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Review Article

Delineating and Exploring the Dimensions and Properties of Place-based Phobias*

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Abstract | Phobia, as a pervasive anxiety disorder, is characterized by a persistent and irrational fear of specific situations or objects, which can cause distress, significant avoidance, and impairment in an individual's daily functioning. This disorder has its roots in a complex interaction of genetic factors, developmental environment, and traumatic events; on average, one in four people is susceptible to developing specific phobias at some point in their lives. This significant prevalence makes phobias a major challenge in the realm of health and quality of life. From the perspective of architecture and environmental design, this phenomenon is not merely an individual challenge but also a disruptive factor in achieving the utility and comfort (Utilitas) of a space, one of the three pillars of the desirable Vitruvian architecture. This disorder can hinder architecture's responsiveness to the needs of its users, particularly vulnerable groups. This research was conducted to analyze "place-based phobias", explain the spatial components of each phobia, and extract design considerations aimed at reducing perceived threat and injury avoidance when confronting each place-based phobia. Data were collected and analyzed through the study of scientific resources and interviews with affected individuals, as well as environmental design specialists. The findings indicate that instead of intervening in the multitude of phobias, architects should focus on spatial components from the initial design stages, such as geometry, proportions, hierarchy, spatial positioning, and the characteristics of spatial elements. Furthermore, four key spatial realms were identified as critical points in the formation or exacerbation of phobias: thresholds, boundaries, signs/spatial cues, and ceilings. The targeted management of these realms through the mentioned spatial components not only prevents the creation of phobia-inducing environments but also takes an effective step towards creating ideal spaces. This approach, based on a deep understanding of human-space interaction, not only does not diminish environmental quality but will also, a fortiori, be acceptable and calming for humans without phobias.

Keywords | *Architecture, Phobia, Place-based Phobias, Environmental Design, Mental Health*

Introduction| Maslow's hierarchy of needs theory (Maslow, 1943), as one of the most fundamental frameworks in psychology, argues that satisfying basic and physiological needs is a necessary prerequisite for the emergence and attention to higher psychological needs. This principle, which extends beyond psychology, is also of strategic importance in architecture. The strict building codes common in contemporary societies have largely led to the creation of spaces that adequately ensure the physical safety of users, thus covering basic physical needs. However, this relative success itself gives rise to a new challenge in architecture: today's users are not satisfied merely with physical comfort and demand that their psychological needs be addressed in their experience of space—especially the need to feel psychological security and comfort in built environments.

Psychological findings show that the necessities of

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contemporary architecture can, in some cases, cause insecurity and disorientation and even pave the way for the formation or exacerbation of place-dependent phobias. Place-based phobias are an experience of an irrational level of anxiety related to a specific spatial situation in which drawing a clear line between justifiable dangers of a stimulus in space and pathological dangers is difficult. A subset of phobias can be classified as place-based phobias—such as enochlophobia, acrophobia, nyctophobia, claustrophobia, agoraphobia, etc.—which are influenced by design codes such as environmental configuration, environmental qualities, physical elements, and human-social factors. The impact of these design factors on the cognitive-affective and sensory-motor aspects of spatial experience, especially within the framework of spatial perception systems (Coburn et al., 2017), enables understanding how environmental stimuli disrupt spatial behavior and predict individuals' movement responses, such as approaching or avoiding, as well as how mass panic is induced and spread in emergencies. On the other hand, users' perception of space is influenced by the dynamic and complex interaction of static and dynamic contextual factors, some of which play a predisposing role, some a triggering role, and others a perpetuating role for anxiety and phobia. Clinical evidence clearly shows that fear profoundly distorts spatial perception (Weerts & Lang, 1978; Hekmat, 1987); individuals with place-based phobias not only interpret the world as more threatening but may also see it differently—such as exaggerating building heights by those with acrophobia (Rachman & Cuk, 1992), and perceiving related stimuli as more vivid and unpredictable (Riskind et al., 1992). These perceptual biases and heightened anxious appraisals create a vicious cycle that severely distorts spatial experience. Despite the significant prevalence of place-based phobias—one in four people susceptible to developing them (Benjamin, Sadock, & Samoon, 2019) and their profound impact on spatial experience, understanding how these disorders interact with built environments has been severely neglected in the architectural design process and the development of building codes. This neglect becomes more complex in a context like Iran, which lacks comprehensive databases on mental health and place-dependent phobias (Isna, 2024). The present study aims to fill this gap by examining the interaction of built environments with place-based phobias. This study seeks to identify the environmental generators of phobias and explain them within the framework of architectural design features. The ultimate goal, in addition to introducing a framework for recognizing and defining phobias in the architect's thought process, is to provide suggestions for amending building codes and design considerations that not only respond to physical needs but also support the mental health of users in architectural spaces.

Research Questions

-What physical, perceptual, and experiential components in the built environment can act as triggers or exacerbators for each of the place-based phobias?

- How can architecture, through design considerations, reduce environmental avoidance and increase users' psychological resilience?

Research Method

This research was conducted using a mixed-methods approach in two independent but related stages. In the first stage, with the aim of identifying types of place-dependent phobias and analyzing how they are represented in scientific literature, a systematic review of sources was performed. Then, semi-structured interviews were conducted with individuals suspected of having specific phobias. In the second stage, to understand the effect of the identified phobias on architectural design, semi-structured interviews were conducted with architectural and environmental design specialists.

First stage: First, a systematic review of scientific literature was conducted to identify, classify, and precisely define phobias that form in reaction to environmental characteristics or physical spaces. This stage was based on transparent and reproducible protocols and designed to systematically extract conceptual data from the existing literature. Searches were conducted in three reputable databases: Google Scholar, Web of Science, and EBSCOhost. Search keywords were defined in combination and Boolean form according to the research topic. The most important keywords were: "spatial phobia" OR "place-based phobia" OR "environmental phobia" OR "phobia and built environment" OR "architecture and fear" OR "environmental anxiety disorder."

Inclusion criteria were: 1) studies examining phobias in relation to the physical environment, architecture, or urban spaces; 2) sources providing classification, definition, or clinical analysis of place-based phobias; 3) articles presenting empirical evidence or case reports of phobia experience in specific environments. Exclusion criteria were: 1) studies solely addressing individual or biological phobias without reference to spatial factors; 2) theoretical articles lacking environmental examples; 3) duplicate sources, conference articles without full-text access, or articles outside the research focus. The screening process was first based on title and abstract, and then selected articles were reviewed in full. Content analysis of selected sources led to the identification and classification of eleven types of place-based phobias based on prevalence: 1) Enochlophobia, 2) Acrophobia, 3) Nyctophobia, 4) Claustrophobia, 5) Agoraphobia, 6) Pyrophobia, 7) Chromophobia, 8) Trypophobia, 9) Sciophobia, 10) Acousticophobia, and 11) Numerophobia.

Additionally, semi-structured interviews were conducted with individuals suspected of having specific phobias using a snowball sampling method to gain insights into their thoughts and experiences regarding various aspects of architectural design. The number of interview samples in this section was not quantity-oriented because many people struggle secretly with this disorder, and precise statistics are not available. The interview structure was organized around three axes: 1) discovering environmental details in the experience of encountering phobic spaces, 2) supportive design elements for controlling phobia attacks, and 3) sensory distortions regarding the physical characteristics of space during panic. Interview duration varied from 20 to 30 minutes, and respondents' answers were recorded and analyzed using thematic analysis (Kvale & Brinkmann, 2009). Table 1 presents an example of these interviews, showing extracted themes for each phobia.

The findings from the systematic review and interviews provided the theoretical and conceptual basis for the second part of the research.

