
Exploring Public Perceptions of Urban Resilient Design: Insights from Mental Mapping

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Abstract

Urban resilient design is a crucial strategy in urban sustainable development, which needs to be understood by the public. However, misunderstandings surrounding resilient design often impede its effective implementation and impact. This study explores public perceptions of urban resilient design characteristics and the factors influencing such perceptions. Through interviews and mental mapping of 14 participants between the ages of 18 and 65, the study was analysed based on landscape perception theory, combined with mental mapping and field interviews. Our findings reveal personalised painting mechanisms influenced by subjective factors and explore participants' experiences and feelings in depicting natural and built elements, as well as route reviews. The results highlight how participants' perception of resilient design manifested itself in the routes and key elements they described, with subjective factors such as age, identity and familiarity playing a key role. Moreover, the study describes how experience shapes public perceptions of robustness, adaptability, redundancy, efficiency, and connectivity, while familiarity influences perceptions of diversity and modularity. Based on these insights, the study proposes strategies to optimise resilient design characteristics, which have important implications for promoting sustainable urban development.

Keywords:

Urban resilient design,
Public perception,
Sustainable development,
Mental mapping, Field
interviews

Article History

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1. INTRODUCTION

The urban resilient design addresses challenges stemming from unplanned urban growth and rapid urbanisation, congestion problems, limited space with high population density, and inadequate supply of basic elements (Deponte et al., 2020; Jayakody et al., 2016; Sepe, 2021; Stevens et al., 2021). Previous research has noted that urban resilient design comprises seven characteristics applicable to physical elements: robustness, adaptability, efficiency, diversity, connectivity, redundancy, and modularity (Davoudi et al., 2013; Feliciotti et al., 2016; Lak et al., 2020; Mehmood, 2016; Ribeiro & Gonçalves, 2019; Samuelsson et al., 2019; Sharifi, 2019a, 2019b, 2019c; Stevens et al., 2021).

Robustness refers to enhancing the durability and resilience of buildings, roads, and urban infrastructure to withstand various challenges, such as emergencies, and long-term usage, while maintaining their stability and functionality. This is achieved through stricter building regulations, multifunctional design, and green spaces that improve safety, traffic flow, and community cohesion (Davoudi et al., 2013; Mehmood, 2016). Adaptability refers to systems that can better respond to both short- and long-term challenges, such as traffic congestion and environmental changes. This is achieved through hierarchical infrastructure and multifunctional roads that adjust to varying needs, encouraging more interaction opportunities (Anzoise et al., 2020; Sharifi, 2019b). Efficiency refers to the optimal utilisation of urban resources by minimising waste and enhancing operational performance. This is achieved through high-density development and mixed land use, optimising energy consumption and reducing transit demands (Ribeiro & Gonçalves, 2019; Sharifi, 2019a). Diversity refers to the spatial heterogeneity of urban environments, where different functions, styles, and uses coexist, fostering inclusivity and vibrancy. This enables different groups to interact and engage in diverse urban activities, fostering a more dynamic and accessible environment (Feliciotti et al., 2016; Mehta & Bosson, 2021). Connectivity refers to the integration of buildings, roads, and public spaces, enhancing accessibility and efficiency. A grid layout, for example, optimises traffic flow, reduces detours, and improves walkability and cycling convenience. Strong connectivity also facilitates smooth movement between residential, commercial, and recreational areas, contributing to a more efficient and accessible urban environment (Samuelsson et al., 2019). Redundancy refers to the backup capacity of urban infrastructure, ensuring system functionality despite component failures. For example, multiple road connections to the same area prevent disruptions if one route is blocked (Allan et al., 2013; Lak et al., 2020). Modularity refers to the standardisation and repeatability of infrastructure, allowing for flexible adaptation to spatial needs. For example, movable facilities allow for rapid functional adjustments (Sharifi, 2019c).

While urban resilient design can mitigate urban vulnerabilities and potential hazards, there remains a gap in public understanding of resilient urban design. More precisely, the urban landscape presented by resilient design is not yet clearly recognised by the public. Neglect and misunderstanding of urban resilient design often result in adverse outcomes, hindering the effective implementation of urban resilient design. Furthermore, urban resilient design, as a part of the landscape, currently lacks exploration into how different individuals perceive it and how subjective factors influence their perceptions of urban resilient design. Therefore, the objective of this study is to explore the public's perceptions of urban resilient design characteristics and the subjective factors influencing these perceptions.

2. LITERATURE REVIEW

According to landscape perception theory, subjective factors such as expectations, experiences and motivations have been identified as influencing perception (Zube et al., 1982). Individual attributes, such as age, gender, occupation, and experience. These particular attributes affect how people perceive and understand the landscape. Different age groups may provide different perceptions and preferences; for example, young people are highly willing to convey perceptual information (Palacio Buendía et al., 2021), whereas gender can lead to distinct perceptual patterns, such as females being more prone to spatial orientation distortions than males (Lee et al., 2017). Compared to males, females are greater

concerned with spatial safety (Zumelzu et al., 2022). The influence of occupation on landscape perception is that individuals pay more attention towards landscapes that are relevant or interesting to them (Santoro et al., 2021).

