SINERGI Vol. 29, No. 1, February 2025: 83-96
http://publikasi.mercubuana.ac.id/index.php/sinergi
http://doi.org/10.22441/sinergi.2025.1.009

Five questions on the multisensory perception in historic urban areas

Eggi Septianto[1,3]*, Firmansyah[2], Heru W. Poerbo[2], Widjaja Martokusumo[2]
[1]Doctoral Student in Architecture, School of Architecture, Planning, and Policy Development, Institut Teknologi Bandung, Indonesia
[2]Architecture Design Research Group, School of Architecture, Planning, and Policy Development, Institut Teknologi Bandung, Indonesia
[3]Architecture Program, Faculty of Architecture and Design, Institut Teknologi Nasional (ITENAS) Bandung, Indonesia

Abstract
Multisensory perception is essential for individuals or communities to fully appreciate urban historic areas. Recognizing non-physical aspects such as sound, smell, and tactile sensations based on human senses is crucial for enhancing the relationship between individuals and their environment. Discussions on heritage conservation extend beyond physical aspects evaluated visually to encompass non-physical elements. This article presents five questions covering the definition, influencing factors, types and categories, and methods for multisensory perception research. Furthermore, this article aims to explain gaps in multisensory research in urban historic areas to determine what and how future heritage conservation studies should be conducted. The research employs content analysis methods to analyze discussions from selected literature regarding the benefits of multisensory research in urban historic areas. Multisensory perception significantly influences the diverse sensory experience of intangible aspects in an environment, enriching urban heritage conservation approaches.

Keywords:
Cultural heritage;
Historic urban area;
Multisensory perception;

Article History:
Received: February 4, 2024
Revised: May 31, 2024
Accepted: June 13, 2024
Published: January 2, 2025

Corresponding Author:
Eggi Septianto
School of Architecture, Planning and Policy Development, Institut Teknologi Bandung, Indonesia- Architecture Program, Faculty of Architecture and Design, Institut Teknologi Nasional (ITENAS) Bandung, Indonesia
Email:
35221007@mahasiswa.itb.ac.id; eggi@itenas.ac.id

INTRODUCTION

The paradigm shift and expansion of cultural heritage studies in the future are taking place in anticipation of the evolving environment [1]. The shifting and expanding discourse highlights emerging notions of public perceptions and experiences of buildings and places in urban areas [2]. Perception and experience, based on subject perceptions, are integral to appreciating the non-physical aspects of an environment, such as sound, smell, and tactile aspects [3, 4, 5, 6, 7]. Appreciating an environment's non-physical aspects using sensory means provides individual preferences for environments experiencing changes in activity, economy, and culture [8][9]. Multisensory perception provides a better opportunity to describe, understand, and eventually appreciate developing historic urban areas [10, 11, 12, 13, 14].

Discussions on the management of cultural heritage areas so far have primarily focused on the physical (tangible) aspects and have yet to consider significant non-physical (intangible) aspects [15]. Physical and visual attributes are not the sole considerations in determining the significance of particular urban historic areas experiencing environmental transformation [16][17]. If only the physical approach is emphasized, the objective of conserving values and meanings based on the relationship between humans, social structures, and their environment will never be fully achieved [17].

In the context of the urban heritage conservation approach, efforts are no longer limited to maintaining the physical authenticity of artifacts [18]. Discussions on conservation approaches for historic urban areas emphasize creating quality urban spaces through unique

experiences incorporating historical identity [18][19]. Individual experiences of the area's distinctive character are crucial in conserving historic urban areas transformed by urban development and modernization [20].

The increasing complexity of urban development and modernization dynamics demands attention to how observers perceive these phenomena through unique sensory experiences. In this regard, the urban heritage conservation approach must pay more attention to positive aspects that are felt and understood based on individual or community perceptions when appreciating historic urban areas [18, 21, 22].

This article aims to uncover the essential principles of multisensory perception that can enrich the urban heritage conservation approach. The questions in this article address the definition of multisensory perception, the factors influencing sensory perception, sensory types and categories, methods, and the issues arising in the context of multisensory perception discussed in conservation in historic urban areas.

The answers to these critical questions are based on the author's opinion after reflecting on a literature survey of multisensory research and urban heritage studies in heritage conservation. Furthermore, the responses to these five questions can help identify and describe the development needed to identify gaps in multisensory research in urban heritage conservation areas.

METHOD

This research analyzes selected scholarly publications on multisensory perception in urban historic areas. The authors identified the publications through a Google Scholar search using the keywords "*multisensory* AND *perception* AND *cultural* AND *urban heritage*. After the initial search, the authors implemented a two-stage selection process to identify relevant articles. The first stage involved preliminary screening based on titles, abstracts, and keywords. Articles that explicitly needed to address multisensory perception in historic urban areas were immediately excluded. The second stage involved a thorough review and discussion of the articles that passed the initial screening and focused on the research background, objectives, methodology, and conclusions of the selected articles. Based on these processes and discussions, the researcher selected twelve articles that addressed multisensory perception in urban historic districts, as shown in Table 1.

Table 1. List of twelve selected articles on multisensory topics in urban historic areas

No	Author and Year	Title
1	La Malva. et al. (2011) [23]	Livingscape multisensory experien.ce in urban historical places: subjective assessment from the local people and quality of the urban environment
2	Bruce. et al. (2015) [24]	Analysing olfactory and auditory senses capes in English cities: Sensory expectation and urban environmental perception
3	La Malva. et al. (2015) [25]	Livingscape: A multisensory approach to improve the quality of urban spaces
4	C. Vasilikou (2016) [26]	Sensory Navigation in the City Centre. Perceptual paths, sense walks, and interactive atmospheres
5	D. Choudhury (2016) [27]	Sensory Experience of Architecture: Creating Meaningful Spaces
6	T. González. et al. (2017) [28]	Urban multisensory laboratory, an approach to model urban space human perception
7	T. Zhang. et al. (2019) [29]	Restorative effects of multisensory perception in urban green space: a case study of an urban park in Guangzhou, China
8	Nitidara. et al. (2019) [30]	The human perception based on memory recall of the multisensory stimuli in outdoor urban space
9	M.Wojnarowska. et al. (2020) [31]	Odor nuisance and urban residents' quality of life: A case study in Kraków's Plaszow district
10	S. Boumezoued. et al. (2020) [32]	Pedestrian itinerary choice: between multisensory, affective, and syntactic aspects of the street pattern in the historic quarter of Bejaia, Algeria
11	N. Muleya and M. Campbell (2020) [33]	A multisensory approach to measure public space quality in the city of Bulawayo, Zimbabwe
12	J. Samadi. et al. (2020) [34]	Qualitative Assessment of the Sensory Dimensions of Space in Historical Bazaars from the Users' point of view (Case Study: Qazvin Bazaar)

The selected papers were analyzed using content analysis on the five research questions the researcher created, constituting the unit of analysis in this study. Five discussion topics based on the research questions the researcher created include a definition of multisensory perception, factors influencing sensory perception, sensory types and categories, methods, and the issues arising in the context of multisensory perception discussed in conservation in historic urban areas. The entire

process and discussion of article selection and analysis of the twelve selected articles can be seen in Figure 1.

RESULTS AND DISCUSSION

What is Multisensory Perception?