Second stage: While the first stage focused on identifying place-based and place-dependent phobias through scientific sources and interviews, the second stage aimed to understand the design implications of these phobias from the perspective of the architectural design expert community. In the existing literature, there is insufficient evidence to explain the mechanisms of phobia arousal in response to characteristics of built environments. Therefore, reaching an initial expert consensus in this field can provide a basis for future empirical research. For this purpose, a set of information cards was developed for each of the eleven place-based phobias identified in the first stage. These cards included the definition of each phobia, its main characteristics, examples, and provocative questions for design thinking. The selection criterion for participants was having both educational and executive backgrounds in architecture and human-centered design. The number of participants was determined based on the principle of theoretical saturation, and due to the novelty of the topic, repetitive themes were identified sooner than expected. In total, nine interviews were conducted, and after the seventh interview, concurrent data analysis showed that no new themes were identified. Two additional interviews were conducted to ensure theoretical saturation. The average interview duration was 30 minutes. All sessions were audio-recorded and fully transcribed into text by the research team.

Data analysis: Qualitative data analysis was performed based on the reflexive thematic analysis method. Analysis was conducted in three main stages: 1) Identifying initial meaning units; meaningful sentences were extracted from the text; for example, phrases such as "winding spaces intensify the feeling of helplessness" or "heterogeneous lighting can activate the fear of shadows." 2) Initial coding; each meaning unit was coded as an initial conceptual label. For instance, the above phrase was labeled with codes such as "experience of disorientation," "feeling of losing control," or "intensification of shadows." 3) Extracting conceptual themes; in the final stage, related codes were grouped into conceptual clusters, and higher-level themes were formed. For example, themes such as "boundless spaces and spatial anxiety," "light and sense of threat," or "formation of perceptual control in design" were extracted from the data.

Due to the lack of an established theoretical framework to explain the relationship between place-based phobias and environmental design characteristics, this research attempted to obtain an initial interpretation of the spatial dimensions of each phobia through the concurrent analysis of: 1) scientific sources, 2)

Table 1. Example of theme extraction from interviews and autobiographies. Source: Authors.

Interview excerpt	Coding	Extracted theme	Type of phobia
"...I don't go near the windows of tall buildings. I know the glass won't break, but I can easily convince myself it could. If I can see the ground from above, it's worse. I don't look down..."	Detachment from the ground (as a safe point)	Overestimation of danger	Acrophobia (fear of falling from height)
"...When I reached a very steep downhill slope, I couldn't go any further. I couldn't even lift my foot. It was as if my feet were glued to the ground. I sat down on the ground on my back and pulled myself down using my hands and feet..."			
"...As I was going up the building stairs, I suddenly thought about the height and then involuntarily looked down through the gap between steps. I felt dizzy and had to start thinking again to move..."			

insights of individuals with place-dependent phobias, and 3) perspectives of architectural design experts. In this framework, phobia is considered not merely an individual disorder but rather a cognitive-anxious response to specific environmental situations situations that directly or indirectly disrupt an individual's sense of control, security, or spatial perception. Data from this section were organized based on two main sources: 1) conceptual and semiotic analysis of identified phobias through systematic review and interviews, and 2) perspectives of architectural and environmental design experts regarding the feasibility of occurrence and exacerbation of these phobias when encountering built spaces. Dialogue with experts enabled the analysis of each phobia from the perspective of design patterns, activating environmental characteristics, and harm-avoidance challenges.

In the following, each of the place-based phobias is presented in an independent subsection. The structure of each subsection includes three parts: first, a brief conceptual review of the phobia; second, a specialized analysis of its environmental activators from the participants' perspective; and third, preliminary design considerations to avoid triggering this anxious experience.

Enochlophobia: Fear of Crowds and Congestion

Enochlophobia, derived from the Greek word "ochlos" meaning crowd, is a persistent and deep anxiety about being in crowded and populous environments. The main focus of this phobia is not the inescapability of space, but the threatening presence of others at an uncontrollable distance. An individual with enochlophobia perceives the crowd not merely as a social situation, but as a factor beyond personal control and a source of intrusion into their personal space (Stokols, 1972; Aiello, 1987).

Conceptually, enochlophobia involves two psychological dimensions simultaneously: on the one hand, anxiety caused by intrusion into physical and personal space (Ellis, 1979; Sundstrom, 1975; Bowers, 1979; Worchel & Teddie, 1976; Stokols, 1972) and on the other hand, processing pressure resulting from information overload (Evans, 1979; Cohen, 1978). In this type of phobia, the physical environment becomes an exacerbating factor when it exceeds the individual's capacity to process environmental cues, or when the individual cannot recognize exits or escape routes through spatial cognition and architectural cues.

Enochlophobia often manifests in specific environmental situations: queues, entrances, narrow corridors, movement nodes, shopping centers, or waiting halls. However, non-place-based situations can also trigger anxiety, including anticipating crowds or mental representations of crowds, such as recalling a scene of human traffic or a memory of pressure in the subway.

In interviews with design experts, this phobia was associated with characteristics such as depletion of spatial perception, loss of control, and weakening of the ability to respond motorically in space. More importantly, many of them identified the origin of the anxious feeling not in the number of people present, but in how space is organized, and crowd movement is directed. From the experts' perspective, it can be concluded that enochlophobia depends not only on the number and density of the crowd but also on the nature of the design of flow paths and focal points. Many participants noted that the quality of perceptual control of space (e.g., visual clarity, path diversity, and access to escape spaces) plays an effective role in mitigating or exacerbating crowd-induced anxiety. They also pointed to the role of sound, light, framing of views, furniture layout, and the form of covered space or enclosing walls, which can reinforce the feeling of "pressure" and "collective entrapment" in the individual.

Findings indicate that designing space for users sensitive to crowds goes beyond merely complying with square footage or capacity standards. Effective design should proactively address perceived anxiety by incorporating fluid and pragmatic dimensions of space. Accordingly, providing sufficient physical and visual distancing (attention to personal bubble and physical demarcation of privacy), minimizing unwanted and forced encounters through flexible and diverse paths, and maintaining dynamism and control of spatial rhythm with the possibility of free and unobstructed movement during peak hours, considering the ratio of people density to area, are essential. Defining visual thresholds (such as adjusting sightlines to exits or alternative routes in crowded conditions) and strategic spatial zoning, such as creating movement axes and clear functional zones to manage flow and perception, reduces the sense of crowding. Also, preventive design in points prone to crowd bottlenecks, optimization of movement axes, definition of designed stopping points and separation of pathways from them, and considering the effect of furniture on the effective width of these paths are effective in making the perception of the crowding level controllable. In general, designing for enochlophobia requires not only managing the number of people but also managing the perceived sense of others' presence. Designed spaces should provide the user with the possibility of withdrawal, reassessment, and behavioral response.

Acrophobia: Fear of Falling from Height

Acrophobia, meaning fear of heights, is derived from the

Greek word "akron," meaning peak, summit, or edge. This phobia is accompanied by an intense fear of being or imagining being in high places. The difference between acrophobia and "healthy caution" is that in acrophobia, the emotional response to height far exceeds logical estimates proportionate to the actual risk. The main cognitive characteristic of this phobia is an exaggerated estimation of vertical distance and the harm from falling. Clinical research has shown that affected individuals typically (1) perceive vertical distances as longer than they are, (2) estimate the probability of falling higher than actual, and (3) imagine the consequence of falling as severely catastrophic (Coelho et al., 2009; Menzies & Clarke, 1995; Stefanucci & Proffitt, 2009; Teachman et al., 2008).

