, it should be noted that whatever sighted people discover through their visions, the blinds persons realize through their other senses. Also observation of undesirable practices of the blinds And lack of knowledge of proper techniques of movement, The necessity of the independence movement of blinds because of the social, economic and psychological reasons, the reluctance of teachers to teach orientation and mobility skills, and no efficient of the current training of these skill, are set of problems which caused by the lack of a written plan for orientation and mobility skills (7). In general, there is not enough research regarding orientation and mobility skills in Iran. The only existing research in the field of orientation and mobility skills in Iran has done by Lida Ebrahimmi Nejad in 2002 and she examined the effect of spatial perception exercises on orientation and mobility of blind girls, 10 to 14 years old in Narjes integrated school in Tehran. In this study, 20 blind girls (10 to 14 years) were chosen as sample. First, a pretest was done in terms of their orientation and mobility skills, and then they randomly divided into two groups of experiment and control groups with 10 subjects. The experimental group performed exercises on perception and spatial visualization. After that the post test was performed to evaluate their orientation and mobility skills. The results showed that the experiment group did better in perception of spatial relations and creating a cognitive map than the control group. Other researchers have considered the various aspects, and have done some researches. These researches are numerous and diverse but the researcher's are more interested in ways to help them to improve orientation and mobility skills. Researches such as this can be pointed as following:

A study was conducted in 2002 by Mark Blades and colleagues, and the effect of spatial exercises on blinds orientation ability was assessed. They put 38 visual disabilities persons in 4 groups. They gave verbal information about the desired path to one group and the second group received modeling tips. The third group learned the path through hint, and the fourth group was control group. The desired path was about 483 yards inside the college campus. The result showed that all four groups had progressed on the orientation with repetition, but the group who have used modeling method, showed better progress (7). Diderot, in another study in 1749, proposed some theories regarding tactile sense based on that the blinds may be able to feel through the skin of their faces. Some of the organized changes regarding features of a complex nature that makes them aware of the existence of objects in their surroundings. Although these theories were major for decades of year 40, there is a little agreement regarding features of the quite natural topics of discussion or especially about that how these features can be percept. Dallenbach and colleagues at Cornell University in early 40 studied the special sensory processes which were factors to identify non-visual objects. In this study, they were asked from 12 blinds and 2 sighted participants (which their eyes had been closed), to take steps to an obstacle under different conditions and as soon as they feel the obstacle they should declare it (first perception) and then they should stop near it without any contact as much as possible. The result showed that the blind and sighted persons in most cases were able to be stand nearby the obstacle without any touching (8). So, the influence of the olfaction, audition and tactile sense in mobility and orientation of blinds is the main question of this research. In order to answer the main question of this study, the following items should be examined initially:

Orientation and mobility- One of the important needs of children with visual impairment is mobility and orientation that without these the growth and cognitive, motor, social, linguistic and emotional development are also would disrupt. Mobility and orientation are basis of human influence on his environment (9). Someone who recently lost his sight, at the beginning the conditions such as instability, imbalance and inability to orientate cause him panics. Even in familiar environments, he is too anxious, astonished and embarrassed. The objects in the environment cause him panic and the ordinary daily activities can be very difficult for him. Certainly, overcoming these problems does not take place automatically and unusual, but perception of environment cognition and chores requires focus and repeated practices over time. Also since visual sense fades, other senses do not sensitive automatically and prompt. Blind persons learn more accurate use of other sense gradually such as audition, tactile and olfaction senses (10). Lowenfeld stated that the mobility combined from 2 components: 1) orientation or (mental position determination), 2) body (physical) movement from