The discussion of multisensory perception began in the 1960s when Kevin Lynch initiated and developed a visual sensory method that relates the memory of a place to the study of a city [35]. This discussion then expanded into various disciplines, including environmental psychology, sociology, geography, cartography, ethnography, urban anthropology, cultural studies, and geographic information systems [14]. Furthermore, Pallasmaa and Steven Holl discussed the influence of other senses in architecture, namely hearing and touch, on appreciating an environment [34].

Merleau-Ponty, in his seminal book "The Phenomenology of Perception," defines sensations caused by external factors, also known as stimuli, as the basic units of perception [36].

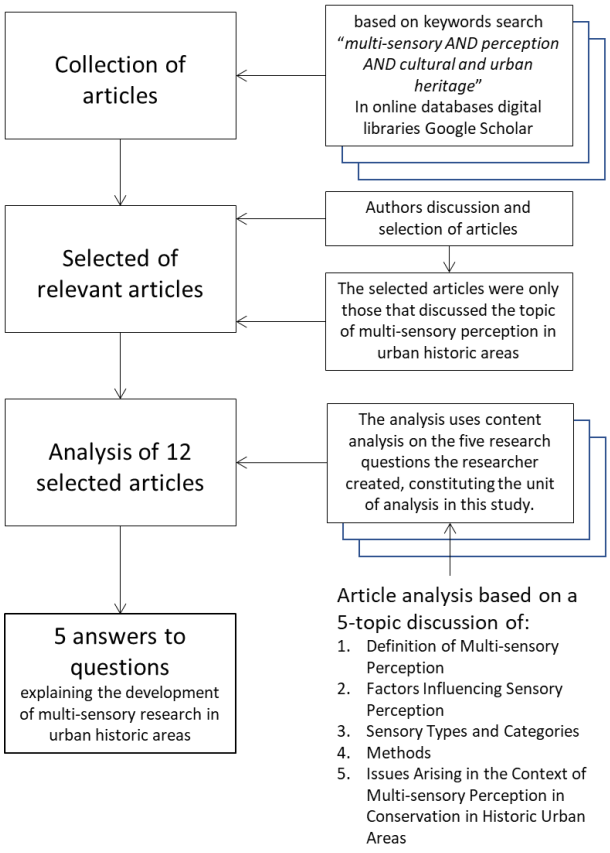

Figure 1. Research methodology diagram process

Multisensory perception in an environment involves considering the senses [37]. By considering the sensations experienced in a specific place, at a particular time, and under certain conditions, a comprehensive understanding of the experience of a place is obtained [37].

Multisensory perception extends visualization to sensing the city through other sensory modalities, aiming to avoid the dominance of visual or ocular centrism [33]. It is also a human process of directly responding to stimuli from various sensory modalities when experiencing an event in an environment [38]. Based on the analysis, twelve articles were dominated by discussions using more than one sensor. Figure 2 explains the use of the senses of sight, hearing, smell, and touch, which are widely used in research on sensory perception in urban historic areas.

According to Lotfi and Zamani (2015), the primary senses perceive environmental information through visuals, sounds, smells, and tactile sensations; they collectively shape environmental experiences [34]. The environment perceived through multisensory aspects contributes to the spatial understanding of an environment [39] and fosters its users' social, cognitive, and emotional development [40], as shown in Figure 3.

What Factors Influence Multisensory Perception?

Robbins, Judge, and Langton (2007), in their book Organizational Behavior: Concepts, Controversies, Applications, state that there are internal and external factors that influence perception [41]. The concept of a perception of public open space was developed based on the interests and satisfaction of users while also considering various internal and external factors [42].

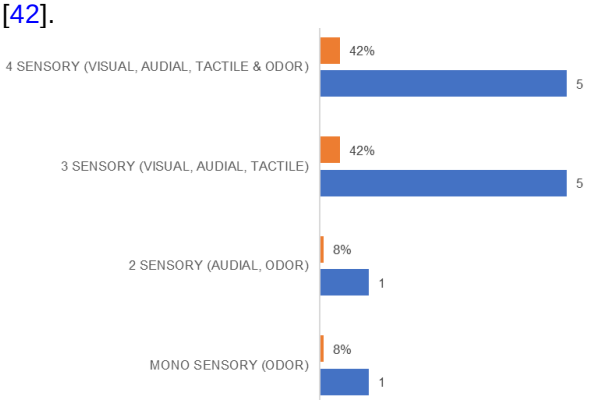

Figure 2. Sensory elements used in multisensory perception research in urban historic areas

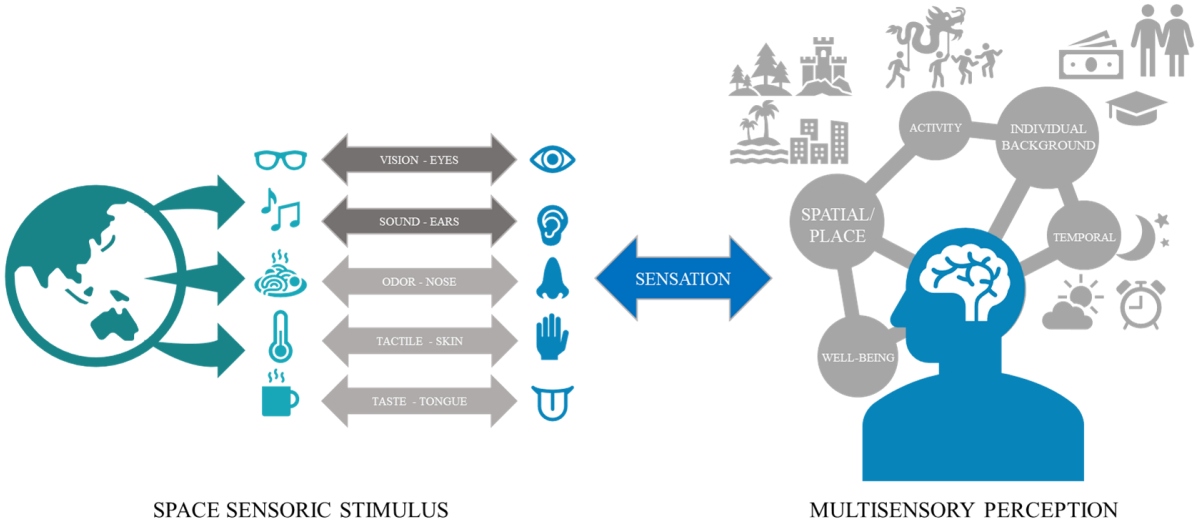

Figure 3. Sensation in the multisensory perception of an environment diagram

Individuals not only respond to multisensory impressions of external stimuli but also to internal judgments that produce multisensory images within themselves [43]. Internal factors have two things that affect perception, namely (1) limited senses and (2) human psychology, while external factors also have two things, namely (1) characteristics of targets/objects and (2) locations and activities [41].

These internal and external factors are the main factors analyzed in many studies of multisensory perception in historic urban areas, such as in Figure 4. Internal factors discuss the individual's proximity to the location of the historic urban areas, the background of the subject, the understanding of the location of the historic urban areas, the physical condition and health of the subject, and the experience of sensing memories of the urban historic areas. In comparison, external factors discuss the spatial characteristics of historic urban areas and the diversity of activities carried out at historic locations.

