A Systematic Review on Visual Sensory of Children Towards City Landmarks

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ABSTRACT

Children's visual sensory of city landmarks is interesting because it has a different perspective than adults or teenagers. High curiosity about something made the preferred landmarks and chosen focus different for each child's age. It does not have to be a prominent city landmark like a monument; even landscapes have become interesting for children to visit. The problem is how many papers discuss this and the resulting children's visual sensory issues. The purpose of this study was to review as many papers as possible to explore the objects of preferred city landmarks and the responses obtained. The method used was to collect various documents from Google Scholar with Publish or Perish and Vos Viewer based on keywords about children's visual sensory of city landmarks, a total of 25 papers to be described in table form to see the essence of the research, the country conducting the study and the year of the study. Then, the paper's contents, such as methods, landmark objects, memory responses, and age groups, were reviewed. The result is that the landscape has become a widely studied place, and technology has begun to create landmarks virtually, using EEG tools, eye trackers, and game engines.

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1. INTRODUCTION

Sensory components are inextricably linked to the issue of sensory. The four types of senses are tactile, kinesthetic, auditory, and visual [1]. It has visual or vision sensors, which are crucial, particularly in urban science and architecture. Humans, including children, manage their information and identify items around them using their sense of sight [2]. Youngsters typically show interest in things that are visible to the naked eye. For instance, genuine specimen objects, or concrete objects, are immediately visible to the naked eye and feel directly without assistance [3]. Sensory learning is crucial to the early childhood cluster's development because it helps them comprehend their surroundings. Children with well-developed senses can process information, identify and react to sensory inputs, and grow in their motor, cognitive, social, and emotional abilities [4]. In the meantime, children in the child cluster between the ages of four and six exhibit curiosity, particularly concerning items and pictures [5]. Children's visual senses must be enhanced and developed to their full potential during their growth and development. Many things that children want

to see and feel connected to, visual sensory aspects of everything, are influenced by their constant need to be active and move around to learn about their environment.

Children's visual senses can be stimulated by walking and seeing the city, especially if they are taken to the city centre to see landmarks, typically where people congregate. According to Kevin Lynch, landmarks are a significant component of the city's features. Landmarks, usually physical objects with simple definitions like monuments, buildings, signs, stores, or mountains, are also markers that are more valuable in a place and are typically quite conspicuous, such that they are frequently used to identify a place. In other words, a landmark is a structure, monument, or other item that causes others to view it as a municipal icon. A landmark must have unique physical features visible from places with excellent visibility. Because city landmarks can help children's visual senses become more sensitive to shape, colour, and texture that can be directly seen and felt as part of the expression created by city landmarks, they were chosen as research objects.

Since children are naturally curious, discussing children and architectural landmarks cannot be separated from understanding what children want and find interesting in landmarks. The sensory experience, such as visual sensory, must be matched with the intensity of the senses. Similar to the visual sense, an architectural landmark does not become overshadowed by its surroundings or become something that people do not consider, since it is encased in them, which would lead to an imbalance. Sensory and landmark things require equilibrium with their surroundings. Numerous research comparisons conducted through examinations of various situations created by the surroundings and sensory perceptions surrounding the landmark demonstrate this balance and conclusion.

This research evaluation will be intriguing regarding visual sensory and the surrounding environment because of the variations in city landmarks throughout each region, city, and nation. For them to be further explored in depth for future research, this study gathers a variety of research outcomes and describes them in terms of methodologies, types of landmarks, and visual sensory reactions produced by a child.

2. RESEARCH METHODS

The method used is data collection and analysis, as well as conclusion, so that essential points of this research are obtained. A review of neurophysiological research on sensory processing in autism was the focus of earlier studies. By examining the research on the neurophysiological reactions of autistic people to touch, visual, and auditory stimuli, this article examines the brain foundations of sensory processing in autism. We discuss research on multisensory integration and unimodal sensory processing that has employed a range of neuroimaging methods, including functional magnetic resonance imaging (MRI), electroencephalography (EEG), and magnetoencephalography (MEG) [6]. One by one, the method is explained in terms of the main points of each paper.

The following study's subject systematically reviews sensory recruitment in visual short-term memory. Using transcranial magnetic stimulation (TMS) and a meta-analysis, this study examines the function of the sensory visual cortex in VSTM [7]. Meta-analysis is the technique employed.

The most recent study reviews the brain networks involved in Parkinson's disease sensory perception. According to Fiona Permezel et al [8], this study emphasises the significance of the basal ganglia in sensory perception across modalities, with a further function for integrating numerous simultaneous sensation types in Parkinson's patients. Research comprising 101 studies published between 1982 and 2022 was gathered this way.