Ribeiro (2014) defined experience as the foundation where individual perceptions are formed, with perception being the outcome of interactions among individual experiences, the physical attributes of perceptual scenes and the context. Furthermore, given the differences in individuals' experiences, perceptions are diverse and evolve (Vedrédi, 2014), highlighting the profound impact of experience on perception formation. Individual experiences can be shaped by various factors, including cultural backgrounds from different living environments and direct personal experiences. The influence of cultural backgrounds leads individuals to develop diverse interests, thus impacting perceptual differences (Hunziker, 1995), such as physical elements relevant to their lives are considered significant, and vice versa (Iacopino et al., 2022). Past living environments and experiences affect human perception and consciousness. For example, older individuals who have experienced landscape changes tend to prefer artificial landscapes, whereas younger individuals prefer natural landscapes (Luo et al., 2019).

Building on this, when a region undergoes functional or other changes, groups from different cultural and geographical backgrounds perceive these changes differently. Cultural values shape individual attitudes, leading long-term residents in traditional areas to develop a deeper understanding of local traditions and symbolic meanings. As a result, they are more inclined to preserve traditions and may resist change. In contrast, groups with more modern and dynamic perspectives tend to adopt a more open attitude, favouring adaptations that align with contemporary development trends. Furthermore, different living environments influence usage habits and functional expectations. For instance, residents prioritise maintaining the original functions of an area, whereas outsiders are more likely to support market-driven transformations and developments (Crouch, 1990).

However, within the variables relevant to this study, experience also includes factors such as contact time and familiarity. For example, a longer contact time enhances individuals' sense of belonging, thereby strengthening their perception of environmental changes (Nunta & Sahachaisaeree, 2012; Palacio Buendía et al., 2021).

3. METHODOLOGY

The case studies, Yongqing Fang I and Yongqing Fang II, located in an old town in the Yuexiu District of Guangzhou City, Guangdong Province, China, were once the economic centre of the city. However, economic activities have shifted elsewhere, leading to the area's decline despite the preservation of ancient architecture and historical remnants. These cases were selected for their demonstration of urban resilience through policies aimed at revitalising the region while preserving its cultural and spatial structure. Yongqing Fang serves as public open spaces that attract a diverse range of groups, providing an opportunity to study mental mapping and public perception of urban resilient design.

The target population for this study consisted of healthy adults residing, working, or engaging in leisure activities within Yongqing Fang, Guangzhou. The sampling method employed was purposive rather than random. Through maximum variation sampling, individuals were intentionally selected to encompass the broadest diversity, thereby enriching the depth and diversity of the research (Johnson & Christensen, 2015). The sampling criteria excluded vulnerable groups, such as minors under 18 years of age, elderly individuals over 65, and those who were disadvantaged physically, mentally or socially.

This study employs snowball sampling and maximum variation sampling for selecting interview participants. Participants were recruited through the researcher's network and referrals from previous participants. To meet the selection criteria, participants had to be healthy adults with prior experiences of engaging in activities within Yongqing Fang. Additionally, to ensure a balanced age distribution, the

study included participants from four age groups: 18–29, 30–39, 40–49, and 50–65 years old. The participants' occupational backgrounds were initially screened and categorised to ensure representation from diverse professional sectors. Based on prior research on interview sample saturation (Boddy, 2016; Guest et al., 2006; Morse, 2000), this study ultimately determined a sample size of 14 participants. The participants consisted of six males and eight females, aged between 18 and 65, with a majority over 50 years old classified as the older group. Their occupations were categorised into six types: law enforcement and public safety-related, education-related, business-related, planning-related, student, and retired, reflecting diverse professional backgrounds. Participants were coded by occupation, gender, and age.

This study collected data through qualitative interviews, incorporating mental maps to help participants reflect on the interview topics. Mental maps are powerful tools for understanding how individuals construct cognitive structures about a place or theme based on their experiences and perceptions. They assist researchers in examining the relationship between individuals and their environments, often closely intertwined with the interview process (Giesecking, 2013). Mental maps also enable researchers to gain a profound understanding of participants' thought processes, cognitive structures, and personal experiences, thereby yielding more in-depth, comprehensive, and rich research data (Showkat & Parveen, 2017). Through mental maps, it becomes possible to illustrate each individual's focal points and details of interest, with the identification of 'hubs' in participants' mental maps representing crucial areas of significance (Catney et al., 2019).

Before the interviews, participants were invited to tour the area together with researchers, allowing them to familiarise themselves with the environment and recall their past experiences. The interviews were conducted in a semi-structured format, ensuring a balance between guided discussions and open-ended responses. Questions covered participants' perceptions of the area's resilience-related design elements, their experiences engaging with the space, and any changes they had noticed over time. Each interview took place in a quiet and comfortable setting. With participants' consent, all interviews were audio-recorded to ensure accuracy in data collection, and researchers took supplementary notes to capture non-verbal cues and contextual details. Following the interviews, participants were instructed to draw mental maps using A4 paper, a pencil, and an eraser provided by the researchers. They were encouraged to freely sketch their impressions of the area, including landmarks, buildings, and routes taken, using symbols or words as needed, without any time constraints. During the process of map drawing, the researcher instructed participants to describe each element they depicted and asked them for details about their activities in the area. For participants who had visited the area multiple times, the researcher also inquired about changes observed in the area. These questions helped participants recall specific details of the space, thereby further enriching their mental maps.