What are the Types and Classification of Multisensory?

Human senses include sight, hearing, smell, taste, touch, temperature, kinesthesis, balance, synthesis, pain, joints, and muscles [14][34]. According to J. Smith in his book On The Soul (1931), human senses often felt in daily activities include sight, hearing, smell, taste, and touch [45].

Bell (2012) [46], in his book Landscape, Pattern, Perception, and Processing, states that environmental perception is multisensory, which can be classified into the near sense (tactile/touch) and far sense (sight, hearing, and smell) [36][37]. Touch and smell provide information about near space, the space directly around a person's body. The visual and auditory systems can receive data over a broader range or vast geographical area [47]. The visual element in public spaces contributes to urban beautification as visually appealing and engaging spaces [48]. In several studies of multisensory perception in cultural heritage areas, the multisensory classification of far space, namely vision and hearing, is most widely used. The senses of near space, i.e., smell and touch, should be discussed more, as seen in Table 2.

What Approaches, Data Collection, and Analysis Methods Are Used?

Mixed Methods Approach

In the context of multisensory perception research in historic urban areas, researchers looked qualitatively at the influence and assessment of multisensory perception to determine which sensory elements needed to be protected and maintained [37, 40, 41, 44, 48]. Several other researchers looked for multisensory elements that fit the character of urban historic areas [28, 35, 51, 53]. Other researchers validated the assessment quantitatively, measuring and recording sound levels based on decibels, lux of light, and temperature to further strengthen the findings of the initial qualitative assessment results [28][50].

Figure 4. The development of factors (internal and external) of multisensory perception in the context of historic urban areas diagram

Table 2. Classification of multisensory elements in the area of historic urban areas

Element Classification	Uni-sensory	Multisensory
near space	Olfaction [31, 49, 50, 54, 55]; Touch [56]	-
far-space	Hearing [51, 57, 58]; Sight [59]	Hearing and Sight [52][53]
Combined near and far space	-	Hearing and smell [52][53]; Hearing and touch [61]; Hearing, sight, and touch [25, 30, 38, 62, 63]; Hearing, sight, and smell [64][65]; Hearing, sight, smell, and touch [32, 34, 66, 67, 68, 69, 70, 71]; Hearing, sight, smell, touch, and taste [26, 68, 69]

Incorporating qualitative and quantitative approaches into mixed methods has several combinations and objectives. Exploratory mixed methods, a technique widely used in multisensory perception research in urban historic areas, aims to look for previously unknown factors [74] in individuals' relationships with the sensory environment in urban historic areas, as seen in Figure 6.

Data Collection

The use of mixed methods affects the process of collecting sensory data, namely: (1) carried out in the field directly and relying on memory from the user; and (2) conducting document studies and asking for expert opinions assessing the quality of the sensory environment. The goal is to discover the opinions and subjective evaluations of individuals and groups on the perception of the sensory environment in an environment.

To obtain data from direct sensing based on individual memory is carried out by first distributing questionnaires to users of one heritage environment, either with open questions [23, 37, 38, 65], or with closed questions [5, 26, 28, 43, 44, 48, 50, 54, 55, 71], or by combining closed and open questions [37, [56, 63, 68, 72]. The next step is conducting field surveys, which consist of two stages. It starts with assessing perceptions of the sensory environment using direct filling of questionnaires or interviews with users based on what is perceived directly in the field [43, 46, 50, 54, 57, 68]. The final step is to identify areas by foot, measurement, recording, segment division, selection of circulation path patterns, and selection of objects or locations that are considered representative of a particular sensory environment in a heritage area [26, 28, 37, 71, 72, 73].

Researchers collect information from several literature sources and conduct structured interviews with experts to study the appreciation of the sensory environment's quality. This activity aims to create measurement methods, variables, or criteria for assessing individual multisensory perceptions of one environment [26, 55, 74], perceptual responses, and characteristics of multisensory

elements from several previous studies [40, 55, 59].

Discussions and interviews with both users and experts are also carried out to obtain experiences, opinions, or responses related to sensory environment assessments [5, 44, 59, 62], as well as validation of variables or criteria from document or literature reviews that become initial hypotheses [28][55]. These data collection steps depend mainly on the purpose of the study. Figure 7 displays data collection methods for multisensory research in urban historic areas. Multisensory perception research collects data about opinions based on individuals' direct experience in the field through interviews and questionnaires. Measuring sensory sensation data and documenting the quality of the physical environment are considered essential, as shown in Figure 5.

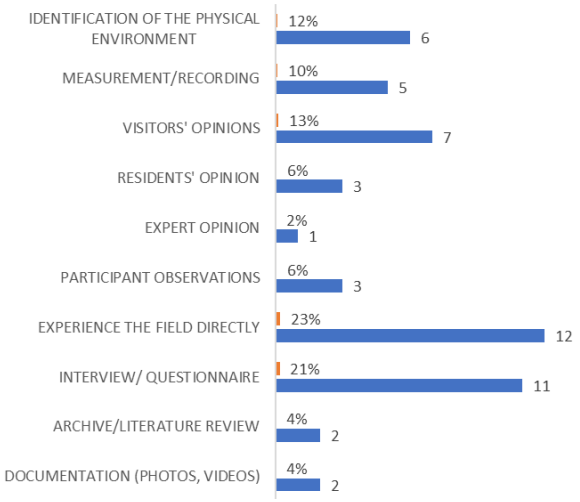

Figure 5. Data set used in multisensory perception research in urban historic areas

Data Analysis

A mixed-methods approach is employed to study multisensory perception within urban historic areas, combining qualitative and quantitative analyses to facilitate the data analysis [44][68]. Researchers use content analysis methods in several qualitative studies to analyze data, including statements and responses regarding the quality of the sensory environment obtained from interviews, document reviews, and literature, as shown in Figure 6. They employ these methods to map and categorize the data.

For quantitative studies, analysis of data such as measurement results and answers to closed-question questionnaires is carried out in two ways: the first is to perform statistical analysis [25], such as ANOVA analysis (Analysis of variance), carried out to determine the significance and difference of two multisensory element assessment data and their context [42][54]. Several researchers use SEM (Structural equation modeling) analysis to measure and analyze the relationship between observed variables and latent variables of multisensory elements or environments that relate to the context [28, 50, 63].

The second method involves conducting laboratory testing using simulations of the sensory environment of one place [48, 50, 60], and field testing by measuring and assessing the perception of multisensory elements by individuals directly at the location of urban historic areas [60]. Researchers carried out stages of analysis on several multisensory studies in urban historic areas, as shown in Figure 8.

