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Original Research Article

Perceiving Landscape Process Based on Sensory and Intellectual Perceptions*

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Abstract

Problem statement: According to definitions, Landscape is a phenomenon that is perceived by man. First, Human beings have physiologically communicated with the environment through senses and stimuli, which leads to strengthening mental memory and sensory perception. In the following, in Intellectual Perception, sensory experiences will meaningful and cognition is obtained. Consequently, the lack of attention to all senses reduces sensory experiences. Since there has not been a comprehensive research on the landscape perception process, the present study seeks to answer the main question, what is the process of landscape perception? In order to answer this question, it is first necessary to answer these sub-questions. Based on which senses do human sensory perception form? What are human intellectual perception and its influencing factors?

Research objectives: This research aimed at increasing the sensory experiences and higher responsiveness of the landscape by identifying and considering the process of perception and its effective factors on the perception of the landscape.

Research method: The present study is qualitative and in terms of purpose is the applied research. The methodology of this research was qualitative content analysis and the method of data collection was the bibliographic method. The data were collected by the bibliographic method through studying the texts, documents, and others' reviews. The induction method was used to analyze the data and investigated the process of landscape perception in two areas of sensory perception and Intellectual perception.

Conclusion: These results demonstrate that considering only five human senses in the landscape perception, regardless other 51 senses, intellectual perceptions and its factors (physical landscape, cultural factors, individual factors) can lead to an "objective and technical" description of the landscape. Besides, it can cause the record of a superficial layer of experiences, decreasing sensory experiences, weakening the relationship between the user and the physical environment and affecting humans' behavior. So that, failure to meet humans' expectations of the environment may result in one resentment and even leaving it.

Keywords: *Landscape, Perception process, Sensory perception, Intellectual perception, Senses.*

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Introduction and statement of problem

According to Article A1 of the European Landscape Convention, the “landscape” is a part of the land, as perceived by local people or visitors, which evolves through time as a result of being acted upon by natural forces and human beings (European Landscape Convention, 2000). People play a constructive role in perceiving, using and changing the landscape, both physically and in their minds. According to this definition, landscape is not only a physical entity to be analyzed by measurement and observation; the study of landscape involved attention to the observer and the process through which it is perceived. In the environment perception process, a large part of cognition is acquired by the sensory organs. The objects, are seen and touched in the landscape, the smells are inhaled, the sounds are heard and thus, various sensory-emotional experiences are formed. While most definitions of the landscape are focused on its “objective and technical” description with no consideration to its “sensory” attributes, and it seems that human is living in a poor mental-perceptual landscape that records an only superficial layer of experiences (Landry, 2013, 39). The sensory richness forms various sensory experiences in space, resulting in greater responsiveness of the space (Bentley, Alcock, Murrain, McGlynn & Smith, 2015, 9). The application of senses in the landscape leads to human’s non-visual communication, aesthetic understanding the meaning of the environment and improvement of the memory and the senses as the driving elements affect human’s behavior and the spirit of the space. El-Khoury studies (El-Khoury, 2006) showed since the modern era, the sense of vision and its perceptions has received more attention than the other sense while the other senses make a deeper perception of the space. This study aimed at increasing the sensory experiences and higher responsiveness of the landscape by identifying and considering the process of perception and its effective factors on the perception of the landscape. In this sense, the

absence of sufficient knowledge on perception and its effective factors leads to a misunderstanding of the landscape. Since the human’s perception is influenced by senses and reason, there is a need for a detailed study of both senses, sensory and intellectual, as well as the effective factors.

Research hypothesis

The nature of the landscape and the human being that interacts with it are complex and multifaceted themes that are being discovered every day new facets of these two issues. Accordingly, it is hypothesized that the landscape perception cannot only involve the identification of the classical five senses but various mental and sensory factors play roles in the process of landscape perception.

Review of literature

There are various studies on the effect of senses on the landscape from different points of view; the first group of studies is based on the classification of the classical five senses, which was first developed by Aristotle (384-322 B.C.). They examined the objective aspects of the senses, leading to the prioritizing the senses (Gholipour Gashniani, 2014; Sedaghat, 2017; Salehiniya & Niroumand Shishavan, 2018; Szczepańska, Wilkaniec, Labeledzka, & Micinska, 2013; Jenkins Yuen & Vogtle, 2015). The second group includes the studies in which one or two senses were added to the classical five senses and were mainly focused on the sense of time and sense of direction (Lotfi & Zamani, 2015). The third group are the sources that only have studied one of the senses (Lotfi, Hariri & Shahabi Shahmiri, 2017; Keller & Vossall, 2004; Le Poidevin, 2009; Naghizade & Ostadi, 2014). Nowadays, psychophysics (psychology-physics) addresses the effect of senses on perception and the number of discovered human’s senses are increasing. Thus, it is not enough to consider the senses as 5 or 18 (Shahcheraghi & Bandarabad, 2015). Various studies can be mentioned regarding the discussions on the sensory perceptions, including the extensive

studies by Merleau-Ponty in philosophy, and those by Juhani Pallasmaa and Edward T. Hall in architecture. “The Eyes of the Skin” is the title of a book written by Juhani Pallasmaa, which is considered as one of the earliest resources that studied the role of sensory perception in a complete architectural experience. The role of sensory perception and its collective and personal functions in perceiving the space in different cultures is the theme of the book “The Hidden Dimension” by Edward T. Hall. Regarding the intellectual perception, Barati (2010, 34) mentioned factors such as age, gender, natural setting, occupation, education, culture, and language.

