Spatial-Interactive Perception in People with Visual Impairments

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Research Abstract

The aim of the present study was to investigate the interactive spatial perception of people with visual impairments and to examine the implications of differences in interactive spatial perception according to the variable of gender (male and female). The research sample was limited to students with visual impairments who were enrolled and actively attending institutes affiliated with the Ministry of Labor and Social Affairs. The sample comprised 248 students with visual impairments for the academic year 2025–2026. The researchers then developed a scale for interactive spatial perception. After verifying its psychometric properties, the final version comprised 43 items. The researchers adopted three response options for each item: Always applies to me 'Sometimes applies to me and Does not apply to me'. These options were assigned weights of 3, 2 and 1 respectively. Consequently, the maximum possible score on the scale was 129, whilst the minimum possible score was 43, whilst the scale's hypothetical mean was 86 points. The results showed that people with visual impairments possess a high level of spatial-reactive perception, and that gender does not influence the level of spatial-reactive perception among people with visual impairments. The researchers then put forward a number of recommendations and suggestions

Keywords:

Interactive spatial perception, people with visual impairments, Gibson's theory

Interactive spatial perception in people with visual impairments

Abstract:

The present study aimed to identify the spatial interaction perception of visually impaired individuals and the significance of differences in spatial interaction perception according to the gender variable (male–female). The research sample was limited to visually impaired students enrolled and continuing their studies at institutions affiliated with the Ministry of Labor and Social Affairs. The sample comprised 248 male and female visually impaired students during the academic year 2025–2026. The researchers then developed a spatial interaction perception scale; after verifying its psychometric properties, it was finalized with 43 items. The researchers adopted three response options for each item: 'always applies to me', 'sometimes applies to me' and 'does not apply to me'. These options were assigned weights of 3, 2 and 1, respectively. The highest possible score on the scale was 129, whilst the lowest possible score was 43. The hypothetical mean score was 86. The results showed that visually impaired individuals possess a high level of spatial interaction perception, and that gender does not affect this level. The researchers then offered several recommendations and suggestions.

Keywords: Interactive spatial perception, visual impairment, Gibson's theory

Research problem

Visual impairment has a clear impact on the lives of those affected, through the way in which they obtain information from their surrounding environment; it limits their opportunities for learning, leading to the emergence of special needs relating to their level of independence. Consequently, they need to learn specific academic, vocational and motor skills (Al-Shar'a, 2016: 322), We find that many countries around the world are making serious efforts to identify modern, effective, scientific and practical methods and approaches through which to meet all the needs of people with special needs in general, as they require the collective efforts of everyone and greater care and attention, particularly those with visual impairment (Boshteh, 2021: 232).

Visual impairment affects cognitive development, particularly in the areas of sensory stimulation, communication and conceptual development; thus, vision determines cognitive development at in terms of the diversity of experiences, control and management of the environment, and the ability to move or progress, However, limited visual input, or limitations in visual learning (learning based on observation and imitation), affect conceptual abilities. For example, some pupils may not understand certain specific concepts such as distance, time and colours. They therefore lack this type of direct learning that occurs through the sense of sight, resulting in visual impairment which affects all areas of life, and they face numerous difficulties (Al-Zariqat, 53:2006), One consequence of vision loss is that the individual is deprived of most of their life experiences relating to the formation of mental images of objects, shapes and colours, leading to learning difficulties and a reduced ability to move about, interact and participate in various school activities (Al-Qamish and Al-Ma'ayta, 2009: 107).

Modern societies regard people with disabilities as an integral part of the social fabric; therefore, nations and peoples must fulfill their responsibilities towards individuals with disabilities. They face particular challenges in the face of the knowledge explosion and the increasing volume of knowledge and information in the present era, Consequently, greater attention must be paid to the educational process to ensure it is tailored to their needs, and efforts must be intensified to enhance their independence and self-reliance in academic, educational, physical and professional terms (Mohammed, 3:2024).

Perception is one of the key topics addressed by psychology through research and study, as it forms the fundamental pillar of human life from both a mental and practical perspective; it is the essential foundation for the process of cognition, and it is intertwined with all other mental processes—such as imagination, visualization and thinking—providing them with the necessary and essential information; It is regarded as the main pillar of success for any human endeavor, whether it be a theoretical or practical cognitive endeavor (Mansour and Al-Ahmad, 1996: 13).