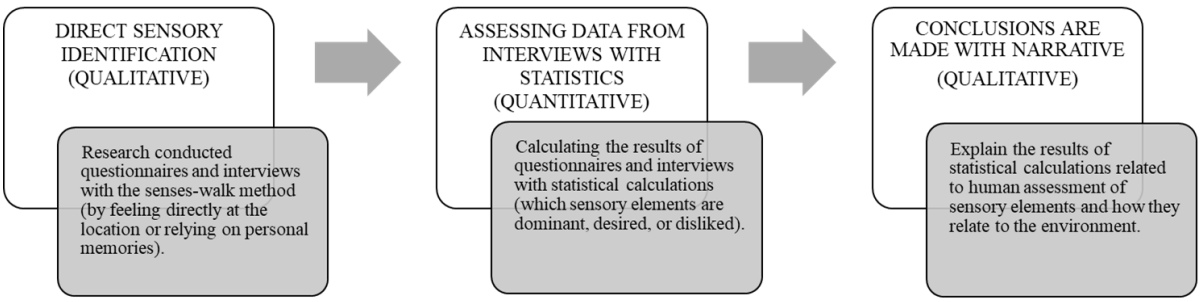

Figure 6. Mixed exploration methods in multisensory research of historic urban areas diagram

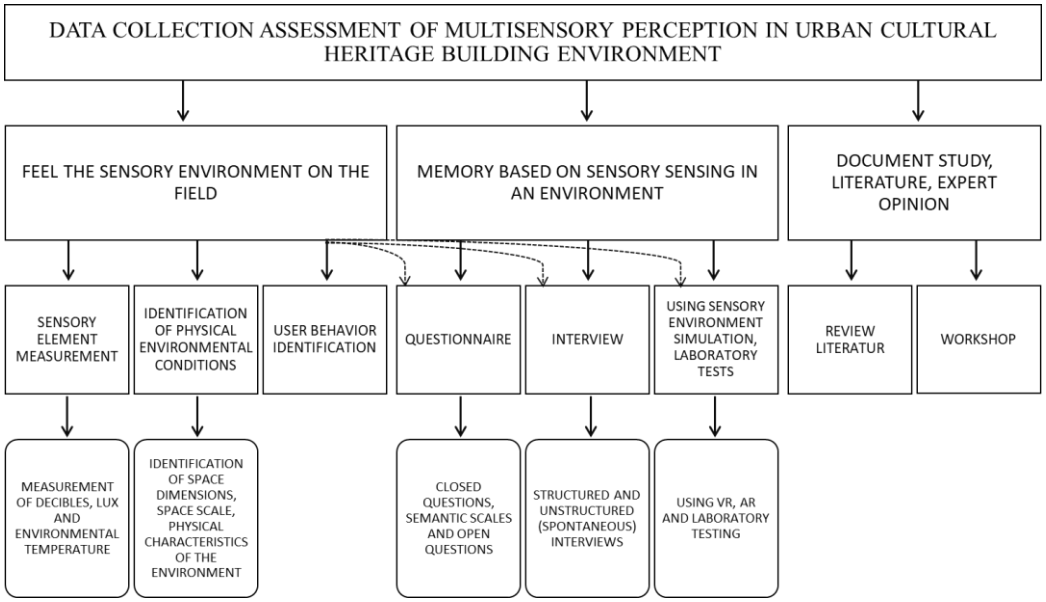

Figure 7. Data collection for multisensory elements diagram

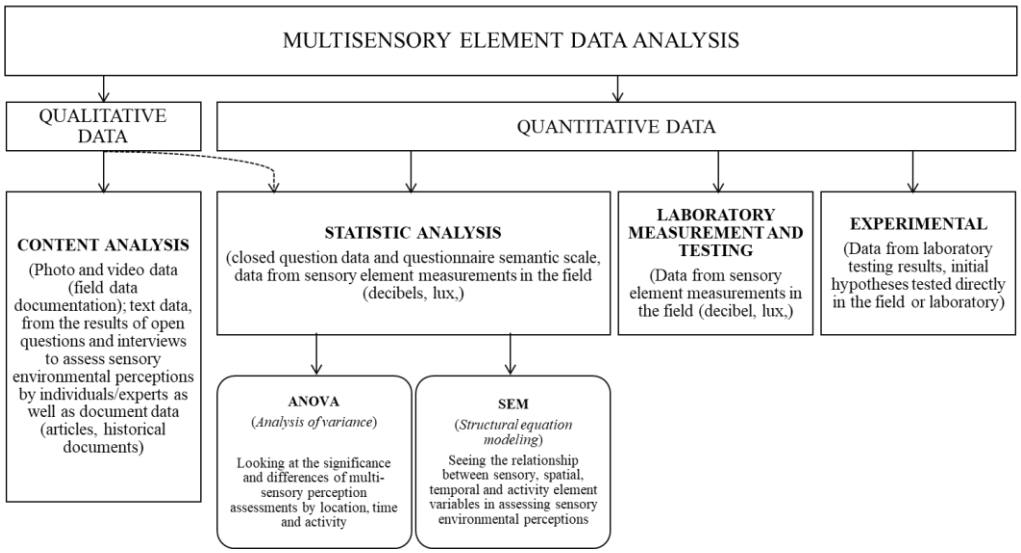

Figure 8. Data analysis for multisensory elements diagram

What Issues Develop in the Discussion of Multisensory Perception Research in Urban Heritage Areas?

In general, the topics that emerge and develop in multisensory perception research in urban heritage contexts are divided into four discussions in Figure 9, consisting of (a) subjects or individuals, (b) spatial, temporal, and activity context, (c) the development of multisensory perception of specific concepts and methods, and (d) the correspondence between sensory elements and the environment.

Subject/individual

Discussion of the influence of individual backgrounds and experiences on perception in the sensory environment is essential in multisensory perception research. Human psychological factors [41], as well as personal traits like age, gender [65], educational background, economic background, social background, and cultural background [61][63], all have an impact on how a person interprets the sensation of this sensory stimulus. An individual's daily experience of sensory perception of an environment significantly influences and contributes to the evaluation of the environmental quality of heritage areas [72].

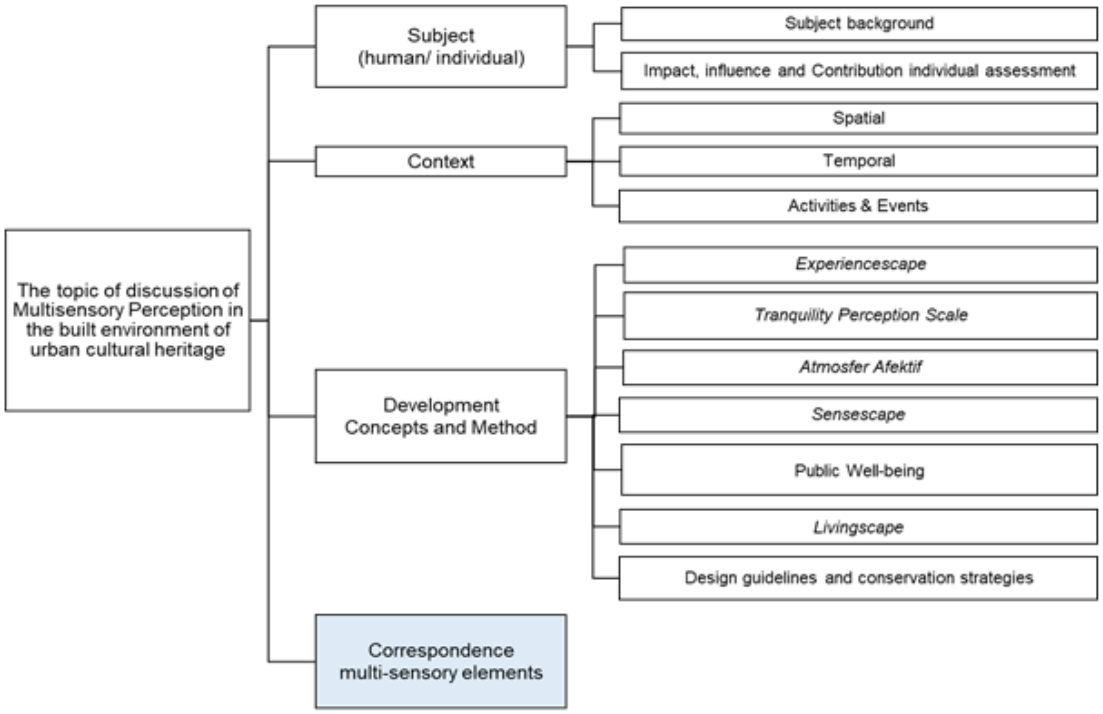

Figure 9. The development of the topic of perception of multisensory elements in the context of an urban heritage diagram