Methodology

This research is a qualitative study in nature, and is an applied study in terms of purpose. The methodology of the present study is qualitative method in terms of content analysis. The results can lead to increased sensory experiences and higher responsiveness of landscapes by identifying and considering the process of perception and the effective factors on perception of the landscape. This study consists of two parts. In the first step, due to lack of adequate attention to all human senses and considering only the five senses in the previous studies, all human senses will be studied and sensory systems will be formulated. In the second step, intellectual perception and its influencing factors will be discussed. The data were collected

by the bibliographic method through studying the texts, documents, and others’ reviews. The induction method was used to analyze the data. This process is presented in Fig. 1.

Perception

In the field of psychology, perception is a mental process through which the sensory experiences find meaning and the human can find out the association between the matters, as well as the meaning of the objects (Iravani & Khodapanahi, 2001, 25). In the process of perception, the raw information gathered by the senses is transmitted into the mind and find meaning. Therefore, the process of perception consists of three successive stages: “sensation”, “sensory perception”, and “intellectual perception”. The first stage, i.e. “sensation”, is a preliminary stage for any sensory activity performed by senses and the nervous system. Then, in “sensory perception”, the information detected from the selected sensory data is examined. The basic information, in this stage, is stored and classified in the brain based on their features. This is the stage of imaging in the brain. The subjective inquiry that involves the evaluation, conclusion, and formation of subjective affirmations is performed in the last stage, i.e. “intellectual perception”. These three stages together make the environment meaningful to human, resulting in a behavior (Bakhtiarimaneh, 2016, 23). This linear process is presented in Fig. 2.

“Perception and cognition are two separate concepts.

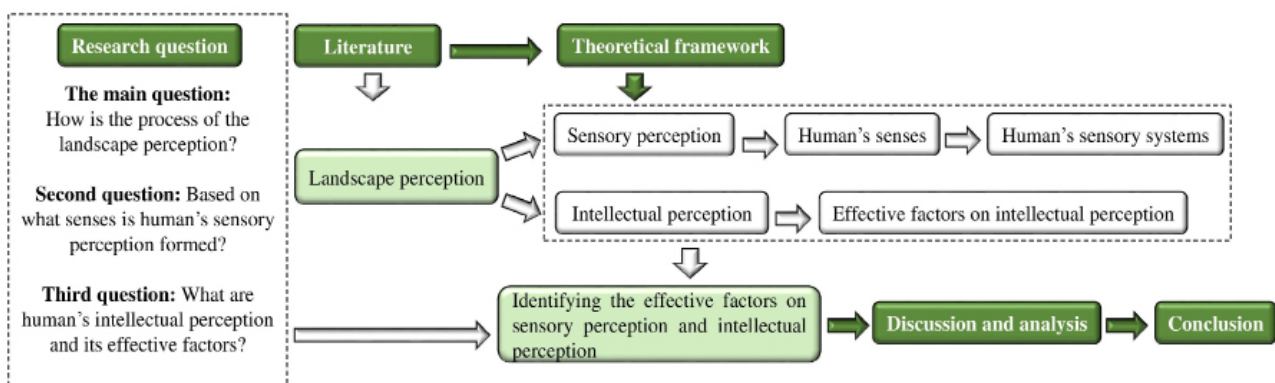


Fig. 1. The flowchart of the form and content process of the research. Source: authors.

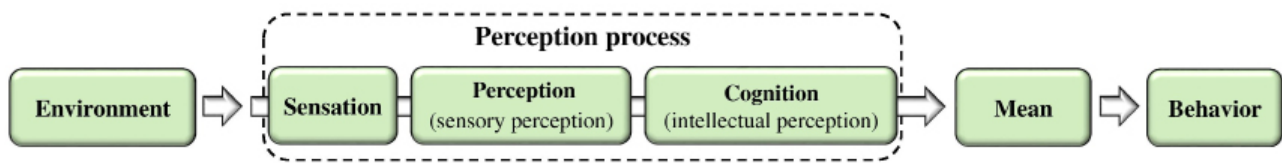


Fig. 2. The process of sensation, perception, and cognition. Source: authors from Bruner & Postman, 1949, 16.

Perception is the external mechanism of the process of stimulating the sensory organs and information gathering while cognition is the internal mechanism of a process in which one’s past experiences, psychological (motivations and values) and personality factors influence the interpretation of sensory information” (Shahcheraghi & Bandarabad, 2015, 129).