The analysis of the mental maps in this study followed the framework proposed by Giesecking (2013), which categorises the analysis into four components: Mechanics of method, drawing elements, narratives of place, and personalisation.

Mechanics of method encompasses participants' demographic backgrounds, their approach and focus while creating the maps, and the technical methods employed in their creation. Drawing elements analyses how mental maps convey information, including the proportions of depicted elements and the symbolic use of colours to denote specific meanings. Narratives of place integrate Lynch's (1960) established categories of districts, edges, nodes, landmarks, and paths. These components elucidate the intersection of physical, remembered, and imagined spaces in the construction of place, reflecting its simultaneous conception, perception, and lived experience. Personalisation explores aspects likely to unveil participants' profound experiences and emotional connections. For example, significant personal meanings often attach to the initial and concluding elements drawn on the maps.

The mental map analysis framework employed in this study is a well-established method that has been widely applied in research on spatial cognition and environmental perception, thereby ensuring its content validity. The framework comprises 57 available analytical techniques and components. To

ensure its applicability to the analysis of resilient urban design in this study, 44 of these techniques were selected, while 13 irrelevant components were excluded (see Table 1). These modifications were made based on a comprehensive literature review and expert discussions to maintain the framework's effectiveness in measuring public spatial perception. Furthermore, to verify the accuracy of the mental map analysis, the results were cross-checked with interview data, revealing a high degree of consistency between the spatial features depicted by participants—such as landmarks, pathways, and spatial changes—and their descriptions in the interviews. Additionally, during the mental map analysis process, all coding results underwent two rounds of review to ensure consistency and reliability in classification standards and data interpretation.

Table 1: Categories of analytic techniques and components.

Category	Analytic
Mechanics of method	Sequence Count of drawn items Text labelling Text labelling: Acronyms, slang, abbreviations Continued to label map throughout Mirror the physical space Last residence in place (excluded) Frequency of visits now (excluded) Reside near place now (excluded) Map elements in relation to one another Drawing anxiety Drawing skills Enjoyed mapping process Time limit Used of the entire paper Mirror the standard map of the physical space Remained focused on drafting the map (excluded)
Drawing elements	Centre Borders Use of colour (excluded) Symbols Legend (excluded) Accuracy of scale of included elements Shapes (standard) North arrow Projection Orientation Scale of elements (excluded) Included elements at various scales (excluded)
Narratives of place	Built environment elements Physical environment elements Live space in walking through the space Percentage of accurate labels Districts Edges Nodes Landmarks/notoriety/popular elements Paths (and roads) Personal paths Access to car (excluded)

	Went to and from space often (excluded)
	What is included is out of the ordinary
	What is omitted is out of the ordinary
	Subjectivity identifiers (excluded)
	Cultural factors/traditions
	Discuss emotions through physical space
	Felt close to the space at present (excluded)
	Remembering intimate spatial details
Personalisation	Include what possesses personal meaning
	Includes what lacks personal meaning
	Proximity
	First-drawn element
	Last-drawn element
	Includes depiction of self in map
	Text labelling: All capitals, uneven sizing (excluded)
	All buildings are given a shape
	Social during experience

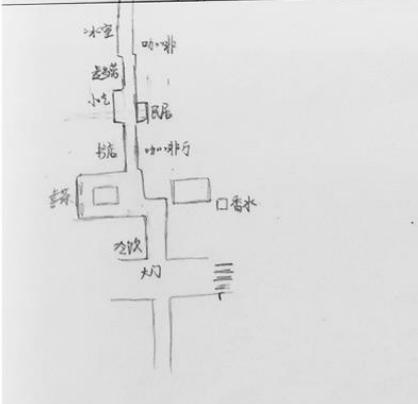
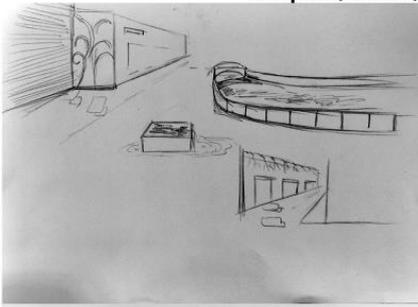
Source: Giesecking, 2013

4. RESULTS

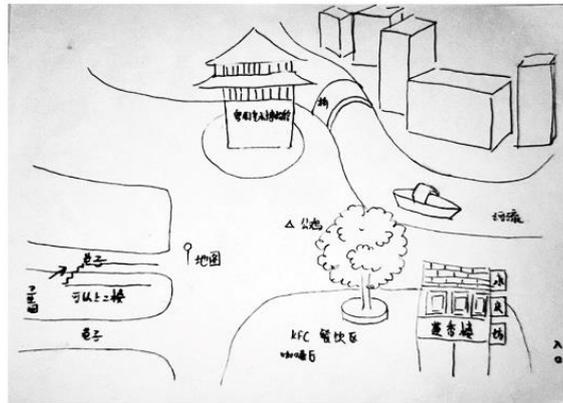
Four out of the 14 participants declined to draw a map but instead provided oral descriptions of their walking routes within the area, highlighting notable landmarks. As a result, this study reported only the locations mentioned by these four participants, without employing the mental map analysis method for the routes described.