Figure 10. Multisensory topics discussion in the context of urban historic areas

Spatial, temporal, and activity context

A spatial environment's quality and physical arrangement can influence visitors. Behavior and perceived sensory environment assessments [46][75]. Multisensory perception is also influenced by temporal perception [78] and how specific weather conditions (cold and hot) can affect sensory environmental assessments of outdoor activities [45][54]. Sensory environment perceptions of residents'

cultural activities carried out by residents [46][77], and walking activities in one environment [75] will influence individual behavior. The spatial, temporal, and activity context conditions will significantly affect the quality of the multisensory perception assessment of an environment. Each place, time, and activity will provide a different sensory environment.

Development of Multisensory Perception on Certain Concepts and Methods

Multisensory perception is also widely used in developing several concepts and methods to improve the quality of historic areas, especially for their users. Some developments in the idea of multisensory perception of historic urban areas, such as:

- Multisensory perception is part of the experience scale. It is an element of Intangible Cultural Heritage (ICH) that involves the interaction of multisensory perception experiences most felt by users (residents and tourists) as a basis for consideration of cultural heritage area development strategies based on subjects or individuals [79].
- The tranquility perception, or Tranquility Perception Scale (TPS), is an inclusive concept that refers to the desired quality of the environment. It involves paying attention to attractions, activities, and multisensory experiences to create calmness and inner peace [55].
- The concept of affective atmosphere or affective environment refers to the sense generated by the interaction and movement of individuals/humans in specific spaces and places to perceive the space they inhabit based on other activities and actors in that space [80] and also based on visual, aesthetic, social (multiple sensory experiences), and spiritual dimensions [64].
- The concept of sensescape was coined by Porteous (1985), reflecting the idea of a sensory-built environment by extending the range of sensory interaction with a place beyond visual consumption alone. Hence, we can define it as a collection of visualscape, smellscape, tastescape, and hapticscape [24][69].
- The concept of livingscape addresses the environmental quality of open spaces based on multisensory properties and is perceived and assessed together with all sensory, environmental, and cultural aspects [23]. Elements of the living scape include urban blight, environmental sound quality (soundscape), environmental lighting quality (lightscape), quality of ambient temperature (thermalscape), and user response. The living scape methodology can improve urban orientation or assess pleasant and less pleasant spaces for residents and visitors in one area [25].

Correspondence of Sensory and Environmental Elements

Correspondence between multisensory elements, or cross-modal correspondence, refers to systematic perceptions and associations based on interactions between two or more sensory components [79][80]. In general, researchers are interested in the problem of binding multisensory elements, focusing on the role of spatial and temporal factors in modulating the integration of multisensory elements [82]. Research on relationships and correspondence (suitability, compatibility) between multisensory elements (cross modal) in one particular environment still needs to be discussed. Correspondence between multisensory elements, or cross-modal correspondence, refers to the systematic perception and association of the interaction of all sensory factors into the appreciation of one environment at a given location, time, and activity

Issues and discussions surrounding multisensory perception in historic urban areas are inherently interdisciplinary, drawing upon insights from various fields to enhance our understanding of this complex phenomenon. Psychological factors, including individual backgrounds, personal experiences, and preferences, significantly shape multisensory perception [81][82]. Conversely, anthropological perspectives on symbolic meanings, cultural values, and social practices influence how individuals experience and interpret their surroundings [83][84]. By integrating these psychological and anthropological understandings of multisensory perception, architects and urban planners can design more human-centered spaces, landscape elements, and public infrastructure that foster a higher quality of life in historic districts.

The interdisciplinary approach employed in this study fosters a robust synergy among diverse disciplines. Psychology elucidates how individuals process sensory information, urban planning demonstrates how physical space influences perception, and anthropology provides a cultural context for comprehending the meanings and values associated with historic environments.

Given the conditions above, historic urban areas' planning and design process must be sensitive and contextualized. Regardless of the physical context, urban forms, or layouts, understanding multisensory perception will significantly contribute to the research on the planning and design of our living environment. The importance of human sensory experience in urban planning and design and its consequences for urban heritage conservation [87].

CONCLUSION

This article's five questions address the definition of multisensory perception, the factors influencing it, and the commonly used approaches and methods of data collection and analysis. Additionally, it reveals the issues that arise in multisensory perception research in historic urban areas.

The explanation of the definition of multisensory perception in the answer to the first question indicates the importance of extending from visual dominance (monosensory) to a whole-sense approach (multisensory). Expansion of visual dominance can create environmental experiences through direct responses from the sensations of various sensory modalities in experiencing a single event that can optimize spatial understanding.

The subject's background, the place, time, and activity conditions shape spatial understanding based on multisensory perceptions. This understanding provides a comprehensive framework to strengthen the relationship and attachment between individuals and historic urban areas. Increasing an individual's attachment to place is the unification of aspects of an individual's background as internal factors and elements of place, time, and activity as external factors, discussed in the answer to the second question.

Division of categories based on sensory type in answer to the third question, there is a division between far-space elements consisting of hearing and vision and near-space elements, namely smell and touch. However, in understanding multisensory perception, all sensory components will be interconnected, not limited to the categories created, especially in creating attachments between individuals and urban historic areas.

The answer to the fourth question, which discusses the multisensory perception research method approach in urban historic areas, explains the advantages of mixed methods in several studies. The blended approach starts with a qualitative approach that explores how individuals perceive these sensory elements, places, times, and activities based on specific backgrounds. Furthermore, for quality assessment, the quantity of the sensory environment was validated using quantitative approaches as one of the efforts to confirm individual perceptions qualitatively. Both of these approaches require a data collection process by directly feeling and measuring sensory sensations in the field.

In general, according to the answer to the fifth question, researchers are interested in the problem of binding multisensory elements, focusing on the respective roles of spatial and temporal factors in modulating the integration of multisensory elements in one environment [80]. However, it is necessary to discuss further the relationship and correspondence between multisensory elements in a particular domain, which refers to an individual's perception of an environment according to time and activity [79], [80]. It is crucial to consider the involvement of sensory diversity experiences, as the role of different senses in multisensory perceptions varies across different environmental contexts [62].

The growing body of research and discussions on multisensory perception in historic urban areas has increasingly embraced interdisciplinary approaches, drawing insights from various fields to enrich the understanding of this topic recently. For example, integrating psychology, urban planning, and anthropology has enabled a more comprehensive grasp of multisensory perception in historic urban contexts. By incorporating perspectives from diverse disciplines, valuable contributions can be made to the design, management, and interpretation of historic areas, ultimately enhancing the quality of life and experiences for visitors and residents.