one place to other place. Mental orientation is defined as (the ability of a person to understand his environment around and the visual and spatial relation of environment on person) (11). Blind children from the first years of life require learning methods for independent mobility and awareness of their environment that would enable them to move safely and efficiently. It is necessary to evaluate or train the following items: Body awareness, space awareness, audition awareness, method of using the sighted guide, skill of moving with cane, independent move in familiar environment, to follow, environment awareness, protective methods and searching for things on the ground (12). Mobility skill can be seen in different forms among the people with impaired vision. It is very difficult to determine which person with what characteristics has better and impressive mobility. Most people think visual impaired persons have more mobility than blinds, while this is not true in all cases. Motivation and training are variables that are involved in mobility. Some blinds have the ability to understand the environmental obstacles; it seems that they are able to detect objects on their path. This ability called sense of obstacle. This feature has caused many of the common people think that there is another sense grown in blinds which create this ability, even, the blinds themselves have problem in specifying this phenomenon. Studies have shown that as blind persons close to objects, they understand the very delicate changes in high intonation voices. Due to the Doppler Effect, they have superiority than normal persons. Doppler Effect is a physical law that says: voice intonation increases by approaching to that source. Obstacle sense is important in mobility of blinds but it cannot create mobility skill alone. In addition, the sound in the environment such as car horns, wind and rain, prevents a blind person from taking advantage of this sense. Also for taking advantage of obstacle sense, the person should move slowly (13).

The blinds mobility greatly related to their ability of understanding the distances. Experts have described two different ways which a person with vision impairment can visualize the information relevant to distances in his mind, through it. One of the ways is the (sequence method) and the other one is drawing a map that can trace various points in the overall relations. The second way which called (cognitive maps) is more appropriate because of its flexibility. If we consider three points of A, B, C, in sequence method the blind person visualize the distances in his mind, for instance to get from point A to C, he passes B. but person with cognitive map can go directly from point A to C without having to be forced passes point B. it is worth noting that other senses play a wonderful role in moving and orientation. Application of these senses in the blinds is to such a degree that after a while, a blinds perception and sense level are senses except his sight (14). - Audition sense- After vision sense, the audition sense plays a major role (15). Even perhaps it has more advantages than vision in terms of social and musical art. This sense has a close relation with speaking and vision and even though sound action can be detected better with open eyes or a color visualize in eyes from hearing a sound(stated that: Beethoven recalled a not in red and the other not in yellow). Previous experiences are important in voice recognition as unfamiliar voices are not understandable and comprehensible for us. This sentence that "deaf and dumb persons are strong in other senses" is not true but their skills involve due to their experience (16). Robert Lawler writes in his book (sacred Geometry): (Audition sense, operates mind in an instant and this is an image-free reaction which has a wide range and response returns from emotive centers. Today, these centers which are related to sound feeling, has a link with spiritual, sensory, chimerical and mental experience. When logic takes the unchangeable relations, we forget to use it) (17). The Audition sense causes blinds to learn a lot about their world around and inaccessible things. Audition includes four distinct skills: sound recognition, interpretation, localization of sound and receiving sound reflections. Receiving sound reflections is quite different than the other three skills (18).

Through this ability (distinguish the object's location from sound reflections), the blind persons can recognize the obstacle such as wall, before they touch it. If you close your eyes and go toward a wall, you can feel a type of (pressure) on your face when approaching to it, because it feels as stimulation on the face. The blind persons could potentially feel the difference between the walking in indoor place with an outdoor place. Perhaps the reason of this ability is somewhat related to sudden change in the weather. But basically it is related to the difference of sounds in these two environments. All of the sounds around us reflect from the walls that surround us, and tell us to what

environment we have entered to. Most of blind persons can walk in corridors without touching the walls; this is because of the reflection of their steps sound in dealing with the walls. Therefore, attention to the reflection of sound in environment perception and orientation of blind person is necessary (18). Bichof and Hat man, noted that, many experts still believe that listening skills in blind children normally grow well. Unfortunately, this theory is not true. Now it has become revealed that blind children are not able naturally and miraculously compensate their defects through listening and focus so they should learn the techniques of listening methods in most cases. (6)