The mental maps drawn by the ten participants in this study are presented in Figure 1 and Figure 2, while Figure 3 displays the actual map of the area for comparison.

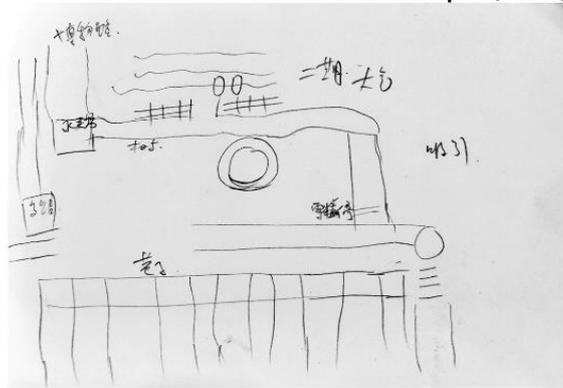
Map 3 (SM30)



Map 1 (BF29)



Map 4 (EF43)



Map 2 (PF30)

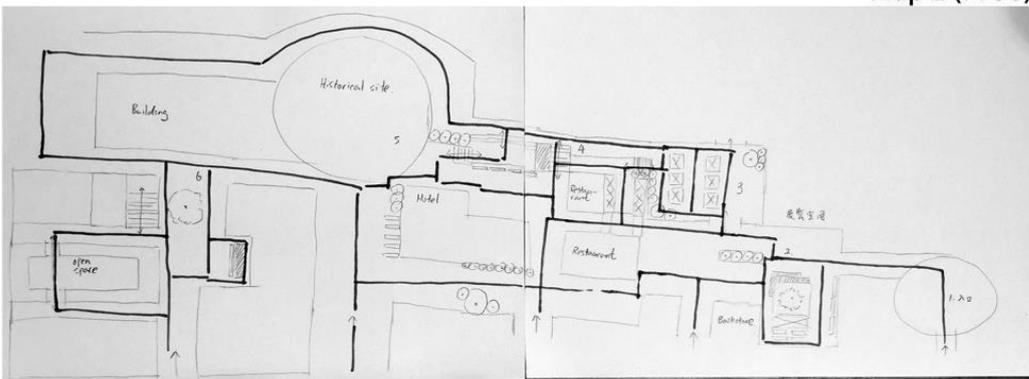
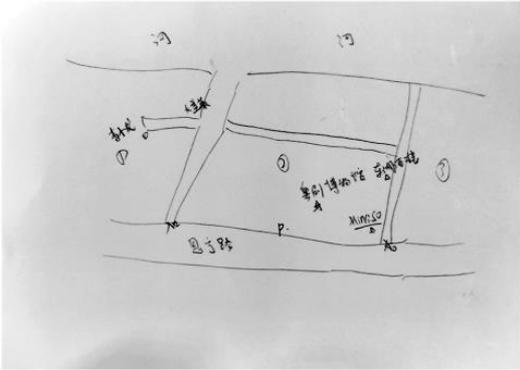
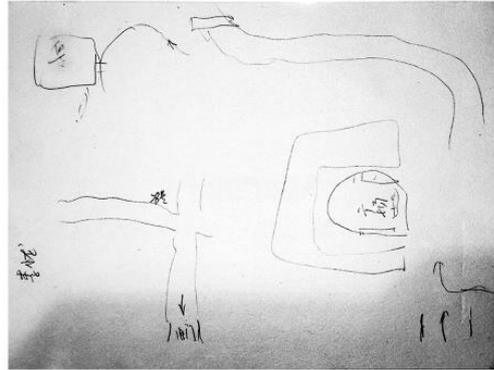


Figure 1: Maps 1-4

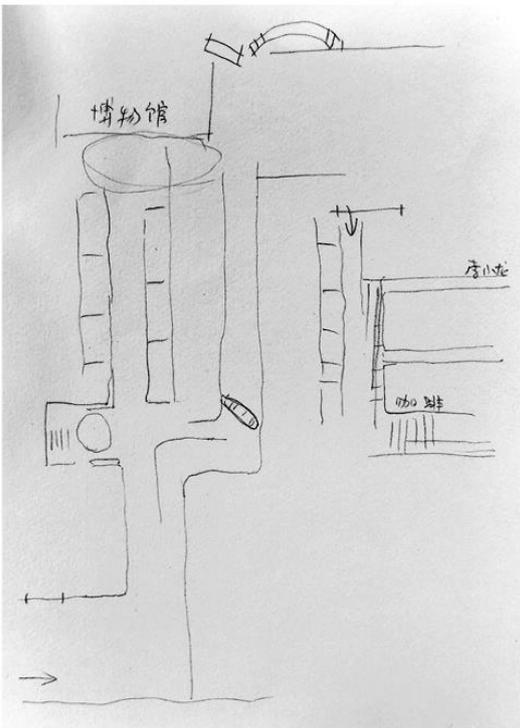
Map 5 (BM45)



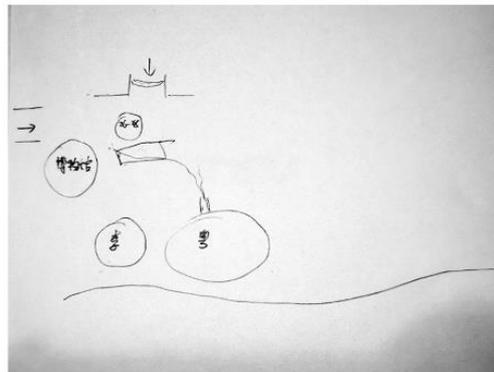
Map 8 (RM62)