From a place-based perspective, acrophobia is intensely engaged with specific architectural and natural spaces. Places such as viewpoints, unprotected terraces, roof edges, suspension bridges, glass elevators, voids and atriums, ramps, suspended or spiral staircases, stairs without railings, and glass facades of buildings are among the spaces that can trigger this phobia. These places are often defined by "detachment from the ground" or "confrontation with depth," whereas for individuals with acrophobia, the ground plays a central role in creating a sense of security in perceptual experience.

Environmental design specialists in interviews analyzed acrophobia as one of the phobias most sensitive to spatial design error. They emphasized that the anxiety mechanism in acrophobia is formed not only in the vertical dimension of space but also in how the user confronts depth and height from the perspective of perception and confidence. Several specialists also pointed to the experience of height formed in mental images or media representations. From this perspective, the designer of high-altitude spaces must also be aware of the visual language and know how to evoke danger or security in the audience. Among the factors influencing spatial anxiety at height were the use of frameless glass, flooring with suspended patterns, narrow ramps, or railings that feel unstable or overly transparent.

Findings show that designing spaces with level differences or heights requires special attention to controlling the user's perception of depth and creating a sense of safety. In this context, several categories of design considerations can be suggested: First, eliminating the user's doubt about the safety and reliability of the space. Physical safety is reinforced by railings and parapets of appropriate height and sturdy materials. The use of non-slip flooring with repeatable textures and perceived friction makes movement at height more controllable. Also, avoiding excessive transparency in walls and floors, especially at sensitive points, and utilizing perceptible layers increases the sense of confidence. Second, adjusting the viewing angle to depth by breaking direct sightlines, using intermediate horizontal elements, or designing curved paths makes the depth of space more comprehensible and less threatening. Furthermore, precise placement and design of railings (handrails) also play a crucial role in controlling the viewing angle to depth and improving the user's visual-motor experience, especially in spaces like viewpoints and elevators. Third, adding resting points such as landings, intermediate floors, or mid-platforms allows the user to pause and regain motor and emotional control. Changing the direction of paths and reducing the number of steps between landings, while breaking the slope of the path and shortening the visual distance to depth, defines specific intermediate goals for the user. Attention to the placement of thresholds and starting points of slopes can initially diversify design options and allow a soft and gradual separation of height levels rather than a sudden and immediate confrontation with depth/height changes, so that users interact with the space smoothly and naturally. Ultimately, designing to reduce height-induced anxiety requires a continuous understanding of risk perception and sense of control, and effective design is formed not by eliminating height but by making it psychologically tolerable through architecture.

Nyctophobia: Fear of Darkness

Nyctophobia, derived from the Greek root "nyktos" meaning night, refers to an intense fear of darkness (Paulus et al., 2019). In this phobia, the individual experiences a feeling of threat, anxiety, or even irrational panic when confronted with dark or dimly lit environments (Berk, 2010; King et al., 2005; Nasar & Jones, 1997; Meltzer et al., 2009; Mellstrom et al., 1976; Gray, 1987). Although fear of darkness is observable at certain levels of normal psychological development, nyctophobia reaches a level that causes conscious avoidance of places or times when ambient light is reduced. From a perceptual perspective, darkness acts not as a direct source of danger but as an ambiguous and unpredictable condition (Grillon et al., 1997). In dark conditions, visual information decreases, and the individual becomes uncertain in interpreting spatial boundaries (Stamps, 2009), the presence or absence of others, the path of movement, or the existence of potential threats. This lack of information can weaken perceptual control, stimulate imagination, and consequently evoke high levels of anxiety in the individual (Grillon, 2008; Levos & Zacchilli, 2015; Peake & Leonard, 1971; Rusalem, 1973; Wright, 1980).

From a place-based perspective, nyctophobia usually manifests in spaces with insufficient or scattered light: narrow corridors, basements, windowless rooms, tunnels, warehouses, outdoor spaces at night, or dimly lit parking lots. However, the experience of this phobia is not necessarily limited to absolute darkness; in many cases, dense shadows, intense light contrasts, or unbalanced lighting can also trigger this anxiety.

Based on interviews with environmental design specialists, nyctophobia was recognized as a clear example of phobias caused by perceptual ambiguity in space. Specialists emphasized that the experience of fear of darkness is rooted not in the darkness itself, but in the lack of reliable cues for perceiving safety, distance, and spatial boundaries. From the experts' perspective, a key factor in triggering this phobia is the inability to predict the environment. In darkness, if there are hidden spaces, bushes, parked cars, or secondary corridors, the mind quickly activates scenarios of potential threats. Also, the presence of moving shadows, unclear sounds, or the interference of artificial light with natural sources can greatly intensify the experience of nyctophobia.

To reduce the consequences of nyctophobia in the design of architectural and urban spaces, lighting must go beyond technical and quantitative requirements and pay attention to perceptual and psychological effects to reinforce the sense of safety and cognitive control in low-light conditions. Achieving this goal requires observing the following key considerations in design: Lighting design should be uniform and continuous, avoiding dark spots, light cutoffs at angles, or sharp light contrasts that intensify the feeling of insecurity. Movement paths should be designed with reliable lighting that predictably reveals spatial boundaries, depth of field, and alternative routes. Using appropriate angles and directions of light rays improves visibility to blind spots and reduces misperception of depth, edges, or distances. The integration of natural and artificial light in semi-open or enclosed spaces, utilizing daylight and proper placement of openings, reduces the need for artificial light during the day and stabilizes spatial perception. Also, designing efficient emergency lighting systems for critical points such as exits, ramps, and stairs maintains a sense of safety in power outage conditions. The selection and placement of lighting fixtures should increase visual access and path predictability, reinforce the feeling of security and safety of space, and filter potential environmental threats from the user's view. Designers must be aware of the dynamics of any change in the distribution of light and darkness in space. The arrangement and integration of light levels (natural and artificial) with darkness levels directly affect the user's judgment about color, depth, distance, direction, visualization of edges, boundary clarity, shadows, and reflections. In open spaces, the use of open planting patterns, precise placement of urban furniture, and reduction of physical barriers prevent the formation of deep shadows or hidden points that induce a sense of threat. In general, designing for nyctophobia means designing for the restoration of cognitive control in low-light conditions. Ambient lighting should have a reassuring function rather than merely illuminating. That is, in darkness, the environment should be designed to show the user's mind that what is not seen is also predictable and reliable.

Claustrophobia: Fear of Enclosed and Inescapable Spaces

Claustrophobia, a combination of the Latin word "claustrum" meaning confined or limited space, refers to a persistent and deep fear of encountering places with limited access, small dimensions, or insufficient visual sight (King et al., 2005; American Psychiatric Association, 2000). The prominent feature of this phobia is anxiety caused by confinement and loss of the possibility of control. The affected individual usually, when entering enclosed spaces, first checks the exits and stands near them; sometimes refusing to enter completely. The feeling of "spatial helplessness" and "inescapability" in these individuals depends not only on the physical situation but also on the perception of escape capacity and wayfinding ability. From a perceptual perspective, research has shown that individuals with claustrophobia have distortions in perceiving horizontal distances and perceive their surrounding space as more compressed or limited than reality. These individuals often imagine their personal space to be larger than the average, while their perception of the surrounding public space is smaller and more threatening (Lourenco et al., 2011).

Claustrophobia can clearly be considered place-based. Spaces such as elevators, narrow corridors, windowless or sealed-window rooms, small toilets, underground parking lots, public vehicles, and equipment rooms are among the situations most likely to trigger this phobia. In some cases, even non-architectural elements such as wearing tight clothing or being stuck in traffic can create similar experiences, provided the individual feels unable to exit.