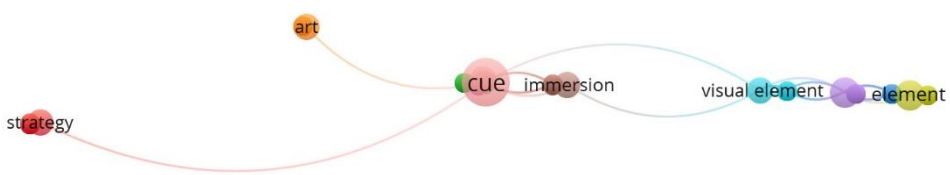

Figure 1. VOSViewer Analysis

To identify the type of visual sensory, particularly concerning landmarks, researchers gathered information from various studies and used analysis methods to conduct a review. The first step involves gathering and analysing data using a variety of methods, such as: (1) Using Publish or Perish (PoP) and keywords like visual sensory, visual of landmark, city landmark, sensory of landmark, and children visual

sensory, the first step is gathering literature in the form of papers and books; (2) Applying the Publish or Perish method to data analysis and continuing to use Vos Viewer to observe the correlation between titles, as well as examining papers with advancements from 2020 to 2024, particularly the final year of 2024. After obtaining 100 papers, the researchers selected 25 for review. Visual components, tactics, artwork, and hints were among the words found (Figure 1).

The analysis of data is the second procedure. This analysis is broken down into multiple steps: (1) gathering information through reading and researching, such as methodologies, landmark types, and a child's visual-sensorial reaction; (2) creating tables or graphs to compare the information for each publication. Drawing conclusions and outlining future study directions about children's visual-sensory perception of city landmarks constitutes the last step in the process.

3. RESULTS AND DISCUSSION

The discussion in this study is divided into three parts, namely the most published years, the most researched countries and details of the paper in the form of a discussion of methods, landmark objects, visual responses and age. The initial discussion was related to the large number of papers each year on research that had been conducted. In 2024, there was only one out of 25 papers, possibly because of the many topics implemented in the previous year, such as in 2020-2022. Meanwhile, the highest year for paper productivity was 2022, with eight papers. All comparisons of the number of documents each year can be seen in Figure 2.

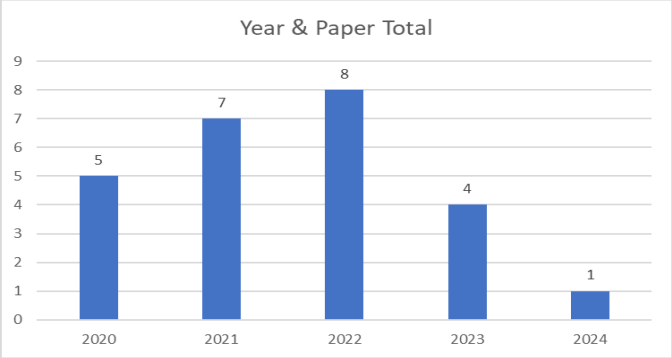

Figure 2. Result of the Paper Years

The following discussion compares various countries that have researched and published papers on the visual perception of landmarks. When viewed from the graph that has been analysed, several countries have the same number of research and published papers. China, Germany, and the USA have the same number of research papers, namely, four from 2020 to 2024. Then, Japan continued with the number of research papers, as many as 2, in 2020-2024. Meanwhile, Serbia, United Kingdom (UK), Iran, Switzerland, Denmark, Poland, Netherlands, Canada, Australia, Greece and Egypt are classified as the same with the number of 1 paper or research conducted between 2020-2024. The countries shown in the graph (Figure 3) are countries whose paper results were analysed or reviewed by researchers.

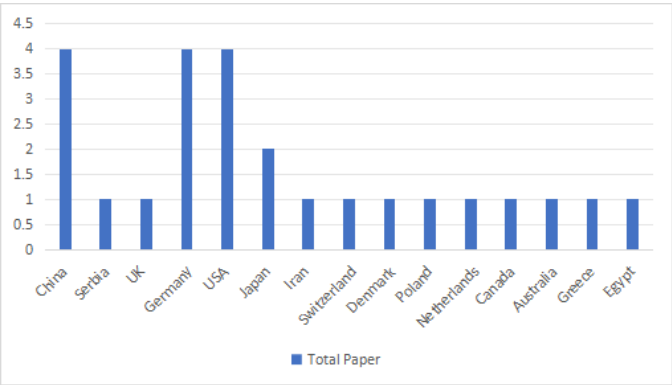

Figure 3. Result of Country of the Author

The final discussion is a description and summary of the 25 papers reviewed. The researcher found that the most prominent objects in this discussion were landscapes, street cities, and virtual towns. Four categories are discussed against the content of the reviewed papers: method, landmark object, visual response and age. The following is a table of divisions with different titles.