Environmental perception and landscape perception

To communicate and interact with the physical environment, human needs to receive and perceive information. In the process of perception, the individual selects the necessary information from the environment according to his need (Sharghi, Motawef & Asadi, 2017, 78). As a result, the perception of environment is a subjective process in which the gathered information by senses is organized and interpreted and helps us to perceive the environment, know the surrounding environment and react in form of behaviors. Perception, in fact, is not only a physiologic phenomenon but influenced by personal experiences and physical, social, and cultural factors. Knox and Marston (2003) believe that different cultural identities and situational categories influence human’s experience and perception. Therefore, the process of environment perception is a selective, dynamic, interactive and individual process.

A particular type of the environment perception is the perception of the landscape. In fact, these perceptions form the landscape and transfer the messages through senses. The perception of landscape is a subjective process, which is performed by the relationship between human and

the environment. Human beings receive the sensory messages of the landscape and make an image of the landscape in their minds. The individual or collective memories are considered as the effective factors contributing to the formation of this image. Memorable spaces are the spaces experienced by human beings. To make association between the landscape and intellectual perceptions, factors that make images in mind are needed to be identified. These factors include the passing of time, events, and memories. In general, landscapes are formed in the process of forming landscape throughout history, which are connected with people’s memories and remain in their minds.

First step: sensation and sensory perception

“Transmission of the effect of stimulus from the sensory receptor to the central nervous system, which is objectively detected, is called sensation” (Irvani & Khodapanahi, 2001, 21). In other words, “sensation” is an experience created by simple stimuli and it is an internal reaction to external stimuli. Sensation is a passive phenomenon realized in the sensory, nervous, and brain receptors. In this context, sensation is formed in two stages: external or internal stimulation and effect of the sensory organ. Sensation does not consist of analysis of information in the brain and giving meaning to it (Pakzad & Bozorg, 2012, 101). “Sensory perception” goes beyond the sensation; it is a subjective process through which the sensory experiences find meaning and human, objects, and their association are perceived. Thus, this stage is an epistemological and cognitive stage. In this sense, there is a difference between “sensation” and “sensory perception”. “Sensation” is a passive and experiential phenomenon, which is created by simple

stimuli and is not epistemological. The formal senses are tools to gain knowledge in the tangible world and obtain information about objects and factors outside of mind. Knowledge gained by formal senses is “sensory perception”. Therefore, sensory perception is knowledge of the tangible world outside of mind, which is achieved by formal senses.

Human’s senses and sensory systems

Senses are the mediators through which human beings record the environment, perform the vital activities, and interact with the world and its inhabitants. Though senses are common in human beings, they can be personal and have special cultural meaning. Colors, flavors, and sounds can have completely different meanings in different cultures (Faycurry, 2012, 67). Therefore, senses connect us physiologically to the present time, and to the past through memory (Stein, 2013, 21). Traditionally, the five senses of hearing, smell, sight, touch, and taste were first divided by Aristotle into two groups: the senses dealing with long distances (distance-based) in the environment, and the senses that are used in the near distances (immediate) (Hall, 2014, 50). Sight and hearing (and smell, according to some) are distance-based senses and touch and taste are

immediate senses. Some researchers called the two groups as higher senses (sight and hearing) and lower senses (smell, touch and taste). However, the number of senses is a controversial issue; some believe in five senses and some believe that there are more than five senses. The source of disagreement in the past was only on the sense of touch; some considered it as only one sense and for some others, it includes multiple senses: 1. Heat, 2. Softness and roughness, 3. Dryness and moisture, 4. Smooth or non-smooth, 5. Heavy or light (Hassanzadeh Amoli, 1996, 58-59). Various research studied how sensory perception works and how many they are in the fields of psychology, biology, and biological psychology, under two main reasons: 1. Multiple senses and ease of identification, and 2. Similarity in the involved sensory organs. Each of the senses falls in a basic category as “sensory system”. These researchers mentioned 6 distinguished sensory systems, as presented in Fig. 3. Table 1 presents the combination of various theories on the identified senses.

The number of senses is increasing with the advancement of science and the psychophysics (psychology-physics) investigates the number of senses and their effects on perception. In the