Overall, multisensory perception research in historic urban areas or urban heritage studies aligns with expanding discourse and ways of thinking about management processes oriented towards public perception (subject-based) for appreciating non-physical aspects (intangible) of historic urban areas. Multisensory perception is a direct response to an environment that changes based on an individual's background and the sensations all his senses feel. Immediate reactions to the individual's perceptions greatly influence the appreciation and experience of a sense of place. Multisensory perception can be potentially an important tool for reading and understanding a single environment and contributing to the

planning and design of historic urban areas (Figure 10).

Public perception based on sensory experience dramatically influences the positive appreciation of an urban historic environment. Therefore, future research can identify and explain the relationships and influences between multisensory, spatial, temporal, and individual elements in appreciating an urban historic environment. Additionally, only examining twelve selected articles, this research cannot fully capture the breadth of the discussion on multisensory perception research in historic urban areas. It is necessary to increase the number of articles and update the analyzed articles based on the year of publication.

REFERENCES

[1] D. Batchelor, M. A. Schnabel, and M. Dudding, "Smart heritage: Defining the discourse," *Heritage*, vol. 4, no. 2, pp. 1005–1015, 2021, doi: 10.3390/heritage4020055.

[2] W. Martokusumo, "The notion of authenticity revisited a search for urban heritage conservation approach," *J. Tataloka*, vol. 13, no. 3, pp. 181–189, 2011.

[3] L. Smith, *Uses of Heritage*. Routledge Taylor & Francis Group, 2006.

[4] N. Gutschow and K. Weiler, *Authenticity in Architectural Heritage Conservation*. Springer Cham, 2017.

[5] W. Martokusumo *et al.*, "Soundcsape and the Understanding of Historic Districts in Bandung," *Tataloka*, vol. 21, no. 2, p. 371, 2019, doi: 10.14710/tataloka.21.2.371-380.

[6] E. Septianto et al., "Multi-sensory in the conception of place in an urban cultural heritage environment," *ARTEKS*, vol. 8, no. 2, pp. 271–282, 2023, doi: 10.30822/arteks.v8i2.2147.

[7] UNESCO Bangkok, "Hoi An Protocols for Best Conservation Protocols," 2005.

[8] T. Chung, "Valuing Heritage in Macau: On Contexts and Processes of Urban Conservation," *J. Curr. Chinese Aff.*, vol. 38, no. 1, pp. 129–160, 2009, doi: 10.1177/186810260903800107.

[9] C. P. Kubontubuh, "Model Konseptual Pelestarian Berbasis Kawasan Bagi Cagar Budaya Tak Utuh, Studi Kasus: Kawasan Ibu Kota Majapahit di Trowulan, Jawa Timur," Institut Teknologi Bandung, 2021.

[10] S. Chung, "East Asian Values in Historic Conservation East Asian Values in Historic," *J. Archit. Conserv.*, vol. 11, no. 1, pp. 55–70, 2016, doi: 10.1080/13556207.2005.10784935.

[11] T. Kwanda, "Western Conservation Theory and the Asian Context: The Different Roots of Conservation," *Int. Conf. Herit. Asia Converging Forces Conflicting Values*, no. January, pp. 1–18, 2009.

[12] M. de la Torre, *Assessing the Values of Cultural Heritage : Research Report The Getty Conservation Institute, Los Angeles*, vol. 50, no. 2. 2002.

[13] J. C. Wells, "Valuing Historic Places: Traditional and Contemporary Approaches," in *School of Architecture, Art, and Historic Preservation*, 2010, pp. 1–15.

[14] E. Jarecka and Bidzińska, "Hybrid methodology of multi-sensory research of public space in urban planning," *Bud. i Archit.*, vol. 20, no. 2, pp. 95–115, 2021, doi: 10.35784/bud-arch.2198.

[15] R. Jigyasu, "Issues and Challenges on Risk Preparedness for Cultural Heritage Cultural," India, 1998.

[16] B. Boudiaf, "A Balance between Commercial Development , Tourism Requirements And Historic Preservation .," *Int. J. Eng. Res. Dev.*, vol. 12, no. 6, pp. 1–21, 2016.

[17] K. Taylor and J. L. Lennon, *Managing Cultural Landscapes*, 1st ed. Ney York: Routledge, 2012.

[18] S. Ouf, "Authenticity and the sense of place in urban design," *J. Urban Des.*, vol. 6, no. 1, pp. 73–86, 2001, doi: 10.1080/13574800120032914.

[19] W. Martokusumo, "Orasi Ilmiah Guru Besar: Arsitektur dan Pelestarian Menuju Pengelolaan Berkelanjutan Bangunan dan Lingkungan Cagar Budaya," Bandung, Indonesia, 2015.

[20] S. Rahardjo, "Beberapa Permasalahan Pelestarian Kawasan Cagar Budaya Dan Strategi Solusinya," *J. Konserv. Cagar Budaya*, vol. 7, no. 2, pp. 4–17, 2013, doi: 10.33374/jurnalkonservasicagarbudaya.v7i2.109.

[21] I. Bentley, A. Alcock, P. Murrain, S. McGlynn, and G. Smith, *Responsive environments. A manual for designers*, vol. 15, no. 3–4. 1985.

[22] M. Carmona, S. Tiesdell, T. Heath, and T. Oc, *Public Place Urban Space*, Second. Oxford UK: Architectural Press is an Imprint of Elsevier, 2010.

[23] F. La Malva et al., "Livingscape multi-sensory experience in urban historical places: subjective assessment from the local people and quality of the urban environment," *J. Temporal Des. Archit. Environ.*, vol. 11, pp. 25–29, 2011.