The research problem emerged from the researchers' observation that this group faces challenges , particularly given the limited availability of training programs that take into account their cognitive, sensory and motor characteristics; which may negatively affect their self-reliance and their psychological, social and professional development , and limit their contact with the environment to which they belong, as well as their interaction, mobility and movement within it. All these reasons provided her with a strong motivation to delve into the root causes of this problem and strengthened her desire to shed light on this group; this is what prompted the conduct of this study to create a suitable environment for them, to alleviate some of their difficulties and, as far as possible, to overcome the challenges that hinder their development and growth, so that they may live and become independent in a safer and supportive of their potential

The aim of this research paper can be summarized as an attempt to answer the following question: What is the level of spatial-interactive perception among people with visual impairments?

Secondly: The significance of the research

The sense of sight is of particular importance in a person's life and in guiding their behavior, especially with regard to real-world interactions and adaptation to the environment, whether that environment is social or natural. It is through this sense that a person builds and develops many of the concepts and perceptions that help them to adapt properly to their environment and control it Given the importance of the sense of sight, it has become essential 3 to compensate for its loss in people with visual impairments by training the other senses, particularly hearing and touch, as people with visual impairments rely heavily on these to connect with the outside world and their surroundings (Al-Jawalda, 2012, p. 106).

Third: Research objectives:

The present study aims to investigate:

1. The interactive spatial perception of people with visual impairments.
2. The significance of differences in interactive spatial perception according to the variable of gender (male and female).

Fourth: Scope of the research

This study is limited to students with visual impairments at the Al-Noor Institute, affiliated with the Ministry of Labor and Social Affairs, who are currently enrolled and attending classes, of both genders, in the Karkh district of Baghdad for the academic year (2025–2026).

Fifth: Definition of Terms

First: Interactive spatial perception: This has been defined by:

1. Gibson (1979): Spatial perception ( ) is an individual's ability to perceive spatial relationships through direct interaction ( ) with the surrounding environment, by relying ( ) on sensory and motor information (Gibson, 1979:122).

2. Tversky (2005): This is an individual's ability to understand spatial relationships within the environment surrounding objects and to interact with them using various senses and movement, through which direct experience is acquired (Tversky, 2005: 225).
3_ (Downs & Stea, 2011).It is an individual's ability to take in, organize and interpret information relating to the spatial environment, to understand the relationships between its components, and then to utilize this information effectively in interacting with the environment, orienting oneself within it, navigating it and making appropriate decisions in spatial situations (Downs & Stea, 2011: 34).

The researcher has adopted Gibson's (1979) definition as a theoretical framework, as she has relied on his theory to explain interactive spatial perception.

The researcher defined spatial-reactive perception procedurally as the total score obtained by a visually impaired person when completing the Spatial-Reactive Perception Scale ( ) developed in the present study.

4. People with visual impairment: This has been defined by:
1. Barraga (1976) as "a person whose visual impairment interferes with their learning and achievement, unless adjustments are made to the ways in which learning experiences are presented, the nature of the materials used, or the learning environment" (Barraga, 1976:34).
2. Definition (Demott, 1982): These are individuals who suffer from impairment in any of the five visual functions, namely: central vision, peripheral vision, visual adaptation, binocular vision and colour vision, as a result of an anatomical abnormality, disease or injury to the eye (Demott, 1983: 35).
3- Al-Rousan (2001): "People who can only read and write using Braille" (Al-Rousan, 2001: 23)
4-(Hassan, 2004): "People whose visual acuity does not exceed 200/20 feet whilst wearing spectacles; in other words, an object that a person with normal vision can see from a distance of 200 feet must be brought to within 20 feet for a visually impaired person to see it (Hassan, 33:2004).
5-(Al-Zariqat, 2006): "These are people who suffer from visual impairment which makes it difficult for them to carry out daily tasks without modifications or special adaptations" (Al-Zariqat, 99:2006).

Theoretical Framework

The Concept of Spatial-Interactive Perception

Spatial-interactive perception is a cognitive process that involves receiving sensory information from the environment, organising and interpreting it, and linking it to prior experiences, thereby enabling the individual to form mental representations of the spatial relationships between objects and people, and to use these for orientation, navigation and effective interaction with the surrounding environment (Carlson & Kenny, 2006: 682). The concept of interactive spatial perception has evolved from philosophical interpretations that linked the perception of space to mental contemplation, to psychological and cognitive approaches that emphasised that an understanding of space is formed through direct interaction with the environment and sensory experiences, and that spatial knowledge develops as a result of continuous interaction with one's surroundings (Tommasi & Laeng, 2012: 566).

Spatial-interactive perception relies on the integration of various sensory inputs; information from the senses is integrated to form a unified picture of the environment, which helps the individual to understand spatial relationships and respond to them appropriately (Gibson & Pick, 2000). Sensory perception is also considered the starting point in this process, as it provides the individual with the initial information upon which subsequent perceptual and cognitive processes are built (Geronazzo et al., 2015: 8).