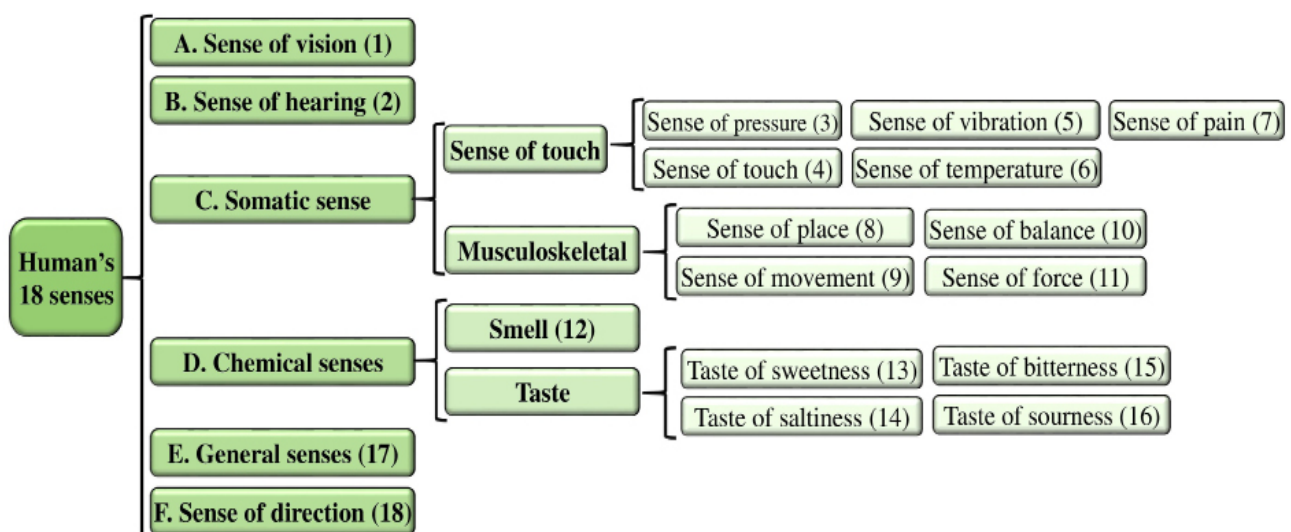


Fig. 3. Human’s 18 senses. Source: Shahcheraghi & Bandarabad, 2015, 144.

Table 1. Human’s identified senses. Source: authors.

Point of view	Developer	Human’s senses
Sensory receptor	Aristotle	1. Vision, 2. Haring, 3. Smell 4. Touch 5. Taste
Sensory systems	Gibson	1. Visual system 2. Auditory system 3. Taste-smell system 4. Tactile system 5. Direction system
The 12 senses	Steiner	The senses of: 1. Touch 2. Life 3. Individual movement 4. Balance 5. Smell 6. Taste 7. Sight 8. Temperature 9. Hearing 10. Speech 11. Thought 12. Ego
Sense and psychology	Psychophysics	1. Sight 2. Hearing 3. Somatic (touch, postural-muscular sense), 4. Chemical senses (taste, smell) 5. General sense
Senses and perception	Ecologic theory of perception	1. Visual system 2. Hearing system 3. Tactile system 4. Taste-smell system 5. Direction system
Unity of senses	Merleau-Ponty	Body
Senses and design	Bentley	1. The sense of movement 2. Smell 3. Hearing 4. Touch
Classification of senses	Michael J Cohen	1. The radiation sense 2. The chemical senses 3. The mental senses 4. The feeling senses

following section each of the senses are introduced and finally, they are classified based on their similar features in sensory organs and their functions.

• **Vision**

Vision is the sensory ability to perceive and interpret the surroundings by using the visible light reflected from objects. Most environmental information is acquired through the visual sense. The subsets of this sense include two senses of color and brightness, due to separate receptors (Cohen, 1997, 48).

- Color (cone cells): These cells are stimulated at higher light levels and, due to the low number of photoreceptors to light, their sensitivity is low and allows the brain to detect color in high light.

- Brightness (rod cells): Rod cells are stimulated at low light levels and due to the large number of photoreceptors to light, their sensitivity is high and causes a feeling of colorless and allows for detecting the objects at low light (night).

• **Hearing**

The sense of hearing uses the energy of sound waves and the perception is as sound, or certain patterns of pitch, rhythm, and resonance, which can be a unique pattern (Bach, Dorostkar & Bell, 2017, 268). This sense (unlike the sense of vision) does not integrate the various sensory stimuli and receives them separately, resulting in feeling the noise. Hearing

is involuntary and human has limited control on it. The subsets of this sense, due to the difference in sensory threshold in transmission to the central nervous system, include two senses.

- Pleasant sounds: The sounds that are simple or regular combinations of simple sounds and are pleasant to hearing.

- Noise: Sounds that are an irregular combination of simple sounds and have vibrations that do not follow a certain rule and are usually unpleasant to hear.

• **Chemical sense**

This sense is associated with chemical reactions in the body. The subsets of this sense, due to separate receptors for each, include three senses of taste, smell, and chemical reception, each of which has a subset.

- Taste: The material in the mouth comes in contact with the fine hair located on the taste buds of the tongue. The hair produces nerve impulses that are transmitted to the brain through nerves. The subsets of this sense, due to different types of receptors of the tongue, include 6 senses: sweetness (tip of the tongue), saltiness (tip of the tongue), bitterness (back of the tongue), sourness (sides of the tongue), umami (the main cause of this taste is glutamate that detects protein), and fat (detected by the chemical receptors in the taste buds on the tongue) (Rogowski, 2016, 27).

- Smell: The sense of smell is the stimuli that stimulate the nasal mucosa receptors, and the stimulations are transmitted to the brain. In the sense of smell, a small amount of chemicals in the air can be detected and this is considered of the first type of communication. The subsets of the sense, due to different types of olfactory receptors and various chemical reactions, include 11 senses: materials, chemicals, outdoors, fruits, foods, spices, unpleasant smells, common, meats, vegetables, and body (Keller & Vosshall, 2004, 4).