[24] N. Bruce et al., "Analysing olfactory and

auditory sensescapes in English cities: Sensory expectation and urban environmental perception," *Ambiances Environ. sensible, Archit. Espac. urbain*, 2015, doi: 10.4000/ambiances.560.
[25] F. La Malva et al., "Livingscape: A multi-sensory approach to improve the quality of urban spaces," *Energy Procedia*, vol. 78, pp. 37–42, 2015, doi: 10.1016/j.egypro.2015.11.111.
[26] C. Vasilikou, "Sensory Navigation in the City Centre . Perceptual paths , sense walks and interactive atmospheres," in *Proceedings of 3rd International Congress on Ambiances*, 2016, pp. 559–564.
[27] D. Choudhury, "Sensory Experience of Architecture : Creating Meaningful Spaces," *Int. J. Res. Civ. Eng. Archit. Des.*, vol. 4, no. 3, pp. 65–73, 2016.
[28] T. González et al., "Urban multisensory laboratory, an approach to model urban space human perception," in *2nd International Conference on Smart Data and Smart Cities*, 2017, vol. XLII-4/W3, pp. 29–35, doi: 10.5194/isprs-archives-XLII-4-W3-29-2017.
[29] T. Zhang, J. Liu, and H. Li, "Restorative effects of multi-sensory perception in urban green space: a case study of urban park in Guangzhou, China," *Int. J. Environ. Res. Public Health*, vol. 16, no. 24, 2019, doi: 10.3390/ijerph16244943.
[30] N. P. A. Nitidara et al., "The human perception based on memory recall of the multi-sensory stimuli in outdoor urban space," *Proc. Int. Congr. Acoust.*, vol. 2019, pp. 7940–7945, 2019, doi: 10.18154/RWTH-CONV-239883.
[31] M. Wojnarowska et al., "Odour nuisance and urban residents' quality of life: A case study in Kraków's in Plaszow district," *Urban Clim.*, vol. 34, 2020, doi: 10.1016/j.uclim.2020.100704.
[32] S. Boumezoued, Y. Bada, and H. Bougdah, "Pedestrian itinerary choice: between multi-sensory, affective and syntactic aspects of the street pattern in the historic quarter of Bejaia, Algeria," *Int. Rev. Spat. Plan. Sustain. Dev. A Plan. Strateg. Des. Concepts*, vol. 8, no. 4, pp. 91–108, 2020, doi: 10.14246/irspsda.8.4_91.
[33] N. Muleya and M. Campbell, "A multisensory approach to measure public space quality in the city of Bulawayo, Zimbabwe," *T. Reg. Plan.*, vol. 76, no. 76, pp. 56–71, 2020, doi: 10.18820/2415-0495/trp76i1.5.
[34] J. Samadi, D. Sattarzadeh, and L. B. Asl, "Qualitative Assessment of the Sensory Dimensions of Space in Historical Bazaars from the Users' point of view (Case Study: Qazvin Bazaar)," *Bagh-e Nazar*, vol. 16, no. 81, pp. 15–30, 2020, doi: 10.22034/bagh.2019.168924.3972.
[35] K. Lynch, *The Image of the City*. Cambride, Massachusetts USA: The Technology Press & Harvard University Press, 1960.
[36] M. M. Ponty, *Phenomenology of Perception*. New York, USA: Taylor & Francis or Routledge's, 2002.
[37] R. Lucas and O. Romice, "Assessing the Multi-Sensory Qualities of Urban Space: A methodological approach and notational system for recording and designing the multi-sensory experience of urban space," *Psyecology*, vol. 1, no. 2, pp. 263–276, 2010, doi: 10.1174/217119710791175678.
[38] H. Shahhosseini et al., "Influence of non-visual factors on visual preferences of visitors to small urban parks in Tabriz, Iran," *PhD Thesis*, Universiti Putra Malaysia. 2013.
[39] B. Piga and E. Morello, "Environmental design studies on perception and simulation: an urban design approach," *Ambiances Environ. sensible, Archit. Espac. urbain*, vol. 1, 2015, doi: 10.4000/ambiances.647.
[40] C. Spence, "Senses of place: architectural design for the multisensory mind," *Cogn. Res. Princ. Implic.*, vol. 5, no. 1, 2020, doi: 10.1186/s41235-020-00243-4.
[41] N. Langton, S. P. Robbins, and T. A. Judge, *Organizational Behaviour: Concepts, Controversies, Applications*, 7th ed. Toronto: Pearson, 2016.
[42] M. A. Tahir, "Assessing the performance of the pedestrian path accessibility standards for people with disabilities," *SINERGI*, vol. 28, no. 3, pp. 669–684, 2024, doi: 10.22441/sinergi.2024.3.022.
[43] D. Agapito, J. Mendes, and P. Valle, "Exploring the conceptualization of the sensory dimension of tourist experiences," *J. Destin. Mark. Manag.*, vol. 2, no. 2, pp. 62–73, 2013, doi: 10.1016/j.jdmm.2013.03.001.
[44] B. L. Keeley, "Making Sense of the Senses: Individuating Modalities in Humans and Other Animals," *J. Philos.*, vol. 99, no. 1, pp. 5–28, 2002.
[45] M. Ba and J. Kang, "A laboratory study of the sound-odour interaction in urban environments," *Build. Environ.*, vol. 147, no. January 2019, pp. 314–326, 2019, doi: 10.1016/j.buildenv.2018.10.019.
[46] S. Bell, *Landscape: Pattern, Perception and Process*, 2nd ed. Routledge Taylor & Francis Group, 2012.
[47] J. Daly, L. M. Farahani, T. Hollingsbee, and

R. Ocampo, “Measuring Human Experiences of Public Spaces: A Methodology in the Making,” *Conscious Cities Anthol.*, vol. 1, 2016, doi: 10.33797/ccj.01.01.
[48] W. Sahabuddin and A. Hildayanti, “Visual communication in public space through mural art in Makassar, Indonesia,” *SINERGI*, vol. 28, no. 1, pp. 83–92, 2024, doi: 10.22441/sinergi.2024.1.009.
[49] C. Bembibre and M. Strlič, “Smell of heritage: A framework for the identification, analysis and archival of historic odours,” *Herit. Sci.*, vol. 5, no. 1, pp. 1–11, 2017, doi: 10.1186/s40494-016-0114-1.
[50] L. Davis and L. T. Şenocak, “Heritage and scent: research and exhibition of Istanbul’s changing smellscapes,” *Int. J. Herit. Stud.*, vol. 23, no. 8, pp. 723–741, 2017, doi: 10.1080/13527258.2017.1317646.
[51] L. Jiang et al., “How do shared-street design and traffic restriction improve urban soundscape and human experience? An online survey with virtual reality,” *Build. Environ.*, vol. 143, pp. 318–328, 2018.
[52] M. Leus, “The soundscapes of Antwerp: A study on the acoustic genius loci,” *Energy Procedia*, vol. 78. pp. 25–30, 2015, doi: 10.1016/j.egypro.2015.11.109.
[53] H. I. Jo and J. Y. Jeon, “Overall environmental assessment in urban parks: Modelling audio-visual interaction with a structural equation model based on soundscape and landscape indices,” *Build. Environ.*, vol. 204, p. 108166, 2021, doi: 10.1016/j.buildenv.2021.108166.
[54] E. A. Nur Belkayali, “Effect of Smell in Historical Environments,” in *New Trends and Issues Proceedings on Humanities and Social Sciences*, 2017, vol. 4, no. 11.
[55] M. Ramazanova and I. V. de Freitas, “Landscape smells and intangible heritage: The porto city,” in *Conference: 4th International Conference on Tourism Research ICTR 2021*, 2021, pp. 451–459, doi: 10.34190/IRT.21.113.
[56] K. Saito, I. Said, and M. Shinozaki, “Evidence-based neighborhood greening and concomitant improvement of urban heat environment in the context of a world heritage site - Malacca, Malaysia,” *Comput. Environ. Urban Syst.*, vol. 64, pp. 356–372, 2017, doi: 10.1016/j.compenvurbsys.2017.04.003.
[57] S. Alves et al., “Exploring the soundscape and the atmosphere of the Gigli di Nola cultural festival in Italy,” *Emot. Sp. Soc.*, vol. 41, p. 100848, 2021, doi: /10.1016/j.emospa.2021.100848.
[58] W. Renel, “Sonic accessibility: Increasing social equity through the inclusive design of sound in museums and heritage sites,” *Curator Museum J.*, vol. 62, no. 3, pp. 377–402, 2019, doi: 10.1111/cura.12311.
[59] D. la F. Suárez and L. Alfonso, “Subjective experience and visual attention to a historic building: A real-world eye-tracking study,” *Front. Archit. Res.*, vol. 9, no. 4, pp. 774–804, 2020, doi: 10.1016/j.foar.2020.07.006.
[60] M. Ba, J. Kang, and Z. Li, “The effects of sounds and food odour on crowd behaviours in urban public open spaces,” *Build. Environ.*, vol. 182, p. 107104, 2020, doi: 10.1016/j.buildenv.2020.107104.
[61] Y. Jin, H. Jin, and J. Kang, “Combined effects of the thermal-acoustic environment on subjective evaluations in urban squares,” *Build. Environ.*, vol. 168, 2020, doi: 10.1016/j.buildenv.2019.106517.
[62] M. Hu *et al.*, “Development of tranquility perception scale: From tourists’ perspective,” *J. Hosp. Tour. Manag.*, vol. 49, pp. 418–430, 2021, doi: 10.1016/j.jhtm.2021.10.008.
[63] N. F. Villalobos and M. P. Cazorla, “Perception and wayfinding at Cultural Sites,” *Int. J. Vis. Des.*, vol. 12, no. 4, pp. 19–34, 2018, [Online]. Available: https://riunet.upv.es/handle/10251/123854.
[64] H. Abusaada and A. Elshater, “Effect of people on placemaking and affective atmospheres in city streets,” *Ain Shams Eng. J.*, vol. 12, no. 3, pp. 3389–3403, 2021, doi: 10.1016/j.asej.2021.04.019.
[65] A. Marto, M. Melo, A. Goncalves, and M. Bessa, “Multisensory Augmented Reality in Cultural Heritage: Impact of Different Stimuli on Presence, Enjoyment, Knowledge and Value of the Experience,” *IEEE Access*, vol. 8, pp. 193744–193756, 2020, doi: 10.1109/ACCESS.2020.3032379.
[66] B. S. Bergner *et al.*, “Human Sensory Assessment Methods in Urban Planning - A Case Study in Alexandria,” in *Conference: REAL CORP 2013*, 2013, pp. 407–417.
[67] T. Dai and X. Zheng, “Understanding how multi-sensory spatial experience influences atmosphere, affective city image and behavioural intention,” *Environ. Impact Assess. Rev.*, vol. 89, 2021, doi: 10.1016/j.eiar.2021.106595.
[68] M. M. Degen and G. Rose, “The Sensory Experiencing of Urban Design: The Role of Walking and Perceptual Memory,” *Urban Stud.*, vol. 49, no. 15, pp. 3271–3287, 2012, doi: 10.1177/0042098012440463.