Map 6 (EF60)



Map 9 (LM62)



Map 10 (RM65)



Map 7 (LF62)

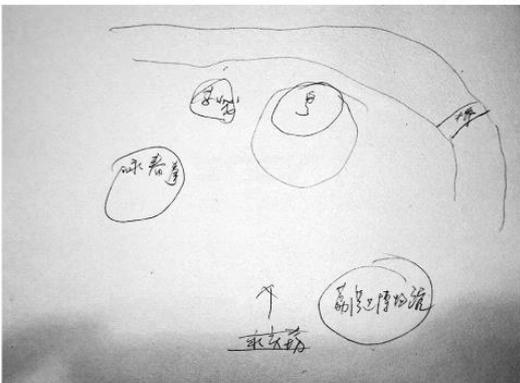


Figure 2: Maps 5–10

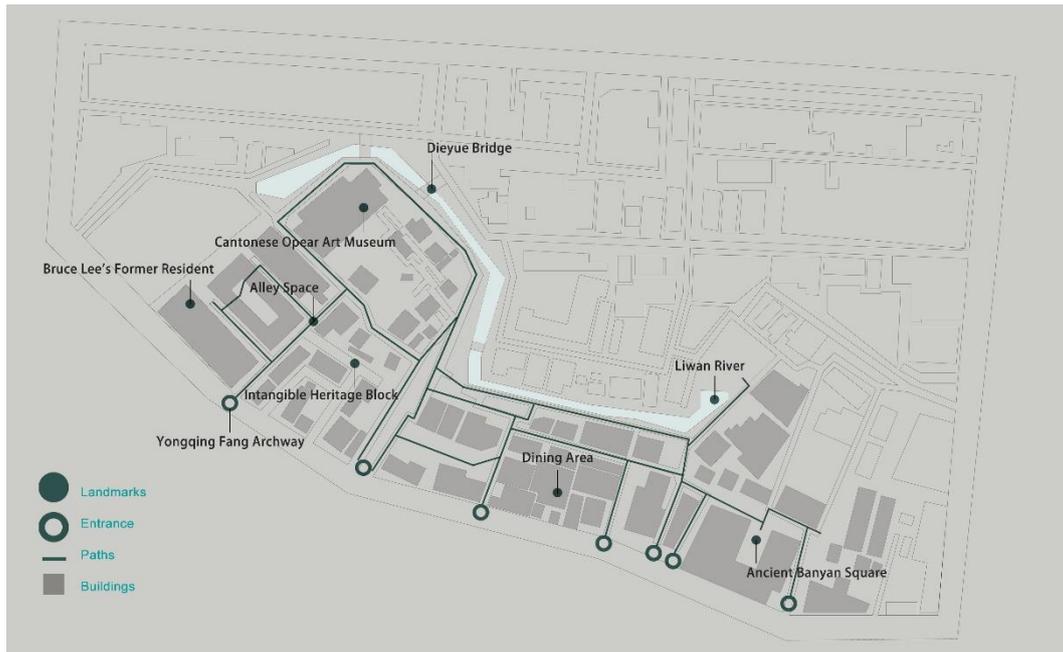


Figure 3: Map of Yongqing Fang

4.1 Subjective Drawing Mechanism

The study observed that many participants expressed hesitancy when asked to draw a mental map, with participants stating they ‘might not be able to draw it,’ ‘became confused about the directions,’ and expressed concerns about accuracy. One participant initially had the researcher draw a mental map based on instructions, but later the participant modified it (LM62/Map 9). Conversely, another participant showed confidence and immediately began mapping due to their familiarity with the area (BM43/Map 5). A significant number of participants enjoyed the process of drawing and continuously recalled details and enriched the content of the maps during the drawing process.

According to the count of items drawn, older participants depicted fewer elements compared to younger participants (LF62/Map7, LM62/Map 9, RM65/Map 10), and their drawing time tended to be less than 20 minutes. Younger participants depicted more diverse elements and tended to use multiple sheets of paper for their drawings (BF29/Map 1, PF30/Map 2, SM30/Map 3).

Half of the participants (BF29/Map 1, LF62/Map 7, RM62/Map 8, LM62/Map 9, RM65/Map 10), who were either elderly or visiting the area for the first time, focused their drawing sequences on individual elements like buildings, with minimal depiction of paths. In contrast, the other half (PF30/Map 2, SM30/Map 3, EF43/Map 4, BM45/Map 5, EF60/Map 6) mapped the area by regions and paths.

Of the ten mental maps, only one participant drew a mental map in the form of a façade (BF29/Map 1), while the others depicted their maps in plan view. One of the participants drew both an area plan and a sketch of impressive elements (SM30/Map 3), which was related to the identity of the participants.