-Tactile sense, physical-visceral sensitivity- Tactile sense is a sense which is used from early days of life. Embracing the child by parents and other family and also experiences of touching objects the child gets, all enhance the tactile sense performance in early days of human's life. But gradually the use of this sense decrease with increasing the age. As today we less use of touching the objects and humans (we see them) and almost we don't receive any information and sensory message via tactile sense. Not using the tactile sense is to the point that we use it with fear and caution, as in darkness we touch the objects around with careful (19). The tactile sense is only the min sense for perception of shapes for persons who were born blind. Heller says, there are two types of the contact perception by hand. The first one is surrounding contact, that small objects can be observed through one hand or two hands. He called this kind of contact as (combinational or complete contact) because the shape of one object perceives at one stage and some deal at the same time. The other type is a contact which is used for perception of big objects that are outside the limited scope of a hand or two hands such as observation of a chair or a table that the hands movement follows the object's shape. This method is call (analytical or analysis contact) (11). Feeling cold, heat, pressure and etc. are considered as quality of tactile sense. Since 1890, it has been cleared that the body skin is not sensitive in all parts for same quality. The studies and tests have shown that the certain areas of the skin are sensitive to cold, the other parts are sensitive to heat, some are sensitive to touch and some parts are sensitive to pain. The other parts of skin that are among the sensitive areas, generally don't exhibit sensitivity. The results obtained along with researcher's information enabling to provide the division of tactile sense to pressure, touch, heat, cold and pain senses and today, considerable information about each of these senses is available. So the sum of these senses is called (physical-visceral sensation) and its difference with other senses is that the recipient of the senses such as audition and sight receptors are not in a specific organs but they are scattered all over the body (20).

Olfaction sense- Smell is one of earliest and most basic methods of communication. First of all, smell is attributed to the chemical sense. With the numerous functions that smell shows, it is not only makes the distinction of persons, but it makes possibility to determine the affective and emotional states in humans and other creatures. In other words, olfaction sense plays a role of message transporter and makes a communication with the unfamiliar surrounding world (21). However, based on what the role of the senses in mobility and orientation of blinds described, the effect of each senses of audition, olfaction and tactile were asked from a total of 100 blinds participants in this study: 1) To what extent you are interested to use of audition sense for mobility and orientation? 2) To what extent you are interested to use of olfaction sense for mobility and orientation? 3) To what extent you are interested to use of tactile sense for mobility and orientation?

Methods

Due to the nature of the subject and purpose of the study, the current research method is empirical and the method of carrying out is correlation. In order to achieve the purpose of the research, several steps were performed. In the first stage, we studied the books, articles, and text and image resources regarding blind persons. In the second stage, we paid direct observation to the non-visual communication of blinds with the world around. In third stage, we set a questionnaire in order to determine the role and influence of the senses in mobility and orientation of blinds and we made it available to the aim society. Then the information collected with appropriate guidance regarding the way of answering the questions. In this test, answer of each question from 1 to 5 were graded as (very low to very much). Collecting this number of blinds were due to our presence in Rudaki, Asaye sefid, Bahman Cultural Center and also connection with blinds through printed questionnaire in Iran Sepid newspaper in June 2013 that accomplished

under title of poll. The blinds participated from whole parts of Iran, through telephone. The time for accomplishment this research took over a year and finally the statistical sample of the study consisted of 100 blinds in the range between 16 to 75 years including 61 males and 39 females that from educational level they were (16 persons lower than Diploma, 26 persons Diploma, 46 persons bachelor and 12 persons M.A), were randomly selected from all regions of the country. Meanwhile, we tried to choose a statistical sample from different age groups and with different educational document in order to examine the mobility and orientation methods in majority of blind persons and achieve to better and reasonable results. After collecting the data and entered them in computer, the data analysis done with SPSS statistical software.

Results

The data obtained from questionnaire analyzed by Fridman test. Also in order to analyzing the data, answer to each question from one to five were graded as (very low to very much). In this test the null hypothesis is based on equality of average scores between groups, and rejects the null hypothesis means that between groups, (minimum 2 groups), have a significant difference. Table (1) show a total scores obtained from aim society regarding the effect of each senses of audition, tactile and olfaction in order to mobility and orientation.

Table 1. The total obtained scores for each senses

Number of samples	Total scores
Audition sense	406
Tactile sense	317
Olfaction sense	365

According to the results of table (1) it can be seen that the audition sense has earned the highest rating, from blinds opinion, and the senses of olfaction and tactile are in their next orders. Table (2) provides an average, standard deviation, minimum and maximum of the scores.

Table 2. Average, standard deviation, minimum and maximum of the scores

Variables	number	Average	Standard deviation	Minimum	maximum
Audition sense	100	4.06	1.29350	1.00	5.00
Tactile sense	100	3.17	1.51127	1.00	5.00
Olfaction sense	100	3.65	1.40256	1.00	5.00

Also table (3) shows the average scores of each sense.

Table 3. Average scores of each sense.