Interactive spatial perception is linked to a number of fundamental concepts, including sensory perception, sensorimotor perception, spatial perception and cognitive spatial perception, each of which contributes to the understanding of locations, directions and spatial relationships, and to the formation of mental maps of space, which are then used for orientation, navigation and interaction with the environment, particularly among people with visual impairments who rely heavily on non-visual senses and direct experience to acquire spatial knowledge (Fathy, 2003: 62; Fayyad, 2024: 264).

Characteristics of interactive spatial perception

1_Continuous interaction with the environment: Interaction contributes to the process of exploring elements of the environment, not merely by relying on sensory information , but also through direct interaction with elements of the environment . This helps to understand the relationships between different locations and improves the ability to orientate oneself, navigate and move around. Continued interaction leads the individual towards independence and the ability to move around autonomously (Bronfenbrenner, 1979:8)

2_Sensory integration: According to this characteristic, the individual relies on the integration of information derived from hearing, touch, movement and sensation — that is, the integration of different sensory inputs and body position — in order to form a comprehensive picture of the surrounding environment and understand the spatial relationships between its elements, thereby enhancing the ability to interact and navigate . This is an integrated perception of the elements of the environment, rather than a specific part or element (Loomis, Klatzky, & Golledge, 2001)

3_ Building mental representations of place: This helps the individual to form cognitive maps or mental images of their surroundings, thereby facilitating navigation and the identification of locations, directions and distances.

4. Guiding behavior and navigation: This helps individuals make appropriate spatial decisions, such as choosing a route, avoiding obstacles and reaching their desired destination safely (Tolman, 1948:10).

5. Flexibility and adaptability: This is characterized by the ability to adapt to new environments and to continuously update spatial information when changes occur in the environment; in other words, behavior is not static but subject to change according to environmental circumstances, which are determined by the individual's relationship with their environment (Lewin, 1936:33)

James Gibson's Environmental Theory of Perception (Gibson's Direct Perception Theory, 1979)

Gibson's ecological theory of perception is one of the most prominent modern trends in cognitive psychology, as it brought about a shift in the understanding of the perceptual process from an internal mental process dependent on the interpretation of sensory stimuli, to a direct process based on the continuous interaction between the individual and their environment. This theory posits that the information necessary for perception is already present in the surrounding environment, and that living organisms can capture it directly without the need for complex inferential processes within the mind. Accordingly, Gibson focused on studying the spontaneous relationship between the individual and the environment, and the possibilities for action that the environment provides, 'which help the organism to orient itself, move and adapt.'

Assumptions of the theory

Given that the assumptions represent the core idea of the theory , they include:

1. First Assumption: According to Gibson's theory of perception , there need not necessarily be internal mental representations of sensory stimuli, in accordance with the principle that the environment provides sufficient and comprehensive information enabling the organism to understand and act without the need for complex mental interpretative processes; rather, perception occurs through the direct apprehension of information.

The second hypothesis: The theory posits that perception and movement are closely interrelated , in accordance with the principle of discovery . An individual's movement within the environment contributes to a better understanding of perceptual information, making perception an active and effective process. Hypothesis 3 : The environment plays a functional role in shaping perception and is also an active source of perceptual information; that is, it is based on continuous interaction with the organism and contains organized information that guides behaviour,it contains 'affordances' that determine what an individual can do within it, and these affordances vary according to the individual's characteristics and abilities.

Hypothesis 4:The theory emphasizes that perceptual information is directly and consistently available in the environment, such as visual gradients and visual movement; these visual cues can be replaced by alternative sensory cues such as hearing, touch and movement, thereby allowing the individual to form functional spatial perception without the need for complex mental inferential processes (Gibson, 1979).

Key concepts of the environmental theory of perception

Firstly: Direct Perception is the process through which an individual immediately perceives the spatial environment based on the information available within its structure, through active interaction with it via the sensory systems (32_3,8,21:1966, Gibson), which function as perceptual systems rather than mere transmission channels, such that the characteristics and possibilities of the environment are discovered directly without the need to construct mental representations or inferences that mediate the environment (Gibson, 1979: 61, 119, 143).

Secondly: Affordances or what are known as contributions or benefits. This concept refers to the opportunities the environment offers the individual: surfaces necessary for walking, objects to grasp, spaces to walk through, barriers that impede movement, and so on. Similarly, the social environment includes 'contributions' such as anger or laughter, which represent positive or negative interactions. Thus, the individual and the environment together form a model of reciprocal relationships and are united in a way that encompasses both the individual's activities and the environmental contributions. As for utilization, which depends on the individual's abilities: if a person with a visual impairment is unable to walk, hard ground becomes of no use for that behavior; utilization involves benefits, Thus, the relationship between the individual and the environmental components around them is perceived directly: the individual does not perceive stimuli, emotions or abstract concepts, but rather the things they can eat, move through, sit on or speak to. Consequently, the more they interact, the more the individual acquires new motor skills(Miller, 2011:428), meaning that the environment is not merely a collection of physical objects, but rather a source of opportunities and possibilities with which the individual can interact. Thus, affordances are based on the integration between the individual and the environment; they are not a property of the environment alone, nor a property of the mind alone (Gibson, 1979:141).