In dialogues with architectural and environmental design specialists, claustrophobia was introduced as a critical state of psychological reaction to spatial enclosure and limitation in perceptual and motor agency. Many participants emphasized that claustrophobia is not merely a product of space size but the result of a complex interaction of spatial proportions, light, ventilation, movement path, and perceptual cues. From the experts' perspective, factors such as lack of natural light, absence of ventilation, close distance between walls, incomprehensible breaks in the plan, dark surfaces, and hard materials can all increase the experience of compression. They also emphasized that in public spaces (such as toilets, examination rooms, or elevators), design should be not only functional but also reassuring.

To reduce the occurrence or severity of claustrophobia in space design, one must focus on creating a sense of control, perceptual clarity, and connection with the surrounding environment. The design should reinforce feelings of openness, predictability, and freedom for the user, even in confined spaces. Some key considerations in this regard include: The use of openings, large windows, and atriums to provide natural light and create visual continuity with the outside space, which reduces the feeling of enclosure. Designing a legible spatial hierarchy with clear wayfinding cues, predictable paths, and display of exit distances reassures the user that the space is controllable and safe. Observing human proportions in corridor dimensions, ceiling heights, and room sizes, especially during peak density times, improves spatial perception. Open and linear furniture arrangement, maintaining distance and avoiding obstruction of movement or sight paths, reinforces the sense of freedom. The use of light colors, natural materials, sound-absorbing textures, and soft lighting, along with adequate ventilation and perceptible airflow, has a positive psychological effect in reducing anxiety. Open plans with translucent or porous partitions increase visual transparency and reduce the feeling of enclosure. These elements, along with continuous access to spatial reference points, help users understand their position and move confidently in space. Overall, designing for individuals prone to claustrophobia requires creating a space that conveys a sense of the possibility of escape, choice, and breathing, even if physical exit is not immediately possible. Also, careful attention to human proportions, user density, and design details, even an increase of a few centimeters, can significantly improve spatial experience and reinforce the feeling of security and openness in users.

Agoraphobia: Fear of Open and Boundless Space

Agoraphobia, derived from the Greek word "agora" meaning public space or gathering place of people, refers to a deep fear of being in or passing through open, boundless, or unenclosed spaces. Contrary to popular belief that this phobia is merely a reaction to crowds or congestion, its main root lies in the feeling of a lack of boundaries (Sussman & Hollander, 2021; American Psychiatric Association, 2000), disorientation, and inability to form a mental image of space (Kallai et al., 2007). In an agoraphobic experience, open space is perceived as threatening, not because of the presence of an external dangerous factor, but because of the elimination of spatial frameworks that enable interpretation, wayfinding, and environmental assessment. In such spaces, walls and edges are either absent or they get lost in the individual's spatial perception due to the high ratio of floor area to walls. Consequently, a feeling of abandonment and helplessness, along with loss of control over spatial position, is formed in the individual.

Places such as large urban squares, open parking lots, unstructured areas in site design, urban balconies, and open spaces at height (such as viewpoints or boundless terraces), and even horizontal panoramic views with vast extents are examples of situations that can activate agoraphobic reactions in susceptible individuals.

In analyzing the perspectives of architecture and environmental design specialists, agoraphobia was defined as a state of "perceptual disconnection from the environment," a state in which the user is unable to define their position in open space. Participants in interviews repeatedly emphasized the importance of spatial boundaries and mental anchoring points. Specialists also pointed to the role of site form design, the ratio of open to closed in the urban plan, and spatial hierarchy in preventing agoraphobic experiences. According to some, even in very large spaces, it is possible to recreate a sense of belonging and direction through the appropriate organization of cues, paths, and spatial rhythm.

To reduce the occurrence of agoraphobic experience in open spaces, design should reinforce the sense of security and wayfinding by creating perceptual frameworks, clear boundaries, and anchoring points. This goal is achieved through the following considerations: First, a precise definition of spatial boundaries using horizontal elements (e.g., paving), vertical elements (such as walls, trees, and colonnades), and changes in material texture creates a comprehensible range for the user. Second, adding reference points such as urban furniture, fountains, and statues aids in wayfinding and perceptual stabilization. Third, reinforcing the geometric legibility of space through rhythmic order, spatial subdivision, and visual-motor hierarchy reduces anxiety caused by disorientation. Fourth, creating a perceptual connection to the surroundings through active edges, clear paths, and visual continuity with the surrounding context increases the sense of belonging. Finally, combining open spaces with semi-open spaces, shading structures, and lightweight structures, along with controlling the open-to-closed ratio, prevents the creation of an empty realm and makes the space more humane and secure. Therefore, designing open space requires choosing a site with an appropriate balance between openness and enclosure. Placing spaces in environments without visual boundaries, such as empty streets, should be avoided. Also, the designer should define a zone with a familiar and predictable geometric pattern to reinforce the user's wayfinding ability. Active and inviting edges that allow easy sight and movement outward, along with urban cues proportionate to the scale of the space, form a coherent mental map in the user's mind. In summary, open spaces should neither be eliminated nor expanded uncontrollably, but should regain their conceptual boundaries within a meaningful and comprehensible structure.

Chromophobia: Fear of Color or Perceptual Aversion to Color in the Environment

Chromophobia, sometimes also introduced by the term chromatophobia, is derived from the Greek word "chroma," meaning color, and refers to an irrational fear or aversion to color. Unlike common sensitivities to certain colors, chromophobia is accompanied by a level of anxiety or repulsion that can cause severe psychological reactions in the individual when confronted with a specific color or a set of colors. Color is a key element in the human cognitive system (Heller, 2015; Valdez & Mehrabian, 1994) for decoding and evaluating the environment. However, in chromophobic experience, color is perceived not as a sign of life or order, but as a threatening and uninterpretable stimulus. Affected individuals usually show a strong reaction to one or two specific colors, but in severe cases, they are also sensitive to high color variety or contrast. This fear can stem from unpleasant associations (such as blood, disease, death, or past experiences), or perceptual responses to uncertainty and ambiguity in space (Wexner, 1954; Langendorf, 1991).

Chromophobia is directly related to spatial conditions. Environments such as overly white therapeutic spaces, commercial spaces with colored lighting, amusement parks, cinema halls, or minimalist interior spaces with monochrome palettes are among the situations that can trigger this phobia. What becomes problematic in these spaces is not just "color," but the "exaggerated, unstable, and complex perception of color in the spatial context."

Analysis of interviews with architectural and environmental design specialists showed that chromophobia, compared to other place-based phobias, manifests more in reaction to perceptual qualities of space than to spatial form or physical structure. In this context, the relationship between color, light, texture, and mental association plays a key role in arousing or reducing anxiety. Specialists also emphasized the challenge of the relativity of color perception (Horton, 1991; De Grandis, 1986). In their view, color is never perceived alone; rather, it is always interpreted in relation to other spatial elements, the type of materials, the type of lighting, viewing distance, and even the individual's psychological states. Therefore, predicting user reactions to color is not absolute or definitive and requires measures to maintain perceptual balance.