- Chemical reception: This sense involves the detection of hormones and the chemicals in blood and includes chemical stimuli. The subsets of this sense, due to the variety in chemical stimuli, include 5 senses: hunger, satiety, thirst, nausea, and asphyxiation (Myers, 2017, 2).

• Somatic

The somatic sense refers to the senses included in the first group of the sense of touch (tactile sense) and detects the stimuli from a near distance or within the body through direct contact of the body with the environment. However, it was found since 1890 that the skin is not sensitive in all parts of the body, and the second group of senses depends on the human consciousness of the body, and are known as musculoskeletal senses (Shahcheraghi & Bandarabad, 2015, 150). This sense is different from other senses, in that its receptors are scattered throughout the body.

- Touch: Skin is the first means of touch and the most effective guard. The cornea is even covered with a layer of skin (Pallasmaa, 2016, 15). The sense of touch, unlike other senses, enables us to change and modify the environment (Howes, 2005, 33). This strong interaction indicates the importance of the sense of touch in experiencing the environment through the meaning of movement. This sense is the combination of mechanical, chemical, and thermal energies as the stimuli for the touch receptors, including:

1. The sense of pressure: There are receptors on the skin to respond to the stimuli of pressure, which

usually adapt slowly to the stimuli (Iravani & Khodapanahi, 2001, 91).

2. The sense of vibration: Skin detects rapidly the vibration on the surface of the skin (ibid.).

3. The sense of touch: The receptors in the hair root in the skin are sensitive to the speed of hair movement. These receptors adapted to the stimulations at a medium speed (Shahcheraghi & Bandarabad, 2015, 154).

4. The sense of itching: This sense has a distinct sensor system from the other touch sensors (Myers, 2017, 1).

5. The sense of external temperature: There are temperature receptors in different parts of the body. Due to two completely different types of temperature receptors, this sense is beyond only one sense and detects heat and cold.

6. The sense of pain: There is a distinct sensor system for this sense. The pain points on skin are more than other sense (ibid., 2). There are three distinct receptors for detecting pain: cutaneous (superficial scratches), physical (muscle cramps and joint pain), and visceral (such as gastric ulcer and gallstone).

- Musculoskeletal senses: This sense deal with humans' ability to perceive the position of organs and the non-active movement of joints in a wakefulness situation. Accordingly, it is a combination of mechanical, chemical, and thermal energies (Iravani & Khodapanahi, 2000, 147). It includes:

- The sense of the position of organs: It tells about the angle, position, location, and direction of the organs (Shahcheraghi & Bandarabad, 2015, 157). For example, the position of the organs can be identified with closed eyes.

- The sense of movement: In changing the position of joints without using the visual sense, one can be informed of the speed of movement in addition to the direction; for example, moving the forearm at the elbow joint (Iravani & Khodapanahi, 2001, 91).

- The sense of balance: The sensor system of this sense is located in the middle ear and maintains the balance and detects the movement of the body due

to the speed and change in direction, contributing to overcoming the gravitational force (*ibid.*, 17).

4. The sense of force: One can recognize the weight of different weights by lifting them. This ability is called the ability of force estimation or the resistance that changes the position of joints (*ibid.*, 92).

5. The sense of internal temperature: The human body produces varying amounts of energy based on the food consumed and the activity it has. Part of the energy is used for mechanical tasks and the rest for producing the internal temperature (Cohen, 1997, 48).

6. The sense of acceleration: The ability to sense rotational movement, acceleration, speed comes from a set of organs in the inner ear. Thus, this sense is divided into two rotational and muscular acceleration (Mao, 2013, 1).

7. The sense of stretch: Due to different receptors, this sense is divided into two groups of stretch in the internal organs and stretch in muscles (Myers, 2017, 1).

8. The sense of tension: Tension sensors are found in muscles and enable the brain to control the muscle tensions (*ibid.*).

• The sense of direction

The sense of direction is both dependent and independent. Direction is a subjective task and depends on the mental images recorded in the cognition stage. But its sense is formed in the feeling stage. The two perceptual/visual analogy and kinetic sense systems are needed for direction. This sense is independent as well; we can in any situation recognize up and down, front and back, left and right (Shahcheraghi & Bandarabad, 2015, 161).

• The sense of time

The sense of time is an internal experience, and the measured time (the clock) is an external framework for activities. Despite indefinable nature, the passage of time is perceived through change and movement and any awareness of time is associated with this aspect (Le Poidevin, 2009, 6). Therefore, the experience of time requires understanding the changes and sequences of the events; the change in

natural state (growth) of creatures (including human beings), the transitional motion of the Earth and the Moon (day and night, seasons, and months), the movement of clock hands that represent the sense and measure of time.