Table 1. Summary of Review Papers

Title	Method	Landmark Object	Visual Response	Age
A landscape study of Sichuan University (Wangjiang campus) from the perspective of campus tourism [9].	Campus landscapes under the all-encompassing effect of humanistic and naturalistic settings were examined from three distinct multi-level (scale) angles.	Along with several research subjects that include (i) building and vegetation landscapes, (ii) colour landscapes, (iii) campus space use landscapes, and (iv) thermal landscapes, the campus landscape includes (i) point scale, (ii) line scale, and (iii) plane scale.	Provide visual sensations that are bright, upbeat, and calm.	All ages.
Assessing Linear Urban Landscape from dynamic visual perception based on urban morphology [10].	Real-time scene identification, hierarchy, recognition, and visual comfort dimensions.	Linear urban landscape.	Continuity of the visual field.	All ages.
Children's perception of the visual identity of Belgrade [11].	Children believe Belgrade's visual markers are essential to its visual identity and identify the central locations on the capital's symbolic map.	Belgrade City landmarks.	Beautiful and colorful.	Children .
Computer models of saliency alone fail to predict subjective visual attention to landmarks during observed navigation [12].	Watch movies about spatial navigation from the video game Sea Hero Quest.	Identify landmark saliency and maneuver a boat in a river or canal.	Curious.	All ages.
Effects of visual map complexity on the attentional processing of landmarks [13].	Seeing a maps.	Landmark pictograms.	Often examined were (possible) decision spots and landmark representations farther off the route.	Adults.
Evaluating augmented reality landmark cues and frame of reference displays with virtual reality [14].	HMD-based AR pedestrian navigation systems.	Landmark with VR, AR & MR.	Spatial abilities.	Adults.
Explorations of young people's sense of place using urban design qualities in Surabaya, Indonesia [15].	Evaluations of locations, walking experiences, and photography by visitors.	Local districts or *kampungs.*	Sense of place in the historic city.	All ages.
Exploring the sense of place components in historic districts: A strategy for urban designers and architects [16].	Identify the components of the sense of place.	Historic districts.	Memories and experiences of place.	All ages.

Title	Method	Landmark Object	Visual Response	Age
Using a graph-theoretical analysis approach, finding landmarks and investigating viewing behaviour during spatial navigation in VR [17].	After spending 90 minutes exploring a new virtual village, participants preferred sure dwellings, which we call gaze-graph-defined landmarks.	The virtual city Seahaven.	Situation of the city.	All ages.
Gender differences and optimising women's experiences: An exploratory study of visual behaviour while viewing urban park landscapes in Tokyo, Japan [18].	Visual perception, gaze heat maps, visual focus area (VFA), gender disparities, and suggested reasons for visual-behaviour variations were all examined.	Mizumoto Park in Tokyo.	The safety and order provided by green spaces.	Younger.
Improving pedestrians' spatial learning during landmark-based navigation with auditory emotional cues and narrative [19].	Participants' eye movements and emotional reactions to 10 modified aural navigation instructions—emotional versus neutral—will be recorded in an outdoor user research.	Swiss town of Le Noirmont, Switzerland.	Emotions' role in navigation.	All ages.
Landmarks: A solution for spatial navigation and memory experiments in virtual reality [20].	Using the Unity game engine to design and construct 3D navigation experiments.	Landmark modelling in unity game engine.	Memory.	All ages.
Mapping the importance of specific physical elements in urban space for blind and visually impaired people [21].	Evaluating the significance of 34 physical components as indicators in the pedestrian environment to aid in the direction of blind and visually impaired people (BVIP).	Streets of the city.	Senses.	All ages of blind people and normal people.
Modelling the effect of landmarks on pedestrian dynamics in urban environments [22].	Agent-Based Model (ABM) is used to simulate pedestrian movement that considers both nearby and far-off landmarks.	Landmarks by pedestrian.	Behaviour.	All ages.
Perception of spatial legibility and its association with human mobility patterns: An empirical assessment of the historical districts in Rasht, Iran [23].	The Mix technique used Space Syntax, cognitive sketch maps, and time-lapse photography to understand the relationship between spatial intelligibility and human motion patterns.	The city's situation, such as buildings and people,	Imagination.	All ages.
Sensory gardens as places for outdoor recreation adapted to the needs of people with visual impairments [24].	In collaboration with the Polish Association for the Blind, 32 respondents participated in in-person garden interviews.	Outdoor recreation.	Sensory garden.	All ages.
Social Media Users' Visual and Emotional Preferences of Internet-Famous Sites in Urban Riverfront Public Spaces: A Case Study in Changsha, China [25].	Examined the views of social media users, particularly concerning visual and emotional preferences, and the traits of human behaviour in various RIFSs.	Urban Riverfront Public Spaces: A Case Study in Changsha, China.	Perceptions of users, emotional and visual preferences, and traits of human behavior.	All ages.
Talking about landscape spaces. Towards a spatial-	Examining the terminology used in the vast literature	City landscape.	Experiencing.	All ages.