In designing spaces where chromophobic reactions may occur, color must be managed not as a decorative element but as an emotional and perceptual stimulus. For this purpose, the use of neutral palettes such as white, gray, beige, and natural colors as a background creates a calm foundation for color perception and moderates the effect of intense colors. Adding colors should be done in a controlled manner and on a small scale, such as color patches in secondary or decorative elements, so that users can voluntarily interact with or distance themselves from them. To reduce anxiety, avoiding sharp and sudden color contrasts is essential. The use of ombre patterns (gradual gradient from light to dark), adjustable lighting, and transparent or transitional colors in intermediate spaces, such as corridors, helps create visual calm. The use of biophilic colors inspired by nature reduces negative associations, and fluorescent colors or intense night-glow lights are suitable only for safety marking, such as emergency exit routes. Also, coordination between color, light, surface material, and texture is vital because color perception changes under the influence of light angle, time of day, and surface characteristics. Ultimately, color design in the face of chromophobia must create a balanced, controlled, and perceptually non-surprising space that allows for "seeing without threat" and "understanding without aggression" for users. Architects should design a calm and pleasant environment by understanding the psychological meanings of colors and using them in balance, minimizing anxiety related to color phobia.

Pyrophobia: fear of fire and thermal threats in the environment

Pyrophobia, derived from the Greek word "pyr" meaning fire, refers to an intense, persistent, and often irrational fear of fire or any sign of burning. Although fire is associated with danger and destruction in public perception (Rofé & Rofé, 2015), and part of natural human caution towards it is understandable, in pyrophobic experience, this fear goes beyond rational levels and becomes a debilitating anxiety that manifests even in reaction to minor or controlled stimuli. From a psychological perspective, pyrophobia is a type of "association-based fear." Not only seeing fire, but also the smell of burning, feeling localized heat, or sounds of flames or sparks can trigger this phobia (Ekman et al., 1983; Langlois et al., 2021). The reason is that the sense of smell—as an alarm sense—in individuals prone to pyrophobia quickly connects to emotional patterns such as fear and restlessness. Consequently, the experience of space in general may become contaminated with a sense of threat, urgency, and need to escape because cues associated with pyrophobia appear more frequently in specific spaces. Enclosed spaces with heating equipment (heaters, ovens, fireplaces), public spaces with open flames (restaurants, coffee shops, open spaces with fire pits), spaces with a history of burning (such as utility rooms or industrial kitchens), or warehouses of chemical materials in ports can all be a context for activating this phobia.

Analysis of interviews with architectural and environmental design specialists showed that pyrophobia in spatial experience is tied to a sense of losing control over the source of heat or fire. This fear is activated not only in the presence of real fire but also in the potential imagining of a fire incident. Specialists emphasized that pyrophobia often occurs in a state of psychological alertness for danger. In such a state, spaces with flickering lights, the sound of sparks, or even designs reminiscent of flames can evoke involuntary reactions in the individual. Consequently, architectural design must provide the possibility of reassuring the user through visual cues, operational safety, and control of environmental conditions.

In designing spaces where fire- or heat-related cues are present, attention to the perceptual and psychological aspects of users, especially those with pyrophobia, is of great importance. These individuals may constantly check escape routes, search for fire extinguishing equipment, or assess fire hazards in public spaces. The following considerations are particularly important in this context: First, the use of open flames such as fireplaces, torches, or fire pits in public spaces such as restaurants, lobbies, and stores should be done with caution or eliminated, as these elements can be anxiety triggers. Also, safety equipment such as alarms, extinguishers, emergency exit signs, and escape routes must be designed to be clear, visible, and accessible. Furthermore, the thermal conditions of the space must be carefully regulated. The use of materials with low heat absorption, insulated envelopes, and prevention of concentrated thermal points provides a safe experience for users. The use of neutral colors, natural elements such as plants and water, and the transparent design of exit routes can also reinforce the sense of confidence. Effective ventilation is also essential to prevent the accumulation of odors from heat or burning, whether through natural air circulation or mechanical systems, because failure to control sensory cues associated with fire (such as flickering lights, clicking sounds, smell of burning electrical appliances, electrical sparks, or even the hot smell of an iron) can induce a sense of danger and alertness in sensitive individuals. Overall, designing for pyrophobia means designing for control, predictability, and reassurance. The user should feel that both the space and its potential hazards are under control and predictable. In such conditions, even the symbolic presence of fire can be safe and part of the spatial experience, not a trigger of anxiety.

Trypophobia: Fear of Clustered Visual Patterns and Repetitive Geometries

Trypophobia is a relatively new term in phobia classification, derived from the Greek word "trypo," meaning "hole" or "borehole." It refers to an intense and often involuntary fear or aversion when confronted with repetitive visual patterns, especially clustered patterns of holes or regular shapes. Unlike many classical phobias that focus on fear of a single object or situation, trypophobia is engaged with the formal and textural characteristics of visual elements. Studies have shown that many images triggering this phobia have specific spatial frequency characteristics (Le et al., 2015; Cole & Wilkins, 2013; Sasaki et al., 2017)—such as high contrast, symmetrical and repetitive spacing, or the presence of dot patterns at unusual intervals. These characteristics can cause reactions such as anxiety, nausea, or itching in some individuals. What makes these reactions place-based is the presence of such patterns in facades and building materials, decorative details, or architectural layouts.

In analyzing interviews with specialists, trypophobia was identified as one of the most complex phobias in spatial experience. Unlike phobias based on function or physical position of space, trypophobia focuses on the visual characteristics of surface and form. Interviewees emphasized that in many cases, the affected user cannot clearly express the source of their discomfort, because the trypophobic experience is highly subconscious and dependent on visual characteristics hidden in the second and third layers of visual attention. Consequently, the designer's awareness of texture, repetition, scale, and spacing of visual components in space becomes doubly important.

In architectural design, attention to repetitive visual stimuli that may activate trypophobia not only helps improve spatial experience but also prevents the creation of spaces with hidden anxiety-inducing loads. To achieve this goal, designers should avoid clustered and porous patterns in facade materials, walls, ceilings, floors, and furniture, and instead use soft, continuous, and organic textures such as wavy wood or simple fabrics with curved lines that provide greater visual calm. Also, bulky decorations, busy patterns, or uniformly repetitive patterns in interior and exterior design should be simplified. In graphic design, signage and billboards should be designed with uniform, low-detail backgrounds to avoid visual stimulation of sensitive users. Even the functional arrangement of elements such as switches and outlets, shelving, or point lighting should avoid clustered and unbalanced geometries to reduce phobic reactions. Ultimately, trypophobia reminds us of the fundamental point that space is experienced not only through its function or scale, but also micro-visual perceptions, even at the level of surface texture or pattern, can profoundly transform the experience of being in space. Attention to these details makes design not only beautiful but also empathetic, flexible, and adaptable to the psychological diversity of users.

Sciophobia: Fear of Reflections and Inconsistent Shadows

Sciophobia refers to a set of fears and anxious reactions toward mirrors, reflections, and shadows. This phobia is also known in psychological literature by other close terms, such as catoptrophobia (fear of mirrors), spectrophobia (fear of reflections), and eisoptrophobia (fear of seeing oneself in a mirror). At the foundation of this fear lies the issue of perceptual ambiguity: reflective surfaces (Merleau-Ponty, 1969) or shaded areas, by breaking direction, scale, and field of view, create a quality of space that is considered "uncertain," "unpredictable," and "disturbing to the mind" (Rochat & Botto, 2021; Caputo, 2017; Caputo et al., 2014; Brewin & Mersaditabari, 2013; Brewin et al., 2013; Broughton, 2002; Cole & Wilkins, 2013; Houran, 2000; Mash et al., 2023; Pekala et al., 1995). The mirror, although one of the common technological products in contemporary spaces (Vollrath, 2018), at the same time defines a psychological boundary between reality-imagination, presence-absence, and here-elsewhere (Caputo et al., 2021). The shadow, although a direct result of light and physical form, can disrupt the perception of spatial stability and security through deformation, elongation, and overlap. Sciophobia is at the intersection of these two factors, namely reflection and shadow, and its experience is often accompanied by anxiety about the perceived self, lack of control over the visual scene, and confrontation with images that seem to be entering a familiar space from an unknown place.