[69] D. E. Gallou, "Heritage and pathways to wellbeing: from personal to social benefits, between experience identity and capability shaping," *Wellbeing, Sp. Soc.*, p. 100084, 2022, doi: 10.1016/j.wss.2022.100084.
[70] A. Marto, A. Goncalves, and M. Bessa, "The Scope of Multisensory Experiences in Cultural Heritage Sites," 2018, doi: 10.1109/ITCGI.2018.8602968.
[71] C. Vasilikou, "Multi-sensory navigation in a heritage city: walking atmospheres of community well-being in Canterbury," *J. Biourbanism*, vol. VII, no. 1, pp. 13–24, 2019.
[72] D. Agapito, P. Valle, and J. Mendes, "The sensory dimension of tourist experiences: Capturing meaningful sensory-informed themes in Southwest Portugal," *Tour. Manag.*, vol. 42, pp. 224–237, 2014, doi: 10.1016/j.tourman.2013.11.011.
[73] D. Buzova, S. Sanz-Blas, and A. Cervera-Taulet, "'Sensing' the destination: Development of the destination sensescape index," *Tour. Manag.*, vol. 87, 2021, doi: 10.1016/j.tourman.2021.104362.
[74] J. W. Creswell and V. L. P. Clark, *Designing and Conducting Mixed Methods Research*, Third Edit. SAGE Publications Ltd., 2018.
[75] T. Campisi et al., "Evaluation of walkability and mobility requirements of visually impaired people in urban spaces," *Res. Transp. Bus. Manag.*, vol. 40, p. 100592, 2021, doi: 10.1016/j.rtbm.2020. 100592.
[76] F. La Malva, V. R. M. Lo Verso, and A. Astolfi, "Livingscape: A Multi-sensory Approach to Improve the Quality of Urban Spaces," *Energy Procedia*, vol. 78, pp. 37–42, 2015, doi: 10.1016/j.egypro.2015.11.111
[77] P. Mercader-Moyano, M. Flores-García, and A. Serrano-Jiménez, "Housing and neighbourhood diagnosis for ageing in place: Multidimensional Assessment System of the Built Environment (MASBE)," *Sustain. Cities Soc.*, vol. 62, p. 102422, 2020, doi: 10.1016/j.scs.2020.102422.
[78] D. K. Hassan and A. Elkhateeb, "Walking experience: Exploring the trilateral interrelation of walkability, temporal perception, and urban ambiance," *Front. Archit. Res.*, vol. 10, no. 3, pp. 516–539, 2021, doi: 10.1016/j.foar.2021.02.004.
[79] Z. Chen, W. Suntikul, and B. King, "Constructing an intangible cultural heritage experiencescape: The case of the Feast of the Drunken Dragon (Macau)," *Tour. Manag. Perspect.*, vol. 34, 2020, doi: 10.1016/j.tmp.2020.100659.
[80] D. Lupton, "How does health feel? Towards research on the affective atmospheres of digital health," *Digit. Heal.*, vol. 3, pp. 1–11, 2017, doi: 10.1177/2055207617701276.
[81] C. V. Parise, "Crossmodal correspondences: Standing issues and experimental guidelines," *Multisens. Res.*, vol. 29, no. 1–3, pp. 7–28, 2016, doi: 10.1163/22134808-00002502.
[82] C. Spence, "Crossmodal correspondences: A tutorial review," *Attention, Perception, Psychophys.*, vol. 73, no. 4, pp. 971–995, 2011, doi: 10.3758/s13414-010-0073-7.
[83] S. I. Quintero, L. Shams, and K. Kamal, "Changing the Tendency to Integrate the Senses," *Brain Sci.*, vol. 12, no. 10, pp. 1–18, 2022, doi: 10.3390/brainsci12101384.
[84] P. Chen, A. Chung-Fat-yim, and V. Marian, "Cultural Experience Influences Multisensory Emotion Perception in Bilinguals," *Languages*, vol. 7, no. 1, pp. 1–17, 2022, doi: 10.3390/languages7010012.
[85] N. Haenn, R. R. Wilk, and A. Harnish, *The Environment in Anthropology (Second Edition) A Reader in Ecology, Culture, and Sustainable Living*, 2nd ed. NYU Press, 2016.
[86] O. C. V.-G. José G. Vargas-Hernandez, Jorge H. Zamudio-Abdala, "Anthropological Perspective of the Implications Between the Environment and Sustainability," in *Intersecting Health, Livability, and Human Behavior in Urban Environments*, IGI Global, 2023, pp. 22–41.
[87] E. Septianto, H. W. Poerbo, Firmansyah, and W. Martokusumo, "Understanding the attractiveness of types of historic districts in Bandung: implementing heritage conservation based on public perception," *J. Asian Archit. Build. Eng.*, pp. 1–16, 2024, doi: 10.1080/13467581.2024.2397111.