Thirdly: The perceptual system (information processing system): This means that the senses function as an integrated system that captures environmental information directly and in an organized manner, rather than as separate channels for each individual sense; Gibson criticized the idea of traditional cognitive processing (Gibson, 1966).

Fourth: the concept of the ambient optic array (i.e. available environmental information), meaning that the environment contains organized and relatively stable information that an individual can perceive whilst moving or at rest, making perception an efficient process linked to the environmental context (Reed, 1988).

Fifth: The concept of exploration

It refers to the activity undertaken by an individual to gather information from their surrounding environment through movement and direct interaction with it. Gibson argues that perception does not occur solely in a state of rest, but develops through the exploration of the environment and the discovery of its characteristics and possibilities, which helps the individual to understand spatial relationships and adapt to different situations. As Gibson described it, humans are active and proactive beings; he defined them—whether children or adults—as beings who constantly seek to discover the things around them by paying attention to the many distinctive characteristics and dimensions of these things, so that they can be perceived and distinguished from one another (Alwan, 2003, p. 236).

Optical Flow

Visual flow is an important concept; it refers to the pattern of continuous change in the visual scene that an individual perceives whilst moving within their environment. When a person moves forwards or backwards, or changes direction, the surrounding objects appear to move relative to them, This results in a flow of visual information that helps them understand their position and direction within the environment. For people with visual impairments, visual flow may not occur in the usual way due to impaired or lost vision; however, the fundamental concept proposed by Gibson can be realized through other sensory sources, such as hearing, touch and movement. A blind person relies on changes in sounds, echoes and tactile stimuli whilst moving to obtain information that helps them perceive their environment and navigate within it. This helps the individual form an accurate understanding of spatial relationships whilst moving, as it provides them with continuous information about directions, distances and obstacles in the environment, thereby contributing to effective orientation and navigation (Gibson, 1979:78)

Principles of the Theory

The theory is based on a set of principles that explain the mechanism of perception, the most important of which are:

1. The first principle: This states that environmental information is perceived as it is, without the need for internal interpretation , in accordance with the principle of direct perception

Principle 2: This states that the environment is rich in organized information, and that this information is continuously available to the organism, thereby aiding its adaptation and orientation.

Principle 3: The process of perception is an active process closely linked to movement , as moving within the environment helps to improve the accuracy of perception and the understanding of spatial relationships.

Principle 4: The theory emphasizes that perceptual behavior depends on the opportunities for action provided by the environment, and not solely on the individual's internal characteristics.

Principle 5: The principle of active exploration of the environment

Environmental theory asserts that the individual does not merely receive environmental information, nor is he content merely to receive such information directly, nor is he merely a recipient of environmental information; but also actively seeks to explore the environment through movement and interaction with its various elements; this exploration contributes to the discovery of the environment's characteristics and an understanding of the spatial relationships within it, leading to improved perception and adaptation to different environmental situations (Gibson, 1966:90).

The concept according to the theory

, according to Gibson's theory, is a direct perceptual process that arises as a result of the active and continuous interaction between the individual and the spatial environment, based on the affordances provided by the environment for mental, cognitive and mediating processes , which are not necessarily inherent to it (1996:1–17,Gibson), that the perception of affordances is essential for adaptation to the spatial environment (2011:445, Miller), This type of perception is characterized by its close connection to action, as it is formed through movement and exploration, such that understanding the characteristics of the spatial environment results from direct interaction with it rather than from abstract thought or mental analysis (147_1979:119,Gibson). This interaction results in the perception of the complex relationships between objects and the extraction of information; that is, the individual perceives and extracts specific information about the objects around them at a particular time and in a particular place, and can extract other information from the very same stimuli if they are encountered at a different time and place (Alwan, 2003: 287–288).