Only one participant’s mental map closely mirrored the actual situation due to their occupation in planning and high regional awareness (PF30/Map 2). In contrast, other participants intentionally emphasised or centred on impressive locations while drawing their maps, often downplaying or omitting areas of lesser interest. For participants relatively familiar with the area, their maps exhibited patterns of regional grouping (PF30/Map2, EF43/Map 4, BM45/Map 5, EF60/Map 6). Text labels were uniformly used to identify locations on all participants’ maps. A considerable proportion of participants

used abbreviations when annotating labels, though for key landmarks, some participants opted to use full names (BF29/Map 2, BM45/Map 5, LF62/Map 7, RM65/Map 10).

Many participants' maps were oriented with a standard north arrow, except for three maps where routes were depicted bottom-up (SM30/Map 3, EF60/Map 6) or front-to-back (BF29/Map 1). In terms of symbols, five participants used arrows to indicate entrances, exits (LF62/Map 7, RM62/Map 8, LM62/Map 9, RM65/Map 10), or steps (PF30/Map 2). One participant marked an important site with a five-pointed star (BM45/Map 5).

In all maps, the study found that participants primarily centred their drawings around three areas: the Cantonese Opera Art Museum, the river, and the Ancient Banyan Square. They typically depicted these three landmarks prominently to emphasise their importance. Additionally, some participants intentionally drew roads as particularly narrow, highlighting their congestion (SM30/Map 3, BM45/Map 5, EF60/Map 6). Furthermore, two participants provided detailed depictions of landmarks that left a strong impression on them (BF29/Map 1, SM30/Map 3). Almost all mental maps did not include boundaries, with many participants indicating uncertainty about where to start and end their drawings. Only one participant delineated boundaries, marking a river on the north side and a road on the south side (BM45/Map 5). With the exception of two participants (BF29/Map 1, SM30/Map 3), the elements depicted in the maps drawn by other participants typically represented shapes such as circles, rectangles, or irregular forms.

4.2 Participants' Depiction of Map

Participants did not depict all elements on their maps but recalled and explained them during the drawing process. Those familiar with the area recalled past experiences and noted differences from the present, while first-time visitors shared personal feelings or compared their experiences with those from other places.

Participants described the map in terms of natural elements such as greenery and rivers. Some of participants mentioned a large ancient tree ($N = 5$), but overall, greening received limited attention, with some noting its scarcity due to the area's origins as built-up space. There was a perception among some participants that, as a commercial area, extensive greening was unnecessary. Older participants generally regarded greening as enhancing landscape aesthetics, highlighting a cognitive aspect of public concern. Regarding the river, participants considered it a significant feature, with some emphasising its role in cultural activities and one participant perceived it as the area's central guiding element, around which scenic spots were distributed (RM65/Map 10). The river was emphasised by all participants.

Participants' descriptions of the built environment often followed their personal walking routes. Regarding entrances, a large share of participants recalled only two: one on the eastern side ($N = 7$), which they frequently used due to its proximity to the subway station. Despite its significance, this entrance was described as simple and lacking clear signage, leading to confusion among some participants. The other entrance on the western side ($N = 6$), marked by the 'Yongqing Fang Archway,' attracted attention for its distinctive feature. Although more entrances existed than participants recalled, one participant depicted additional entrances from memory (PF30/Map 2). Regarding road signs, younger participants noted a lack of signage, which caused navigation difficulties when lost. In contrast, older participants relied on following others or seeking help when lost, with one saying: 'I just follow people' (RF65), and another stating, 'I ask people for help when I get lost' (RM65).

Participants predominantly described seating areas clustered around the 'Ancient Tree,' noting frequent use and congestion issues, with many empty seats blocking pathways ($N = 6$). Some participants omitted seats from their maps but commented on inadequate public seating: 'public seats are not enough, and if you do not rest inside the shop, you cannot find a place to sit outside' (EF43). The dining area, which occupies a large space, was also frequently mentioned ($N = 9$), with some participants who visited the area several times noting new features like temporary sales areas and

decorations (N = 4).

Adjacent to the river, the ‘Cantonese Opera Art Museum’ stood out as a prominent landmark, easily noticed by all passersby, and participants also considered it representative of the area (N = 14). Additionally, participants identified an alley space (N = 14), distinguishing it from the modern area east of the museum due to its traditional style. However, participants’ preferences varied: some favoured the traditional alleys, criticising the modern area for disrupting the ambiance, while others found the modern areas attractive and perceived the alleys as chaotic. Despite individual perspectives, all participants could distinguish between the two areas based on size and style, utilising landmarks even when their sense of direction became confused upon reaching the museum, which acted as a dividing line in their mental maps.

The remaining built elements were described according to participants’ experiences and reflections in various locations. Younger participants tended to emphasise food and shopping areas, whereas older participants focused more on traditional historical elements and natural landscapes. Two participants mentioned that the area attracts many young people but lacks elements appealing to older adults, particularly a deficiency in natural landscapes suitable for their appreciation: ‘Here, it’s mostly things that young people like; I think we also need to add things that older adults would enjoy.’ (BF63) ‘For someone my age, I don’t see much attraction in this place. I imagined there would be lots of scenery and greenery, but there’s none here.’ (RF65) Some participants also mentioned security management in the area and expressed concerns about the impact on robustness due to frequent changes in shops.