Variables	Average of scores
Audition sense	2.29
Tactile sense	1.74
Olfaction sense	1.98

Table (4) contains the main result of the test and provides the amount of chi-square test, degrees of freedom and also the significant level. As seen in this table, it can be observed the statistical amount of chi-square with 2 degrees of freedom and also the significant level of the test with amount of zero which indicate the rejection of null hypothesis.

Table 4. Chi-square, degrees of freedom, significance level

main result of the test	Amount
number	100
chi-square	21.017
degree of freedom	2
significance level	0.000

According to the data obtained from tables, we conclude that from blinds opinion the effect of audition, tactile and olfaction senses in mobility and orientation are different.

Discussion

The aim of current research was to examine the effect of olfaction, audition and tactile senses in mobility and orientation of blinds. The findings showed that there is a significant difference between the questioned senses in mobility. However, in general it can be concluded that the telemetry senses, especially audition has a greater effect in mobility and orientation of blinds. According to Edward T.Hall's hidden dimension book, the human sense is placed in two groups which can be classified as follows. Distance receptors: that is in relation with the perception of distant objects. Eyes, ears, nose. And distant-free receptors: that are in relation with the perception of near world and the effects we receive from our skin, the membrane of organs and muscles. Tactile

For years, scientists have found that a lot of blinds can apparently avoid the obstacles well. In 1950, in a classic study by Kotrin and others, several research done in order to find answer of this question, that how the blinds orientate well and they found that the blinds use the sound (frequency effects) in order to distinguish the obstacles on their way. Since the audition is a factor in obstacle detection, the teachers focused their attention to using the mentioned sense through natural and artificial ways in order to increase the orientation and mobility power of blinds (22). Generally, each particular sound in dealing with obstacles with specific materials reflects the unique and distinct reflections. Taking advantage and use of this reflection necessarily requires a mental background from reflection of a sound by a specific material. This mental background comes only through training and exercises. So, if we want to achieve to environment perception through audition system, we have two ways ahead: first, we approached to recognition of a place through sounds available in that space. For instance, a wood workshop has its own special sound due to its tools. The second way is to use reflection and getting help of echoic orientation in order to recognition of obstacles and details. With ideally using this method, the obstacles on the way, material, Form and its distance can be recognized and also the circular wall can be distinguished from flat one, the difference of materials can be felt and the existent of glass in sidewalls can be realized. But this method needs a great accuracy for perception of details. Because, as mentioned, it is possible to hear the reflected sound from glass similar to a sound from carpet with high pile (8).

The other telemetry sense for orientation of blinds is olfaction sense that according to the obtained results from current research, it is in the second priority after audition. The olfaction sense as well as audition sense has a better experience flexibility of stimulant variety in vast and vide environments for human. Also human can control it better and can be away from it or close to it. The olfaction sense can be used as a sign and director in most paths and places. But the complete research has not been done in terms of orientation of blinds thorough olfaction sense. Most of the Blinds are unaware from their potential of other cognitive devices or they are unable to communicate with the environment consciously and can use all information and available stimulus that this is done by proper training of beneficiary, in a way that can receive and organize most information related to perceptual system in environment. Blinds normally hire the capability of their perceptual system less than half. Using techniques related to mobility and orientation is only possible through training. In this case, the efficiency rises to 90%, so that the blinds can move in the environment alone. The second step is direction of the image resolution in the mind of the Blinds. Proper design of spaces is in such a way that blind persons can organize its relations in their mind easily. For example, most marked paths and places, makes it easy to access.

Thus, proper training of blind persons in order to use their existing capabilities and also organizing the environment in a way to have a greatest ability, Causes them to have mobility and activity in the environment easily. Accordingly, it is recommended that in future studies in order to enhancing the ability to generalize of the results, performing such studies be repeated in all areas of Iran. Also, Identifying items affecting on audition sense specially use of sound reflections and its related parameters and use of the olfaction sense in orientation of blinds be studied.

Conclusions

The findings of this study can complete vacuum information about the role of the senses in mobility and orientation of blinds and also give correct and valuable information to the authorities, planners and the organizations and institutions that have undertaken the task of training and supporting the blinds. On the other hand, doing this kind of research will provide the required field for offering practical areas for the purpose of facilitating the movement of blind persons in the society.

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