In dialogues with architects and designers, sciophobia was recognized as a type of disorder in spatial legibility and perceptual demarcation. Designers emphasized that although mirrors and reflective surfaces are tools for increasing light or visually expanding space, if used incorrectly, they can cause anxiety or psychological aversion. A common point in most analyses was that the experience of shadow or reflection becomes anxiety-inducing when it contradicts spatial assumptions or the user's expectations of the field of view. In this state, the user is not only unable to predict the direction and limits of space but also becomes perceptually uncertain about their own position in space.

To reduce the effects of sciophobia in space design, creating a balance between light, reflection, and spatial legibility is essential. Key considerations in this context include: In the first step, maximizing the use of natural light using translucent and non-glass reflective materials, such as textured or matte surfaces with light colors, is recommended. These materials diffuse light softly and uniformly and prevent sharp reflections or deep shadows. If glass is necessary, frosted or translucent glass is more suitable for reducing disturbing reflections. Mirrors should also be carefully placed at controlled angles and away from direct sightlines. Indirect and multi-purpose lighting, using diverse light sources (wall, ceiling, floor) and curved surfaces, plays a key role in eliminating unwanted shadows and reducing sharp contrasts. Directional lights that create elongated shadows should be avoided, and instead, ambient lights with uniform distribution at different heights should be used. In designing movement paths, avoid straight corridors with endless reflections or combinations of mirrors and dark glass in public spaces. Curved and directional paths, which reduce sudden encounters with reflections, help create a smooth and tension-free experience. Ultimately, sciophobia draws attention to layers of spatial experience where the boundary between self and other, inside and outside, reality and illusion, becomes blurred in the form of light, shadow, and reflection. Therefore, the designer, with sensitivity to these invisible layers, can create a space that remains legible, calming, and reliable.

Acousticophobia: Fear of Hubbub and Sensitivity to Environmental Auditory Stimuli

Acousticophobia, derived from the Greek word "akoustikos" meaning "auditory," refers to anxious or avoidant reactions to environmental sounds, especially unwanted sounds. This disorder can be placed on a spectrum alongside concepts such as phonophobia (fear of sound), hyperacusis (increased auditory sensitivity), and misophonia (aversion to specific sounds) (Amin et al., 2010; Gu et al., 2010; Liu et al., 2015; Mathisen, 1969). Acousticophobia is specifically characterized by an inability to adaptively process environmental sounds and a reduced sound tolerance threshold. In this disorder, the organism is unable to ignore or filter environmental noise, or is forced to expend high psychological energy to do so (Salvi et al., 2022; Tarnopolsky et al., 1978; Tarnopolsky et al., 1980). For this reason, even intermittent or background sounds that may be considered insignificant by other people can be severely anxiety-inducing for affected individuals (Basner et al., 2014; Burns, 1973). The degree of mental arousal in response to a sound depends on several factors such as intensity, frequency, timing, distance, and predictability (Beutel et al., 2016; Weinstein, 1982). Interviews with architects and designers indicated that acousticophobia is one of the most widespread causes of psychological dissatisfaction in public spaces, especially in situations where sound volume is beyond the control of the designer or user. Specialists emphasized that functional density, inappropriate space layout, and lack of sound control in the early stages of design often lead to the creation of spaces that are unintentionally anxiety-inducing. This issue is more pronounced in high-traffic spaces such as airports, cafes, subway stations, and open-plan offices.

In the design of architectural spaces, attention to the user's auditory experience is essential, not only from a technical acoustics perspective but as part of the psychological perception of the environment. Suggested strategies for reducing auditory stimulation and enhancing hearing comfort for individuals sensitive to acousticophobia are: First, a hierarchical design of spaces with acoustic zoning, including the separation of quiet, transitional, and noisy spaces using thick walls, sound barriers, and buffer zones, can create a balanced spatial experience. Second, the use of sound-absorbing materials such as acoustic panels on walls and ceilings, soft flooring, fabric furniture, and textured materials reduces sound reflection and controls hubbub. Third, controlling sound sources by adjusting the volume of music and public announcements, replacing some auditory signals with visual cues, and creating controlled soundscapes with natural sounds like water or wind reduces auditory anxiety. Furthermore, sound guidance through physical design, including space layout, use of angled edges, changing ceiling height, or installing dropped ceilings, can moderate sound intensity in sensitive areas. In outdoor spaces, dense planting of vegetation and choosing an appropriate site location relative to external sound sources, such as roads, also play an effective role in reducing environmental noise. Overall, relative silence, sound quality, and the ability to control the auditory source are among the factors that play a decisive role in reducing environmental anxiety and improving user experience.

Numerophobia: Numerical Anxiety and Ominous Symbols in living Space

Numerophobia refers to an intense fear or aversion to specific numbers; a symbolic phobia rooted in cultural, religious, and mythological systems. In many ancient cultures, numbers were considered not only counting tools but also signs of cosmic, superstitious, or moral concepts. This cultural encoding has continued to this day and persists in the form of fear of numbers such as 13, 4, or 666 in various cultures. A familiar example of this phobia in Iran is triskaidekaphobia (fear of the number thirteen). This number has long carried an ominous connotation in the collective mind and has been eliminated or redefined in many urban, architectural, and public space signage systems. Numerophobia, contrary to popular belief, is not merely a superstitious belief, but in its acute form turns into a debilitating anxiety when confronted with a specific number; an anxiety accompanied by reduced control, increased unpredictable anxiety, and active avoidance of interaction with the environment.

In interviews with designers, numerophobia was analyzed as a kind of "semiotic disorder" in space design; a situation in which numerical cues, instead of aiding spatial ordering and positioning, cause tension, avoidance, or aversion in users. Analyses indicate that numerophobia is related more to the signage system of space than to the form or structure of space. Therefore, aware designers can maintain the path of positive user interaction with space by defining alternative signage systems.

To reduce the effects of numerophobia and improve user experience in architectural spaces, design must be aligned with cultural and psychological sensitivities. First, conducting contextual and cultural studies before design identifies numerical sensitivities associated with the socio-cultural context of the region. This makes designers aware of numbers that evoke sensitivity. Instead of directly eliminating numbers, which may face regulatory limitations, alternative numbering systems such as color coding, thematic names (like flowers, stones, or trees), or alphanumeric combinations (e.g., A12) can be used. Also, redefining the use of floors or units associated with sensitive numbers, such as assigning them to collective or service spaces (like a gym or storage), can be an effective solution. In sign design, using aesthetic graphics that fade numbers into the background reduces the negative feeling associated with them. Furthermore, in high-traffic spaces such as lobbies and corridors, focus should shift from numerical cues to formal, color-based, or functional cues to improve user interaction with the environment. Finally, numerophobia reminds us that even the simplest signs in design, such as numbers, can carry cultural, emotional, and psychological weight. Aware, flexible, and context-based design not only leads to better functioning of the space but also fundamentally improves the quality of human perception of it.