• The magnetic sense

This receptor is, in fact, able to mentally detect the magnetic fields, which is essentially helpful in direction. Evidence (Myers, 2017, 2) shows that human beings are able to detect the magnetic fields in an unconscious way. Insects, birds, and some mammals use this skill for migration and direction.

• The sense of familiarity

Familiarity refers to one's knowledge or feeling comfortable and close to someone or something; for example, meeting an old friend. The recognition memory is sometimes divided into two functions by humanities scholars: familiarity and recall. The strong sense of familiarity can occur with no recalling (Mandler, 1980, 254).

• The general sense

The drives of this sense are internal and are totally mental. For example, fear, sadness, happiness, anger, surprise, and calmness.

• Extrasensory perceptions

This set of sensory perceptions is mental and is known as extrasensory perception. Its subset senses include:

- The sixth sense: This sense is also called extrasensory perception includes claimed reception of information not gained through the recognized physical senses but sensed with the mind (Myers, 2017, 2).

- The sense of Premonition: A strong feeling about the occurrence of an event in the near future, especially a bad or unpleasant event.

- Telepathy: This term was coined in 1883 by Myers and means "the purported vicarious transmission of information from one person to another without using any known human sensory channels or physical interaction" (Peters, 2001, 105).

- The sense of Precognition: This sense is the ability to see future events. Like other types of supernatural

senses, there is no plausible scientific evidence. This sense violates the principle of causation since the effect cannot occur before the cause.

- The sense of Clairvoyance: Insight is the ability to gain information about a physical event through extrasensory perceptions. It is also called as “extrasensory awareness of objective events” (Myers, 2017, 2).

-The sense of Clairaudience: It is the capability of receiving an intuitive vocal message from the world of spirits or a higher being.

The correlation of senses of human’s perception

The human’s senses are often used simultaneously and interrelatedly to get a complete picture of the environment and are rarely used separately. For example, to see a tissue, tactile information is sent to the brain. Perception is the process of organizing and interpreting sensory information to make it meaningful. As a result, there is a correlation between the senses of perception. Human first physiologically communicates with the environment through senses and stimuli, which is controlled by the set of senses. In perceiving the space, the more stimulation of sensory organs intensifies the impact of the space and completely occurs the more perception of it, and it will be more attractive, motivational, and memorable. In this sense, human beings live in a world with multiple senses, and these stimuli help us to understand the environment better. This multi-sense environment considers the presence of all senses.

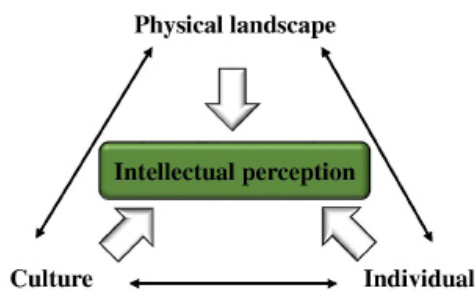


Fig. 4. The effective factors contributing to intellectual perception of the landscape. Source: Heijnen, 2013, 37.

The second step: intellectual perception and its effective factors

Jacobs (2006) divides the landscape into three distinct terms: matterscape (physical reality), powerscape (social reality), and mindscape (internal reality). These factors not only contribute to understanding the meaning of landscape, but also are effective in identifying the influential factors on human’s perception of the landscape. Therefore, as presented in Fig. 4, three factors (physical landscape, cultural factors, and personal factors) are effective in the intellectual perception of the landscape, which is achieved through their interaction. Each of these factors and way of the impact on understanding the landscape is explained

• intellectual perception effective factors

- Physical landscape and its impact on perception: Physical landscape includes all the natural and artificial elements of the landscape. In fact, it can be said that objective and material reality is the starting point for intellectual perception. To attribute a special meaning to an object, that object first must exist. For example, water exists, so it can be seen, touched, smelled, tasted and heard. Physically, it is studied in the fields of study such as geology, hydrology, and environmental science.

- Culture and its impact on perception: Culture is, in fact, the social interaction between human beings and deals with the common values, interests, and rules. Therefore, one can be a member of different cultures.

- Nationality: Belonging to a particular nationality can create similar values. The people with the same nationality can differ in landscape perception but they are influenced by nationality, government, and educational system (Aoki, 1999).

- Urban residential background: There are two general types of people. The first are people who lived most of their lives in urban areas and usually prefer developed parks, and the second includes the people who lived in rural areas, with a preference for natural forests (Schroeder, 1983).

- Politics: Politics can directly or indirectly (for

example, changing the cultural history with political and social intentions through ads or anti-ad influence the landscape and people's perception of it (Taylor & Lennon, 2012).