Title	Method	Landmark Object	Visual Response	Age
visual landscape design vocabulary [26].	on landscape architecture and related fields.			
The effect of landmark visualisation in mobile maps on brain activity during navigation: A virtual reality study [27].	The effects of showing a mobile map with landmarks (three, five, or seven) at intersections one at a time during turn-by-turn instructions on spatial learning, cognitive load, and visuospatial encoding during map consultation in a virtual urban environment will be experimentally investigated.	Virtual city.	Cognitive response of the brain.	All ages.
Therapeutic plant landscape design of urban forest parks based on the Five Senses Theory: A case study of Stanley Park in Canada [28].	Surveyed visitors on the spot to find out how they felt, how satisfied they were, what they thought was lacking, and what they thought about the potential medicinal plants in Stanley Park.	Stanley Park in Canada.	Health and comfort.	All ages.
Using posterior EEG theta band to assess the effects of architectural designs on landmark recognition in an urban setting [29].	Research platform that uses electroencephalography (EEG) and a virtual environment to better study the brain mechanisms involved in landmark utilisation and recognition during urban navigation activities.	Virtual urban environment.	Spatial memory.	All ages.
Using virtual global landmarks to improve incidental spatial learning [30].	Asked 55 volunteers to explore a virtual environment and map their explorations while recording their eye movements and electroencephalograms (EEGs).	Global landmarks.	Cognitive maps.	Adults.
Using virtual reality to assess dynamic self-motion and landmark cues for spatial updating in children and adults [31].	Tested young adults and children (ages 10 to 12) on a virtual point-to-origin task that changed the kinds of self-motion data that could be translated: no-dynamic (teleporting), visual-dynamic (controller-induced), and full-dynamic (walking).	Virtual landmarks.	Memory and cognition.	Children and young adults.
Visual contribution to motor skill DCD disorders &walking physiology using spatial cognition and linear geometries as landmark coordination cues [32].	In three built environments (two urban parks and one pocket park), under two conditions (rich or not in trees, flora, and PnP linear geometries), and in various motor coordination control situations (static balance, dynamic balances, and dark condition), twenty children of five to eight	City Parks.	Poor processing of visual and spatial information.	Children .

Title	Method	Landmark Object	Visual Response	Age
	years old with DCD difficulties (two intervention groups, one with ten boys and the other with ten girls) were evaluated statistically.			
Walking experience: Exploring the trilateral interrelation of walkability, temporal perception, and urban ambience [33]	Participants in an experimental study are instructed to walk along two predetermined routes. Documenting the target group's lived experience through trip reports and questionnaire responses is the foundation of data collection techniques.	Urban streets, pedestrians.	Temporal Perception, sense of "qualitative experience.	All ages.

In this final review section, researchers divide various methods into different approaches. Digitalisation has been achieved in terms of both humans and visual identity. Almost all research conducted uses experimental methods with digital techniques. With experimental digital methods, data is more precise than manual methods. Meanwhile, the tools, such as EEG, eye trackers and video games, vary.

Likewise, with the objects studied. The objects studied have utilised a lot of area duplication by utilising digital twin technology through VR or XR tools. The location of the research is no longer carried out outdoors. However, it can also be carried out indoors, facilitating research that is unaffected by natural and environmental situations. However, the drawback is that some data cannot be captured by this digital simulation, such as dynamic human movements and ecological changes that occur. Landmark objects are not limited to architectural works that can be seen as statues and architectural forms of buildings. However, they are broader, with landmark experiences that can be felt with the surrounding environment. Landmark conditions concern public spaces or public facilities, including city pedestrians. The visual responses obtained vary depending on the situation. The experience obtained is more influenced by memory and emotion.

Several visual responses occur, including memory, spatial ability, emotion, cognitive and sensory. Most of the responses obtained are memory responses. Memory arises because of the visuals captured based on experiences that have been received. This memory is recorded and included in the research results. The last division is the age of the respondents. The respondents' ages are mostly across all age categories, so research is still explicitly limited to children. Nevertheless, the category of children is also included in the category of all ages.

4. CONCLUSION

The results of this research mainly utilise technology to test the perceptions obtained by participants. While the most common age is not a child, it is for all testing ages. Of course, research on children's visual sensory is still much that has not been explored because of the specifications obtained in the form of differences in response, memory and perspective of children who are always attractive compared to adults. City landmarks that are the object of research are not only visited directly but can be made virtually so that visitors do not need to come directly. Landscape is where most landmarks are the target of research because it gives rise to many perceptions from the many external elements, namely the built environment, which is very limited when using landmark objects in the form of buildings, monuments or similar objects. Hopefully, in the future, there will be much research that leads directly to children's visual sensory perception of landmarks related to architecture.

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