Key elements depicted in the maps included the ‘Cantonese Opera Art Museum,’ mentioned or drawn by all participants, followed by the ‘Bruce Lee’s Former Resident,’ which was mentioned or drawn by 10 participants. Six participants referenced the ‘Yongqing Fang Archway’ in various locations, and five mentioned the ‘Ancient Tree.’ Four participants highlighted ‘The Bridge.’ Some participants discussed the messages and significance conveyed by these landmarks, particularly focusing on the ‘Ancient Tree,’ the ‘Cantonese Opera Art Museum,’ and the areas with steps along the river, which were described as spacious and popular gathering spots. Participants generally depicted the surrounding roads as narrow, aligning with their perception of ‘narrow roads,’ in contrast to the open spaces that served as memorable landmarks.

Interestingly, the study found that none of the participants mentioned the ‘Intangible Heritage Block,’ despite having visited them during the tour before the interviews. The study suggests that participants overlooked these areas due to their inconspicuous nature, lack of appeal, and infrequent visits. Some participants expressed, ‘I don’t know what is there,’ and ‘it seems to be a residential area, which retains the appearance of the original residential buildings’ (RM62).

The study found that the content depicted in maps by all participants generally corresponds to reality, with variations in specific locations and sizes influenced by individual memory. During the mapping process, participants typically began with the entry area, which may be linked to their personal route. However, some participants opted to start with a significant landmark and then expand outward from a central point. Additionally, participants tended to conclude their map drawings with a significant landmark or a specific route, and the study found that participants almost invariably chose different elements to conclude their drawings. This may suggest that the landmark represents the final destination visited by the participants.

5. DISCUSSIONS

Participants in the study demonstrated their perception of resilient design through their individual drawing mechanisms and route descriptions, affirming the utility of mental maps for understanding public views on resilient design (Catney et al., 2019). For example, they often emphasised landmarks using words or symbols, sometimes drawing them prominently. This suggests that participants

highlighted these elements to signify their robustness and memorable impact. Their descriptions and shared experiences further indicate effective functionality and public engagement. Additionally, in describing routes, participants recalled spatial details, such as perceptions of redundancy in infrastructure when supply exceeds demand. This aligns with the public's tendency to perceive redundancy through similar functional components (Allan et al., 2013; Lak et al., 2020).

The study demonstrated that individual factors such as age, identity, familiarity, duration of contact, and needs influence the public's perception. Moreover, the study found that these needs vary among individuals, as different groups have distinct preferences and interests (Mehta & Mahato, 2020), making it challenging to address everyone's needs during the planning process.

The study revealed that age and identity significantly shaped public perceptions of resilient design. Older participants demonstrated a heightened awareness of traditional symbols, viewing their presence in space as a manifestation of cultural robustness amidst development. In contrast, younger participants often lacked recognition of these symbols, resulting in lower perceived robustness of development. This disparity is attributed to the influence of accumulated life experiences on individual focus, aligning with prior research indicating that experience impacts cognition (Ribeiro, 2014). Specifically, for older individuals, elements reminiscent of their past environments evoke strong memories, fostering a deep appreciation for tradition and a belief in its positive developmental impact. Compared to the perspective that the public perceives robustness primarily through its physical dimension, including safety and recovery capacity (Davoudi et al., 2013; Mehmood, 2016), this study places greater emphasis on its symbolic significance in cultural continuity.

Previous studies have shown that the public perceives adaptability through opportunities for interaction, with the frequency of interaction reflecting the intensity of adaptability (Anzoise et al., 2020; Sharifi, 2019b). This study further reveals that age is a significant factor influencing the public's perception of adaptability. The study found that older individuals were less likely to be particular or demanding compared to younger individuals, reflecting the idea that perceptual abilities decline with age (Reuter et al., 2012). For example, there was a notable difference in their preferences for public seating: young people focused on comfort and often found the available seats inadequate, whereas older individuals were content with any available seating—whether it be a stone, the edge of a flower bed, or a step—as long as it met their need to sit. Similarly, regarding navigation, young people emphasised the importance of road signs when lost, while older individuals were more inclined to ask passers-by for directions, considering finding road signs more troublesome. The study indicates that older individuals may provide more positive evaluations of spatial adaptability compared to younger individuals.

Participants in the study belonged to six occupational categories. The study revealed that participants' interests were shaped by their respective identities, consistent with the general tendency of the public to focus on matters relevant to their daily lives (Jim & Chen, 2006). The study found that retirees and students both focused on leisure and entertainment functions, with retirees showing a particular interest in natural landscapes, while students were more oriented towards commercially driven entertainment. The law enforcement and public safety group emphasised the efficacy of environmental system maintenance, whereas other groups either did not discuss topics related to law enforcement and public safety or expressed scepticism about their effectiveness. The study suggests that the effectiveness of system maintenance is challenging to emphasise due to public unfamiliarity with its mechanisms and benefits. While previous studies suggest that the public primarily perceives efficiency through factors such as traffic flow, service accessibility, and environmental quality (P. J. G. Ribeiro & Gonçalves, 2019; Sharifi, 2019a), this study emphasises that the public's perception of efficiency is more closely related to their familiarity with the system.

Education-related groups in the study focused significantly on the quality and authenticity of information conveyed in the environment. They believed that information carriers in the environment could vary widely, ranging from building appearances to small items, all of which contribute to shaping public impressions of a place. For those who prioritise education, such information is seen as indicative

of a place's adaptability.