Discussion

The synthesis of findings shows that among the types of phobias examined—despite their apparent diversity—commonalities in how they are affected by physical environment characteristics can be observed. The coding of themes extracted from the findings in Table 2 identifies and categorizes the key design components that play a role in reducing phobic reactions. Analysis of these data indicates that the repetition coefficient of these components in different situations not only implies their fundamental importance but also reinforces their effectiveness in reducing a wide range of phobias. For example, reference to spatial form can be identified in various ways in studies of place-based phobias: In enochlophobia, concave spaces with recesses allow withdrawal and reduce crowd-induced anxiety; in agoraphobia, vast space fuels the feeling of helplessness; and in claustrophobia, limitation and convexity of space directly intensify the feeling of enclosure. These observations highlight the systematic repetition of design components as a key preventive mechanism. Hence, the systematic organization of findings shows that common factors are rooted in spatial components such as geometry, proportions, hierarchy, spatial position, and also spatial elements. Accordingly, the architect in the early stages of design, by focusing on these components, can, instead of addressing the multiplicity of phobias, create spaces that reduce the potential for phobia occurrence and significantly diminish the intensity of anxiety in built environments.

In spatial components (Fig. 1), spatial geometry focuses on the overall shape of space, the form of corners or spatial angles, and how one space connects to an adjacent space; spatial proportions on the ratio of spatial walls to each other, the ratio of space to view and human proportions, and the ratio of population to space capacity; spatial hierarchy on arrangement and organization, relationships (visual permeability and movement permeability), and spatial prioritization; spatial position on the position of space relative to the ground and how it relates to the context and surrounding environment; and spatial elements such as light, color, materials, texture, and furniture focus on physical components as well as perceptual and semantic load. Each of these components can have specific, equivalent, and exemplary roles in spatial experience affected by phobias. For better understanding, examples of these components in claustrophobia can be described as follows: convex space, sharp, closed, and inactive corners, linearity of

Table 2. Example of theme extraction from findings on spatial components for five common place-based phobias. Source: compiled by Authors.

	Derived from the study of...	Coding	Extracted theme	Core code
Enochlophobia	Spaces that allow the user to withdraw, reassess, and react behaviorally when facing others—whether in movement, pause, or escape—help alleviate enochlophobia.	Convex/concave space, spatial recesses, possibility of retreat	Spatial Form	Spatial Geometry
	Perception of crowding depends not only on the number and density but also on focal points.	Concentrated spaces		
	The possibility of free and unobstructed movement during peak hours helps alleviate crowd phobia.	Linear spaces		
Agoraphobia	Unstructured areas with a high ratio of space volume to mass in the urban plan intensify agoraphobia.	Geometric structure, full/empty space		
Claustrophobia	Enclosed and confined spaces intensify claustrophobia.	Enclosed and confined space		
Nyctophobia	Using appropriate angles and directions of light rays improves visibility to blind spots and reduces misperception of depth.	Spatial recesses		
	In darkness, the environment should be designed to show the user that what is not seen is also predictable.	Nooks and edges	Corner Shape / Space Corner	
	Arrangement and integration of light levels (natural and artificial) with darkness levels directly affect the user's judgment of depth, distance, direction, visualization of corners and edges, boundary clarity, and shadows.	Boundary clarity	Manner of connection to adjacent space	

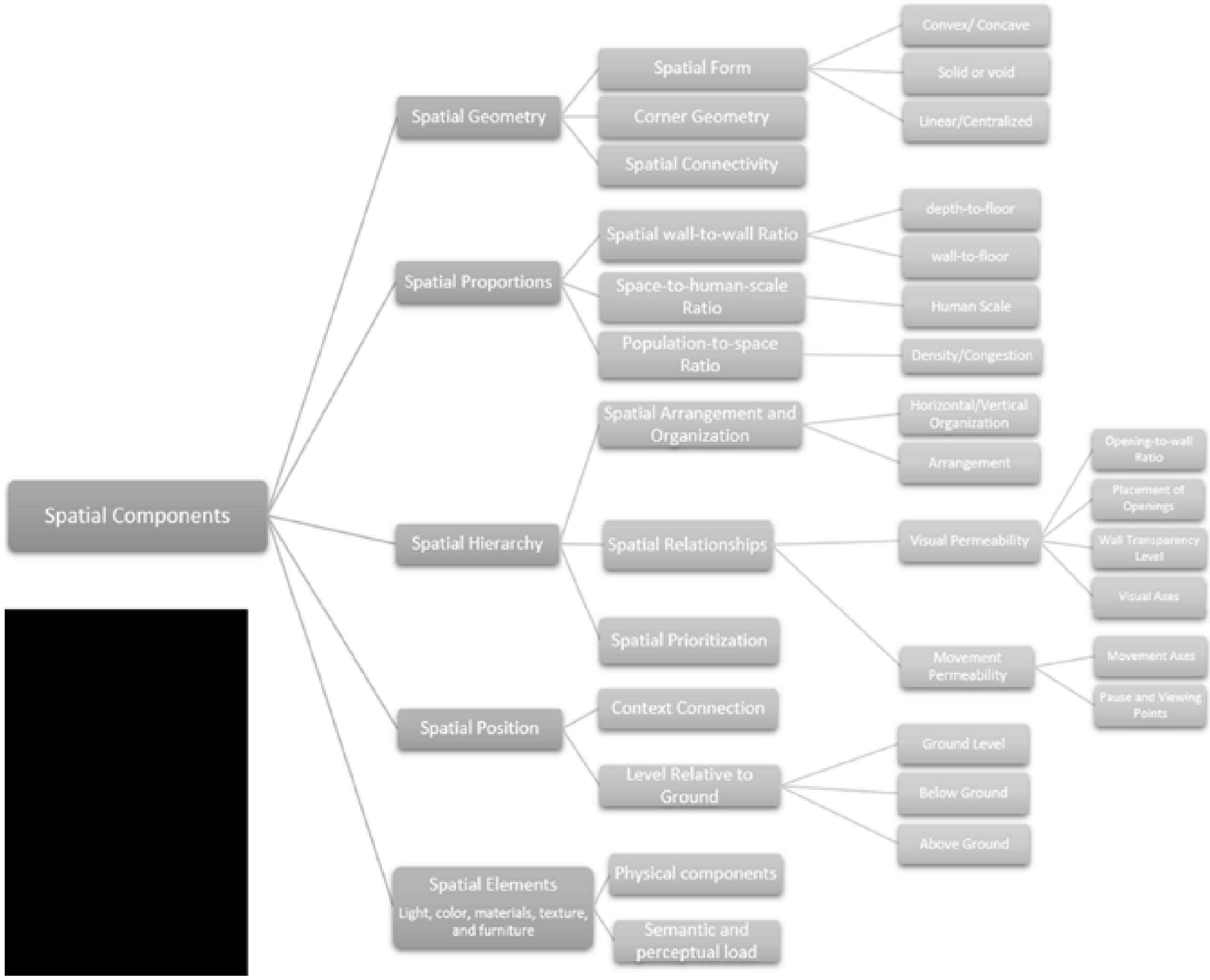

Fig. 1. Spatial components in reducing phobia. Source: compiled by Authors.

plan, and lack of empty space between masses and volumes in spatial geometry; narrow dimensions, increased ratio of wall height to floor and elongation of depth to width, horizontal compression of the human cone of vision, and high density of users in spatial proportions; visual obstruction and lack of clear view to exits, movement limitation, lack of easy access and presence of multiple obstacles, dense arrangement and crowded furniture, complex paths, and irregular patterns in spatial hierarchy; isolation and lack of continuity with the external environment in spatial position; stagnant air, minimal light, rigidity and cold texture of walls, and unstable condition of materials in spatial elements—all exacerbate anxiety, the feeling of being trapped, and phobia of enclosed space.