- Primary information: Preferences can be influenced by information. For example, a subject may not be interesting to someone but may change to an interesting one after gaining information (Danford & Willens, 1975).
- Professional experience: The viewpoint and environmental knowledge of someone who has spent all his/her life in a specific landscape are definitely different from that of a person who only studied about it (Aoki, 1999).
- Daily accessibility to the landscape: The perception of the landscape that one visits every day is different from the one that has only been on holiday and has never seen that (ibid.).
- Familiarity with the environment: Human beings compare the landscape with the places they are familiar with. This sense is associated with a sense of belonging (Wellman & Buyhoff, 1980).
- Economics: Most landscapes form due to economic reasons (Taylor & Lennon, 2012).
- Religion: the view or religion about the landscape and its elements influences the followers' perception of the landscape (Shore, 2007).
- Social values/ rules: These values can be passed to children by the family and through learning in society. This exactly conforms to the culture (Taylor & Lennon, 2012).
- Social class: Though this issue is not justifiable in modern social matters since the prosperous class has been able to buy lands and meet their goals, it can be considered as an effective factor (Howard, 2011).
- Individual and perception: This factor is considered as an individual's personal background in the intellectual perception of information such as individual values and emotions. According to the definition of the landscape by the European Convention of the Landscape, the landscape is an area perceived by human; there is no specific characteristic to human in this definition and it is

assumed that all human beings can perceive it but they have different perceptions due to different characteristics.

- Academic and occupational background: Differences in education affect one's viewpoint towards the landscape (Kent, 1993).
- Hobbies: a place with entertainment and leisure facilities is more preferred (Aoki, 1999).
- Interest in the area: There are different reasons why individuals like/dislike a special landscape; reasons such as the area itself and its features, proximity to the living or work place can attract people (Zube, 1987).
- Age: Children and adults are different in perceiving the landscape. One of the reasons is height (shorter, larger environment) and another reason is how they understand life (Aoki, 1999).
- Gender: Men and women have different priorities in perceiving the landscape. For example, security is one of the most important priorities for women, which affects their process of perception and cognition (Macia, 1979).

Discussion

Recognizing the process of the landscape perception, the sensory and intellectual perception, was identified in two steps in the part of theoretical foundations. As explained in the first step (sensory perceptions and human's identified senses) and as presented in Table 2, there are 51 senses for human beings (unlike the 5 and 18 identified senses), which can be divided, based on the type of sensory receptors and function, into 10 sensory systems (the senses of: vision, hearing, chemical, somatic, direction, time, magnetic, familiarity, general, and extra). Regarding the response to the environmental stimuli, these sensory systems can be divided into two general groups. The first group includes the sensory systems in the organs of the body, which pass the received information, after stimulation in the environment, to the neural centers in the brain. Due to the concurrent function of the sensory receptors of organs and the brain, this type of sensory systems

Table 2. Human’s sensory systems and the subset senses. Source: authors.

Sensory system		Subset senses	Received information	Sensory receptor	Type of the system
Visual system	1. Color	--	Detecting color	Cone cells and message to the brain	Objective-Subjective
	2. Brightness	--	Detecting light	Rod cells and message to the brain	Objective-Subjective
Hearing	3. Pleasant	--	Type, direction, distance, source, speech	Stimulating the hearing receptors in the external and internal ear and message to the brain	Objective-Subjective
	4. Noise	--			
Chemical	Taste	5. Sweetness, 6. saltiness, 7. bitterness, 8. sourness, 9. umami, 10. fat	Flavor	Stimulating the taste and chemical sensors and message to the brain	Objective-Subjective
	Smell	11. Materials, 12. chemical, 13. Outdoors, 14. Fruit, 15. Food, 16. Spices, 17. unpleasant, 18. Common, 19. Body, 20. Meat, 21. Vegetables	Direction and the quality of the smell	Stimulating the nasal mucosa and chemical receptors and the message to the brain	Objective-Subjective
	Chemical reception	22. Hunger 23. Satiety, 24. Thirst, 25. Nausea, 26. suffocation	Blood hormones and medications	Stimulating chemical receptors in the brain and blood	Objective-Subjective
Somatic	Touch	27. Pressure, 28. Vibration, 29. Touch, 30. Itching, 31. External temperature, 32. Pain	Temperature, moisture, tissue, pressure, pain, affection, touch, itching, vibration	Skin, joints, muscles, and the brain	Objective-Subjective
	Musculoskeletal	33. Position of the organs, 34. Movement, 35. Balance, 36. Force, 37. Internal temperature, 38. Acceleration, 39. Stretch, 40. tension	Speed, acceleration, position of the organs, movement, balance, force, temperature, stretch, tension	Stimulating the receptors in the middle and internal ear, and the brain	Objective-Subjective
	41. direction	--	Visual analogy, movement	Stimulating the receptors in the brain	Just Subjective
	42. time	--	Passing the time, hour, age, growth, season	Stimulating the receptors in the brain	Just Subjective
	43. magnetic	--	Direction, magnetic areas,	Stimulating the direction receptors in the brain	Just Subjective
	44. familiarity	--	Memory, recall, remembrance	Stimulating the receptors in the brain	Just Subjective
	45. general	--	Happiness, sadness, fear, anger, anxiety	Stimulating the receptors in the brain	Just Subjective
Extrasensory perceptions	Supernatural senses	46. Sixth sense, 47. Premonition, 48. Telepathy, 49. Precognition, 50. Clairvoyance, 51. Clairaudience	Connection with the supernatural world	Stimulating the receptors in the brain	Just Subjective