Research methodology:

The present study adopted a descriptive approach due to its suitability to the nature of the problem and the research objectives, as it is one of the most widely used approaches in educational and psychological studies aimed at describing phenomena as they actually occur, analyzing and interpreting them, and revealing the relationships between their variables without the researcher intervening to control or influence them. This approach was used to collect data relating to the research variables and to analyse them statistically, thereby arriving at findings that contribute to achieving the study's objectives and answering its research questions (Vanderlin,

Research population:

The current research population consisted of students with visual impairments at institutes for the visually impaired, whose names are registered with social welfare institutions affiliated with the Ministry of Labour and Social Affairs in Baghdad al-Karkh , numbering (332). The study was restricted to students enrolled in the academic stages ranging from the first year of primary school to the third year of lower secondary school, as they constitute the target group for the present research. Table (1) illustrates this

Table (1) Research Population

Name of Institution	Governorate	Number of pupils
Al-Noor Institute	Baghdad	112
Al-Nour Al-Imam Al-Kazim Institute	Baghdad	29
Hussein al-Sadr Private Institute	Baghdad	46

Al-Nour Institute	Diwaniya	54
Al-Nour Al-Imam Al-Hussein Institute	Karbala	91
Total		332

Research sample

The research sample was limited to students with visual impairments who were enrolled and regularly attending institutes affiliated with the Ministry of Labour and Social Affairs in three governorates (Baghdad, Karbala and Diwaniya). The research sample comprised 248 students with visual impairments for the academic year 2025–2026, as shown in Table 2.

Name of Institute	Number of Students		Total
	Male	Females	
Total	134	114	248

Research tool:

Spatial-interactive perception

After reviewing the scientific literature and previous studies relevant to the research topic, the researcher found that there was no specialised scale available to measure interactive spatial perception among students with visual impairments, as the available scales were designed for other groups, such as the deaf or parents of children with special needs. The researcher therefore decided to develop a specific scale tailored to the psychological and social characteristics of students with visual impairments, one that reflects the nature of their experiences.

To achieve this, the researcher reviewed a number of theoretical frameworks and previous studies relating to the concept of interactive spatial perception and its measures, and based the theoretical definition of the scale on Gibson's theory (Gibson, 1979), who defined interactive spatial perception as "the individual's ability to perceive spatial relationships through direct interaction with the surrounding environment, relying on sensory and motor information" (Gibson, 1979:122).

Based on this theoretical framework, the researcher identified three main areas of the concept of interactive spatial perception, as follows:

1. Area 1: Direct perception of environmental information
2. Area 2: Environmental accessibility
3. Domain 3: Kinetic interaction and active exploration

In light of these components, the researcher formulated 45 items to measure interactive spatial perception, distributed across the three dimensions with 15 items for each domain. The researcher proposed the following response options and their relative weights: Always applies to me (3), Sometimes applies to me (2), Rarely applies to me (1).

Psychometric properties of the Spatial Reactive Perception Scale: The researchers carried out the following:

1. Validity

1- Face validity:

Face validity was assessed, as face validity refers to the overall appearance of the scale; it indicates the scale's apparent ability to measure what it was designed to measure, through the relevance of the items to the variable to be measured and the consistency of the scale's content with its intended purpose (Anstasi & Urbina, 1997:148). This was verified by presenting the items of the Spatial Reactive Perception Scale to a panel of 21 expert reviewers specializing in special education, psychology and educational sciences. A total of 45 scale items were presented to them, distributed across three domains, with 15 items per domain, All items achieved a level of agreement of over 80 per cent; therefore, all items were retained following their review by the expert panel.

2- Paragraph formatting

The two-extreme groups method was used to determine the discriminant power of the scale items, by ranking the sample participants' scores in descending order and selecting the highest (27 per cent) and lowest (27 per cent) scores. Each group comprised 54 respondents. After applying the t-test for two independent samples to the scale items, it was found that all items were statistically significant at the 0.05 significance level, with the exception of two items (4 and 9), which were not significantly different between the high and low groups, as their values were 1.328 and (1.877) respectively, which is lower than the tabulated t-value of (1.99) with a degree of freedom of (132) at the (0.05) level, as shown in Table (3).

Table (3)

Distinguishing the paragraphs by the styles of the two extreme groups on the Spatial Reactive Perception Scale