Planning-related groups drew more detailed maps than other groups and were more inclined to recognise the benefits of regional planning. However, the public often does not consider these perspectives from a professional standpoint. This is also a key focus of the study, which examines whether resilient design characteristics that are not perceived by the public are effectively playing a role.

Business-related groups highlighted the commercial dynamics within the region, emphasising the significance of store reputation and robustness as indicators of area development. In contrast to other groups, which might perceive changes in shops positively or neutrally, business-related groups stressed the importance of maintaining reputable establishments while also welcoming new ones to enhance the area's appeal and vitality.

Familiarity is a factor closely related to experience and plays a significant role in shaping people's perceptions. Previous research has indicated that familiarity positively influences preferences and perception (Appelman & Mayzner, 1981; Mangone et al., 2021). This study reinforces this idea, finding that groups familiar with the environment depicted a greater diversity of elements due to their accumulated past experiences and deeper knowledge of the area. This finding aligns with the perspective that the public's perception of diversity stems from multiple experiential factors (Feliciotti et al., 2016; Mehta & Bosson, 2021). However, this study further highlights that cognitive awareness also plays a crucial role in shaping perception. Furthermore, the public's perception of modularity is reflected in the variations of spatial layout and elements (Sharifi, 2019b). This study further indicates that individuals with long-term exposure to the area were more likely to perceive changes in the environment, recognise the modular characteristics of space use patterns for temporary activities, and compare the current environment with their past experiences to determine whether it has become more positive or negative. Participants with higher familiarity viewed these characteristics as incentives for visiting, whereas unfamiliar groups, having not experienced these temporary activities, found the area less appealing. Interestingly, even those who had not participated in these activities showed a strong willingness to return after learning about future events.

The study also indicates that familiarity affects the public's perception of road connectivity. Although the public's perception of connectivity is primarily achieved through the operational conditions between road structures (Samuelsson et al., 2019), the study further emphasises that visual accessibility of public space entrances and central nodes plays a crucial role in shaping the public's perception of road connectivity. Participants often referenced their personal experiences when describing routes, with a tendency to recall the most prominent ones. Less significant paths were either entirely overlooked or vaguely described as part of a larger interconnected network, with specific details often forgotten.

These findings highlight the importance of integrating user diversity into future urban planning and design practices. To accommodate varying needs, urban policies should promote participatory approaches, ensuring that different user groups are actively involved in the planning process. By incorporating these approaches, urban spaces can become more resilient, inclusive, and better aligned with the diverse preferences of the public.

6. CONCLUSION

The study emphasises the importance of exploring the public's perspectives and the specific objective elements through which they perceive urban resilient design. Drawing on landscape perception theory, the study affirms that perceptions vary among individuals. It examines the influence of subjective factors on the public perception of urban resilient design, acknowledging that these factors are shaped by objective conditions. The study also proposes strategies for optimising physical elements in urban resilient design: (1) Minimising unnecessary infrastructure; (2) offering diverse seating options based

on different group preferences and simplifying navigation and signage to ensure the public can engage more independently in social activities; (3) balancing a combination of existing and new businesses to retain customers and sustain a vibrant community atmosphere; and (4) emphasising the preservation of traditional cultural symbols to strengthen public identification.

Moreover, the study provides the following recommendations for optimising the seven characteristics of resilient design: (1) Robustness: Strengthen iconic landmarks by integrating multifunctional features. (2) Adaptability: Create flexible and multifunctional spaces to accommodate diverse uses. (3) Efficiency: Improve the functionality of information systems and signage to enhance usability. (4) Diversity: Promote a variety of activities and integrate cultural elements to enrich user experiences. (5) Connectivity: Develop multiple pathways and alternative routes to improve spatial accessibility. (6) Redundancy: Incorporate redundant features to address emergency needs effectively. (7) Modularity: Employ movable and adjustable design elements to allow for reconfiguration and adaptability. Furthermore, resilient design should go beyond basic spatial functions to address the specific needs and behavioural patterns of users.

Additionally, it is crucial to strengthen education and promotional efforts to enhance public awareness and understanding of resilient design characteristics. For example, traditional knowledge can be disseminated through educational and promotional activities to raise awareness among young people about these landmarks. Furthermore, increasing public awareness of the area, particularly spatial orientation, will help individuals identify more elements and details within the space. In turn, this will improve public perception and engagement, thereby significantly enhancing the effectiveness and sustainability of urban resilient design.

However, this study has certain limitations. First, the analysis of mental maps relies on participants' memory and expressive ability, which may lead to omissions or biases in the information. Second, due to the use of purposive and snowball sampling, the collected mental maps may not fully represent the spatial perceptions of all potential user groups. Additionally, this study primarily focuses on subjective factors, with relatively limited analysis of objective factors. Therefore, the study recommends that future research could incorporate multiple data sources, such as spatial tracking technologies and behavioural observations, to validate the accuracy of mental maps and reduce potential misinterpretations arising from participants' self-reported data. Furthermore, employing more representative sampling methods, such as stratified random sampling, could ensure the inclusion of groups with diverse ages, occupations, and usage patterns. Expanding the study area and comparing results across different regions would also enhance the generalisability of the findings. Lastly, future studies should further explore how the public comprehends urban resilient design in relation to objective factors and explore the interaction between subjective and objective elements to provide a comprehensive understanding

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