is called objective-subjective sensory systems. The second type includes the sensory systems that are just mental and are a type of internal experience and can be called just subjective sensory systems. This part deals with the process of landscape perception, and this process will be identified regarding the effective factors on it. Considering

the place of “sense” in the process of landscape perception, it can be understood that there is a mutual relationship between the features of the landscape, perception, cognition, evaluation, and the human’s behavior in this process. In the stage of “sensory perception”, first the visible features of the landscape such as the environmental

information received by the 51 senses are stored, classified and perceived in the brain. In the next stage, i.e. “intellectual perception”, the received information by the senses is passed to the brain and mentally examined. There are three factors of physical environment, cultural factors, and personal factors in one’s mind in this stage. These factors are subjectively explored (including evaluating, concluding, forming the mental affirmations) in interaction with sensory perceptions. The landscape, in this stage, is formed and perceived in the visitor’s mind. Since the process of the landscape perception starts on the basis of sensory perceptions and is formed in association with the intellectual perceptions and the effective factors, it is called “sensory landscape” in some studies (Howes, 2005). After the stage of sense, sensory perception and intellectual perception, the final step in completing the process of perception is “cognition”. In the stage of cognition, one’s mind creates an image of the environment and attributes a special meaning to the environment based on the environmental information, mental schemas, past experiences and memories. Based on the perception of the environment and causal and “evaluative” processes, the mind reacts positively or negatively to the environment and finally, the person selects a certain “behavior” based on his/her evaluative-mental contents. Fig. 5 represents this conceptual model.

Conclusion

As discussed, the phenomenon of the landscape is defined by human’s perception. Therefore, in studying the landscape, there is a need to consider the perception process and effective factors. In

psychology, perception is a mental process through which the raw information received by the senses (sensory experiences) is passed to the mind, find meanings, and finally, the perception is achieved. Thus, there are two basic steps, i.e. sensory perception and intellectual perception in the process of perception.

In the first step of the sensory perceptions, the information selected from the sensory data is examined. The primary information, in this stage, is stored and classified in the mind based on their features. Therefore, this research aimed at identifying the human’s senses, regardless of the 5 identified categories of the senses, and it was revealed that 51 distinct senses can be identified for human beings, due to a variety in the sensory organs and the type of their function. Finally, it was indicated that these senses can be grouped in 10 sensory systems due to their similarities in the type of sensory receptors, including the visual system, hearing, chemical, somatic, direction, time, magnetic, familiarity, general, and extrasensory systems. They can be also grouped in two objective-mental sensory systems and just mental sensory systems, regarding similarity in responses to stimulations.

In the second step of the intellectual perceptions, that is the mental examination of data including evaluating, concluding, and forming the mental affirmations, it was revealed that the intellectual perception of the landscape is achieved through interaction with three factors of physical landscape, cultural and personal factors. The factor of physical landscape refers to the objective and material reality and is considered as the starting point for

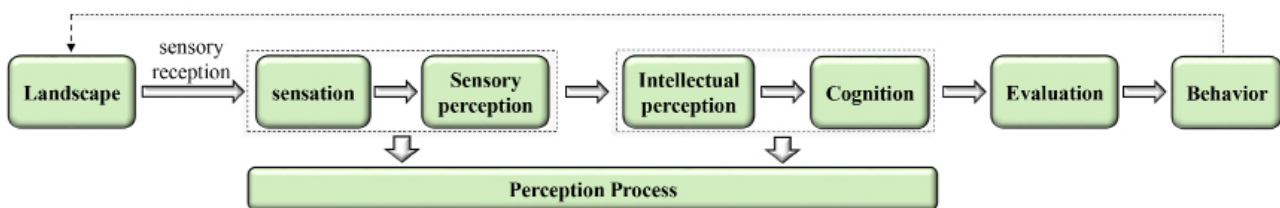


Fig. 5. The process of the sensory landscape perception. Source: authors.

the intellectual perception. Since culture forms all domains of human life, such as politics, nationality, economics, religion, etc. and the perception is considerably influenced by culture, the identification of the cultural factors influential on the intellectual perception is of great importance. The third set of factors in intellectual perception includes the visitor's personal factors, including education, interests, age, and gender.

These results demonstrate that considering only a small number of senses in the landscape perception, regardless other senses, intellectual perceptions and its factors results in an "objective and technical" description of the landscape. Besides, it can cause the record of a superficial layer of experiences. In fact, neglecting other human senses in perceiving the landscape, as well as disregarding the cultural and personal characteristics lead to decreased sensory experiences and weakened the relationship between the user and the physical environment, which finally affecting humans' behavior. So that, failure to meet human's expectations of the environment may cause his/her resentment and even leaving it.

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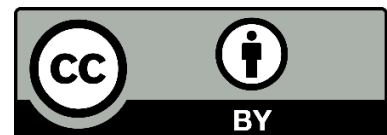
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