T	Highest group		Lowest group		Calculated t-value
	Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation	
1	2.7750	42290.	1.8000	72324.	7.360
2	2.7000	46410.	1.8750	64798.	6.547
3	2.5000	50637.	2.0500	74936.	3.147
4	2.4500	55238.	2.2500	77625.	1.328
5	2.6250	58562.	2.0000	78446.	4.038
6	2.6500	48305.	1.9750	69752.	5.032
7	2.6750	52563.	1.7750	65974.	6.748
8	2.5500	55238.	2.0000	67937.	3.973
9	2.5250	50574.	2.2500	77625.	1.877
10	2.7000	51640.	2.1500	73554.	3.871
11	2.6500	48305.	1.9750	73336.	4.861
12	2.6750	47434.	1.8250	67511.	6.516
13	2.5000	64051.	1.9000	74421.	3.865
14	2.5500	63851.	1.9750	80024.	3.552
15	2.5750	50064.	1.9500	81492.	4.133
16	2.6500	48305.	2.0000	67937.	4.932
17	2.7250	50574.	1.6750	69384.	7.735
18	2.4500	50383.	1.8500	66216.	4.561
19	2.5250	55412.	2.0500	78283.	3.132
20	2.5750	50064.	2.0500	71432.	3.807
21	2.4250	59431.	2.0000	71611.	2.888
22	2.3500	62224.	1.6250	66747.	5.025
23	2.4000	59052.	1.7750	65974.	4.464
24	3.0000	0.00000	1.4000	49614.	20.396
25	2.6500	48305.	1.8250	63599.	6.533
26	2.6500	48305.	1.7750	65974.	6.768
27	2.5000	55470.	1.7750	69752.	5.145
28	2.4500	50383.	1.6500	73554.	5.675
29	2.6750	57233.	1.7750	65974.	6.517
30	2.5500	55238.	1.7500	63043.	6.036
31	2.5000	55470.	1.7750	69752.	5.145
32	2.6500	48305.	1.7750	65974.	6.768
33	2.6500	48305.	1.7750	65974.	6.768
34	3.0000	0	1.4000	49614.	20.396
35	3.0000	0	1.4000	49614.	20.396
36	3.0000	0	1.4000	49614.	20.396
37	3.0000	0	1.4000	49614.	20.396
38	3.0000	0	1.4000	49614.	20.396
39	3.0000	0	1.4000	49614.	20.396
40	3.0000	0	1.4000	49614.	20.396

T	Highest group		Lowest group		Calculated t-value
	Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation	
41	3.0000	0	1.4000	49614.	20.396
42	3.0000	0	1.4000	49614.	20.396
43	3.0000	0	1.4000	49614.	20.396
44	2.6500	48305.	1.7750	65974.	6.768
45	2.6500	48305.	1.7750	65974.	6.768

3- Relationship between the item and the total score on the scale

The validity of the construct is inferred by examining the relationship between the score for each item and the total score for the section and the test as a whole; the strength of these relationships indicates the level of consistency and integration amongst the items in representing the trait being measured, thereby reinforcing confidence in the instrument's ability to measure the intended theoretical construct (Abu Hatab et al., 207:1987). To verify this type of validity, Pearson's correlation coefficient was used, and the results showed that all correlation coefficients were statistically significant, as the calculated values for Pearson's correlation coefficient were greater than the critical value of 0.161 at the 0.05 level and a degree of freedom of (246), confirming the contribution of the items to measuring the overall dimension of the scale, as shown in Table (4).

Table (4)

Relationship between paragraph score and total score on the Spatial Reaction Perception Scale

Item Order	Pearson's correlation coefficient	Item Order	Pearson's correlation coefficient
1	0.454	24	0.738
2	0.378	25	0.411
3	0.288	26	0.459
4	0.150*	27	0.383
5	0.299	28	0.394
7	0.332	29	0.452
8	0.402	3031	0.350
9	0.294	32	0.383
10	0.194	33	0.459
11	0.245	34	0.459
12	0.339	35	0.738
13	0.364	36	0.738
14	0.368	37	0.738
15	0.296	38	0.738
16	0.289	39	0.738
17	0.369	40	0.738
18	0.456	41	0.738
19	0.358	42	0.738
20	0.255	43	0.738
21	0.286	44	0.738
22	0.226	45	0.459
23	0.354		

2. Reliability of the scale

Reliability indicates the consistency of the scale's results over time; it is expected to yield similar scores when administered more than once to the same sample under identical conditions, which reflects the stability of the measurement and the reliability of its results (1974:155,(Bergman). The stability of the Spatial Reactive Perception Scale was verified using Cronbach's alpha, a method that involves examining the degree of internal consistency among the scale's items by analysing the interrelationships between them, and subsequently estimating the stability coefficient, which reflects the degree to which the items measure the same dimension. This coefficient is considered one of the most widely used and relied-upon indicators of reliability in educational and psychological research, due to its ability to demonstrate the extent to which the scale's items and the total score contribute to the consistent measurement of a single variable (Melhem, 2000:328),Cronbach's alpha was used to verify the internal consistency among the scale's items. The reliability coefficient was 0.911, a high value indicating that the scale possesses a high degree of internal consistency.

The scale in its final form

The scale in its final form consisted of 43 items (Appendix 1). The researcher adopted three response options for each item: 'Always applies to me', 'Sometimes applies to me' and 'Does not apply to me'. These response options were assigned weights of 3, 2 and 1 respectively. Consequently, the maximum possible score on the scale was 129, whilst the minimum possible score was 43; the hypothetical mean for the scale was 86.