Furthermore, the synthesis and analysis of findings show that some spatial design realms require more special attention. These realms often act as critical points that can be the focus of formation or exacerbation of place-based phobias. For example, in agoraphobia, when emphasis is placed on the degree of openness and spatial extent, the importance of surrounding walls and mental anchoring points, the thresholds of open space, spatial boundaries, and the reading of environmental cues become important; the anxiety mechanism in acrophobia highlights the role of vertical thresholds in how the user confronts depth, and ceilings in regulating view and the degree of height perception; also, in crowded conditions, bottlenecks (narrow crossing points) and false or low ceilings in enochlophobia become important. The synthesis of these observations all emphasizes the importance of four key spatial realms: thresholds, boundaries, cues, and ceilings. Although these realms are potential points of phobia stimulation, they also provide opportunities for design intervention. Therefore, the management and targeted design of the aforementioned spatial components, especially in these four realms, becomes doubly important.

Thresholds are the starting points in the transition between spaces that shape the change in movement experience and spatial perception. The threshold, in addition to physical separating lines, is a spatial joint that not only links two spaces but also acts as a pre-space or pre-entry to enable the user's psychological and sensory transition between different territories. The main function of the threshold is the gradual management of the effects of successive spaces on each other. The position of the threshold is also a function of spatial hierarchy and the user's ultimate destination to prepare the individual to enter the next space. For example, in a movement sequence between two spaces, the perception of the spaciousness of the destination space depends on the perception of the spaciousness of the space experienced along the path (Gregory, 1997; Helson, 1964; Spence, 2020; Wunder & Lockhead, 1971). Therefore, a large space may make a small space appear smaller and exacerbate claustrophobia. The invisibility of thresholds (e.g., using thin lines or completely opaque partitions) can lead to a reduction in the depth of spatial experience because the user loses sufficient time to process the change.

Boundaries, as interfaces between two different phases or spaces, can be physical—walls and partitions, railings and fences, or level changes such as steps or platforms—or perceptual—change of flooring, change of color, change of lighting, or layout. Boundaries not only define and separate spaces, but also specify the connection or disconnection of different spaces in a building or built environment, and play an important role in creating enclosure, distinguishing inside from outside, and organizing space. In the disconnection of two spaces, boundaries are the surrounding environment of a space, such as walls/edges, which can completely separate and be impermeable (e.g., a concrete wall without windows) and create a sense of isolation, or allow visual connection but be physically separating (e.g., large glass windows) and make the space appear wider. In the connection of two spaces, boundaries are the transition stage between two spaces, such as bottlenecks, which are both visually and physically permeable and allow the passage of light, air, sound, and even human transition between two spaces. An important design point regarding boundaries, especially bottlenecks, is considering and controlling dualities (دوقطبی‌ها) that affect how the user experiences the passage between spaces. Dualities are the qualitative boundaries and binary attributes of successive spaces formed based on contrasts, such as light/dark, open/closed, expansion/contraction, hard/soft, or even private/public. These boundaries are often non-physical and are created through design elements such as light, color, texture, scale, etc. Therefore, clear but hard (impermeable) physical boundaries, ambiguous in predictability (without the possibility of selective escape), accompanied by a sensory shock from a sudden change in qualitative characteristics (light to dark), can trigger claustrophobia.

Ceilings, as the fifth facade (Zevi, 1957) or horizontal overhead surfaces in architecture, define a volume of space between themselves and the ground plane along the vertical (Z) axis, and complete the space of a room or interior environment from above. The ceiling manages the covering surfaces over space and is more than a simple physical roof. By means of height, shape, and form (horizontal, sloping, or curved), color, texture, and materials, the degree of light permeability and transparency, as well as spatial proportions (width and depth of space), the ceiling influences the control of scale and perception of space and can induce a sense of security, openness, or even pressure. The ceiling can direct or filter the user's upward field of view, and also block the space ahead, or make it appear semi-open and change the user's path. This visual filtering not only affects spatial perception but can also be an element for controlling privacy or creating spatial hierarchy. Therefore, manipulating ceiling height (gradual height reduction), using sloping or vaulted ceilings, creating vertical views (with skylights) to open up enclosed spaces, and subdividing very large spaces with dropped ceiling elements can reduce the feeling of pressure or suffocation caused by claustrophobia.

Cues encompass a wide range of spatial clues and are not limited to Lynch's large-scale landmarks (Lynch, 1960). These cues can refer to any external (visual, auditory, olfactory, tactile) or internal (thoughts, memories, feelings) element that is easily distinguished from the background and recorded in memory as a recognizable and meaningful pattern; facilitates information retrieval; and also allows the individual to predict the sequence of future events. For example, an ordinary escape door is only useful for a claustrophobic person when they see it, but if the escape door is turned into a cue element, even without direct sight, its presence remains in the mind. Hence, the cue is the remaining aspect of any space in the mind that allows the user to build an accurate and functional mental map of the environment. The mental map includes two layers: a static layer—knowing the location of doors—and a dynamic layer—knowing how to reach them from any point. Although the nature of place-based phobias differs, there is a common cognitive mechanism in using environmental cues to manage them: designing cues with the aim of strengthening the mental map, creating a sense of control, and providing clear action options can modulate the anxiety response in various phobias. The design strategy for each phobia adapts by changing the type of cue (from escape cues to safety and protection cues) and its scale (from tactile details to macro spatial organization).

Conclusion

The findings of this research demonstrate a deep connection between place-based phobias and the physical and perceptual dimensions of architecture. These phobias are not only rooted in psychological aspects but are directly influenced by spatial characteristics such as geometric forms, visual surfaces, materiality of the environment, and signage systems. Phobia-inducing stimuli sometimes arise from small and detailed components of space, such as focused lights, reflective mirrors, or numerical codings, and sometimes from the overall logic of space, such as spatial sequence, layout, or auditory systems. Neglecting these factors in the design process can lead to the creation of environments that unintentionally evoke a sense of escape or insecurity in users, while integrating awareness of the cognitive and perceptual mechanisms of phobia into design—such as regulating numerical sensitivities, perceptual response to color, sound, shadow, or geometric repetition through subtle interventions—can play a preventive role in reducing irritability and improve the psychological experience of users. The analytical synthesis of findings suggests that architects, instead of focusing on the multiplicity of phobias, should focus from the early stages of design on the role of geometry, proportions, hierarchy, spatial position, and also the characteristics of spatial elements to avoid phobias. Furthermore, it introduces four key spatial realms—thresholds, boundaries, cues, and ceilings—as critical points that are often the focus of phobia formation. Targeted management of these realms can be an effective step toward creating desirable spaces and "phobia-free architecture," and provide an opportunity to redefine the role of space in improving quality of life. The findings of this study have three practical implications: In professional design, recognizing phobia-inducing spaces allows designers, by paying attention to cues, structures, and threatening perceptual experiences, to design environments with minimal psychological stress and maximum perception of safety. This is doubly important, especially in projects with therapeutic, educational, residential, and public space uses that face high diversity in user populations. In policy-making: Reviewing design regulations and standards (placement of exit signs, use of warning lights, numbering of spaces, coding of floors, etc.), taking into account the mechanisms of fear and perceptual avoidance, can lead to the redefinition and formulation of safety guidelines and environmental standards for environments sensitive to people's mental health. In scientific discourse: Opening a new path for interdisciplinary research between architecture, environmental psychology, and neuro-architecture. At the same time, this study has limitations. First, the scope of the research is limited to the Iranian cultural context, and the generalizability of the results requires similar studies in other contexts. Also, perceptual analyses are based on descriptive and theoretical qualities, and empirical or physiological investigation of reactions in real contexts has not yet been performed. Future research can test the models proposed in this article and develop them in practical fields by employing empirical, neuro-architectural, or ethnographic approaches.

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