Statistical methods

The researcher relied on the Statistical Package for the Social Sciences (SPSS) for data processing and analysis, and employed a range of statistical methods appropriate to the study's objectives, the most notable of which were:

1. Pearson's correlation coefficient.
2. The t-test for a single sample.
3. The t-test for two independent samples.

Presentation and interpretation of results:

Objective 1: To identify the level of spatial-interactive perception among people with visual impairments

The researchers used a one-sample t-test on the Spatial Reactive Perception Scale and found that the sample participants exhibited a high level of spatial reactive perception, with an arithmetic mean of (99.040), which is higher than the hypothesised mean (86), The t-value was 14.994, which is statistically significant at the 0.05 level, as shown in Table 5

Table 5: One-sample t-test for the Spatial Reactive Perception Scale

Variable	Sample	Arithmetic mean	Standard deviation	Degrees of freedom	Hypothesized mean	Calculated t-value	The critical t-value	Significance level (0.05)
Interactive Spatial Perception	248	99.040	13.696	247	86	14,994	1.96	Function

The results of the study showed that the sample participants possessed a high level of spatial-interactive perception, as the arithmetic mean was higher than the hypothesized mean by statistically significant margins, indicating that people with visual impairments possess a good ability to perceive spatial relationships and interact with their surrounding environment.

This finding can be explained in the light of Gibson's ecological theory of perception (1979), which asserts that perception does not depend on vision alone, but is achieved through direct interaction with the environment and the utilization of the information it provides. A blind person is able to discover the characteristics of their environment by relying on touch, hearing and movement, as these senses function as an integrated perceptual system that enables them to recognise directions, distances and obstacles whilst moving about, and thereby construct a functional spatial perception that helps them interact effectively with their environment.

The finding can also be explained through Gibson's concept of 'affordances', whereby the environment provides multiple opportunities for action that a person with a visual impairment can perceive in accordance with their sensory abilities. The greater the opportunities for direct interaction with and exploration of the environment, the greater the individual's ability to understand spatial relationships and acquire the experience necessary for orientation and movement.

This finding is consistent with the views of Tolman (1948), who argued that repeated experience within an environment helps individuals to form cognitive maps representing the relationships between locations and directions; this explains the ability of people with visual impairments to navigate familiar environments and rely on spatial memory to determine routes.

The result can also be interpreted in the light of the findings of Loomis and colleagues (2001), who confirmed that the integration of auditory, tactile and motor inputs contributes to the formation of an accurate spatial representation, and that spatial perception is not linked to a single sense, but rather depends on the integration of the senses during movement and exploration.

This finding is consistent with the study by Karim and Saleh (2019), which concluded that the sample participants possessed a good level of spatial awareness; it is also consistent with the study by Habib (2025), which confirmed that orientation, motor and spatial awareness skills can be developed through training and practice; and with the study by Hegarty, Montello and Richardson (1999), which demonstrated that direct interaction with the environment contributes to the acquisition of more accurate spatial knowledge, and the study by König et al. (2021), which confirmed that active interaction with the environment helps to organize spatial knowledge and improve the representation of locations in memory.

The researcher believes that this finding is due to the fact that the participants in the sample continuously acquire their spatial experiences through their daily interaction with their environment, and their reliance on hearing, touch and movement, in addition to the training they receive at institutes for the visually impaired, which helps to enhance their perception of spatial relationships and their ability to orientate themselves and move about more independently.

Objective 2: The significance of differences in interactive spatial perception among people with visual impairments according to the gender variable (male–female)

To achieve this objective, a t-test was applied to two independent samples on the spatial reaction time scale. The results showed that there were no statistically significant differences in spatial reaction time between males and females, as the t-value (0.134) was smaller than the critical t-value (1.96) at a significance level of (0.05) with (246) degrees of freedom, indicating that gender had no effect on the level of spatial reactive perception among the sample participants, as shown in Table (6)

Table (6) Chi-square test for two independent samples on the Spatial Reaction Time Scale

Variable	Sample	Arithmetic mean	Standard deviation	Degrees of freedom	Calculated t-value	Table t-value	Significance level (0.05)
Spatial-reactive perception	Males	98.932	14.247	146	0.134	1.96	Not defined
	Females	99.166	13.081				

This finding can be explained in the light of Gibson's theory, which asserts that perception arises from the nature of the interaction between the individual and the environment, rather than from personal characteristics such as gender. The more an individual is exposed to the same environmental experiences and is afforded similar opportunities for exploration and movement, the more their ability to perceive spatial relationships converges, regardless of whether they are male or female.

The result can also be explained by the principles of Gibson's integrated perceptual system, as the process of perception depends on the effective use of alternative senses and acquired experience—factors that are linked not so much to gender as to training, practice and continuous interaction with the environment.

This finding is also consistent with Tolman's theory, which emphasizes that the formation of cognitive maps depends on experience and repeated exploration – experiences that males and females can acquire to the same extent if they are provided with the same learning and training conditions.

The result can also be interpreted in the light of Vygotsky's assertion that skills are acquired through interaction with the social and educational environment; consequently, the similarity of the educational programs and services provided to boys and girls leads to a convergence in performance levels.

This finding is consistent with the study by Karim and Saleh (2019), which found no statistically significant differences in spatial perception by gender, and is also in line with the findings of the study by Zaki and Al-Faneekh (2023), which showed no differences in a number of dimensions of orientation and motor skills associated with spatial concepts.

The researcher believes that the absence of differences is due to the fact that male and female students at institutes for the visually impaired receive the same training, use the same teaching aids and are exposed to similar environmental experiences, which has contributed to a convergence in their levels of spatial-interactive perception.

Conclusions

1. People with visual impairments possess a high level of interactive spatial cognition.
2. Continuous interaction with the environment and practical experience contribute to the development of interactive spatial perception.
3. The process of spatial perception in people with visual impairments relies on the integration of alternative senses and is not limited to visual input.
4. Gender does not influence the level of interactive spatial perception among people with visual impairments.

Recommendations

1. Incorporate specialized training programs to develop interactive spatial perception in institutions for people with visual impairments.
2. Increase practical activities that rely on direct interaction with real-world environments.
3. Train orientation and mobility teachers to apply the principles of Gibson's theory in educational programs.
4. Providing learning environments rich in auditory and tactile stimuli that help to enhance spatial awareness.
5. Focusing on early training for children with visual impairments in exploration, orientation and mobility skills.

Proposals

1. Conducting a pilot study to assess the effectiveness of a training programme based on Gibson's theory in developing interactive spatial perception among people with visual impairments.
2. To investigate the impact of age and the degree of visual impairment on interactive spatial perception.
3. Designing programmes based on virtual reality or augmented reality to develop interactive spatial perception in people with visual impairments.
4. To verify the psychometric properties of measures of interactive spatial perception across different Iraqi samples.

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Appendix (1)

The Interactive Spatial Cognition Scale in its final form

Paragraph	Paragraph	Always	Sometimes	Rarely
1	I recognise my surroundings by the sounds around me			
2	I can link sounds and touch in an integrated and direct way to understand the surroundings			
3	I use verbal cues to determine directions			
4	I can determine how close or far away objects are from me			
5	I associate sounds with spatial locations			
6	I use sensory cues to avoid dangers			
7	Discover changes in your surroundings through the senses			
8	Use walls or edges as spatial cues			
9	Distinguish between spacious and confined areas by feel			
10	Use sensory cues to confirm my direction			

11	Sensory cues help me feel spatially secure			
12	I get to know new things by touching them or interacting with them directly			
13	I can adapt to my environment through direct sensory exploration			
14	I use consistent sounds to determine my location			
15	I sometimes use smells as a spatial cue			
16	Use spatial relationships to organise your understanding of things			
17	Make use of repetition to establish spatial landmarks			
18	Use touch to work out where things are			
19	Explore the environment around me by continuous movement and practising staying still			
20	Recognize changes in the environment through the senses			
21	Move my body or head to gather more information about where I am			
22	I can determine the position of an object in relation to me			
23	I can get around without constantly relying on others			
24	Explore the things around me and recognize their characteristics using hand movements			
25	Use spatial guidance to navigate safely			
26	I can determine the correct direction after coming to a stop			
27	Explore the nature of the terrain and its varying levels by the movement of my feet			
28	Be aware of barriers or obstacles in the surrounding environment before colliding with them			
29	Move my body or parts of it to recognize changes in my surroundings			
30	I can return to the starting point after moving			
31	I recognize the correct route whilst moving			
32	I navigate confidently in familiar places and explore unfamiliar ones			
33	I can adjust my route when faced with an obstacle			
34	Use verbal instructions to determine directions			
35	Use body movement to understand where you are			
36	I can get about without getting confused in familiar environments			
37	I recognize spatial errors whilst moving			
38	I can move around independently within a space			
39	Use a rhythmic pattern to gauge distances			
40	I handle turns confidently whilst moving			
41	I can determine the correct direction after stopping			
42	I control my movements in a way that suits the conditions of the location			
43	I check the texture of objects (smooth, rough, hard) by touching them directly			