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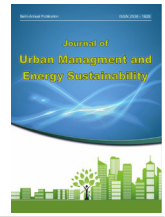

CASE STUDY RESEARCH PAPER

Modeling Sustainable Urban Management with a Salutogenesis Approach: The Role of Shiraz Gardens in Energy Optimization and Public Health (Case Study: Eram, Jahan-Nama, Afif-Abad and Naranjestan-e Qavam Gradens)

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ABSTRACT

With the spread of psychological, social and environmental challenges in contemporary cities, attention to urban green spaces as platforms for sustainable management and the promotion of public health has become increasingly important. The present study aimed to model sustainable urban management with a salutogenesis approach and to explain the role of the gardens of Shiraz city, Iran, in energy optimization and the promotion of public health. The study was conducted with a mixed-methods design. In the quantitative part, data obtained from a questionnaire were analyzed using factor analysis and structural equation modelling to develop a management model. In the qualitative part, semi-structured responses and field notes were examined using content and thematic analysis. In addition, to evaluate the objective environmental and physical indicators related to energy and accessibility, analyses based on Geographic Information Systems and Space Syntax were used. Four historical gardens were studied as multiple cases. The qualitative findings and spatial analyses revealed the key role of the vegetation cover and the structure of Shiraz's historical gardens in moderating temperature, creating psychological calm and facilitating social interaction as pillars of salutogenic urban management. Among the perceived attributes, historical identity, visual quality and perceived safety received the highest ratings, whereas acoustic comfort was the weakest. Results show that Persian garden is interpreted not as a passive green space but as a vital, health-generating infrastructure that supports both urban energy performance and citizens' psychological and social well-being.

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INTRODUCTION

The rapid growth of urbanization in recent decades, alongside the physical, social and environmental transformations of cities, has created numerous challenges for the health and well-being of citizens (Kadakia & Galea, 2023). Rising everyday stress, declining environmental quality, the loss of vitality in public spaces and the weakening of the human bond with nature are among the consequences of contemporary urban development. Under such conditions, the prevailing approaches to urban planning and design which have focused mainly on controlling harm and reducing pathogenic outcomes are no longer able to meet the complex needs of contemporary human life. Consequently, there is a growing need to attend to approaches that, instead of focusing solely on disease, emphasize the origins of health, the quality of life and the enhancement of people's psychological and social capacities. Among these, the salutogenic (health-generating) approach provides a theoretical framework for understanding and strengthening the factors that produce health in human life. This concept was first proposed by Aaron Antonovsky in the late 1970s and rests on the principle that, rather than focusing on pathogenic factors, one should identify and strengthen health-generating factors. In this view, health is regarded not as a fixed state but as a dynamic continuum between disease and complete health, and its goal is to enhance a person's capacity to move toward physical and mental health and to prevent disease (Warne, Snyder, & Gådin, 2014). On this basis, the human living environment can play a decisive role in shaping the experience of health, reducing psychological pressure and strengthening the sense of empowerment and coherence.

As this approach developed further, the concept of "salutogenic design" was introduced as an applied framework for designing health-promoting environments. Building on "health factors" in the design of restorative environments, this term emphasized the importance of creating spaces that can support human health through spatial organization, perceptual quality and connection with nature (Rynor, 2010). Subsequently, the concept of psychosocially supportive design (PSD) was proposed to describe environments in which the structure of space is organized so as to be psychologically and socially supportive and healing (Dilani & Sia, 2008). In the same vein, a healing environment has been defined as one in which indoor and outdoor spaces contribute to the health and well-being of the individual across physical, psychological, social and spiritual dimensions (Jonas et al., 2014). On this basis, urban green spaces and gardens in particular are among the most important platforms for realising the health-generating approach in cities. Beyond their aesthetic and recreational functions, these spaces can improve public health by strengthening multisensory experience, creating mental calm, increasing social interaction and enhancing the human bond with nature (Grahn & Stigsdotter, 2010) (Kabisch et al., 2017). Among them, the Persian garden, as one of the most prominent historical and cultural models of Iran, has a special capacity to be reread within the framework of health-promoting urbanism. Relying on principles such as spatial order, balance, harmony, and the presence of water, plants, shade, fragrance, light and spatial sequence, the Persian garden possesses characteristics that allow it to be regarded as an example of a restorative, health-generating landscape. Such characteristics are not only consistent with the foundations of environmental psychology but also have a meaningful connection with the concepts of salutogenesis and healing design.

Despite these capacities, no comprehensive and integrated model has yet been formulated for modelling sustainable urban management that can link the salutogenic approach (environmental health promotion) with energy-optimization indicators. A large part of contemporary urban-management and design studies has focused either solely on physical functions and the optimization of energy consumption in buildings, or has addressed the psychological and aesthetic

values of Persian gardens separately and without a structured managerial approach. In this context, the ecological potentials and spatial organization of the historical gardens of Shiraz have been overlooked in the decision-making models of sustainable urban management, both in terms of promoting public health (salutogenesis) and in terms of energy efficiency (through moderating the urban microclimate, reducing heat islands and improving environmental flows). This research gap becomes particularly important when today's cities face simultaneous crises of environmental-quality erosion, energy waste and declining mental-health indicators circumstances that redouble the need for an operational model of sustainable urban management grounded in the structure of these gardens. From this perspective, the city of Shiraz one of the most important cities of Iran with a rich history of Persian garden-making offers a suitable context for studying this subject. The gardens of this city are not only carriers of historical, cultural and identity values but can also be regarded as models for rethinking the design of health-oriented public spaces. Rereading the healing principles latent in the gardens of Shiraz makes it possible to draw on the capacities of the Persian landscape heritage to improve quality of life, reduce psychological tension, increase the sense of coherence and shape health-generating urban environments.

Accordingly, the present research aims to model sustainable urban management with a salutogenesis approach and to explain the role of the gardens of Shiraz in energy optimization and public health. It seeks to show how the spatial, ecological and microclimatic potentials of historical gardens can be used to enhance citizens' psychological health while simultaneously improving energy efficiency in the urban context. The importance of this research lies in the fact that, on the one hand, it contributes to the theoretical literature on the connection between salutogenesis (health promotion), ecological sustainability (urban energy optimization) and the management of green spaces, and, on the other hand, by presenting a structured model, it provides a practical, decision-supporting framework for urban managers, planners and designers to regenerate public spaces with high energy efficiency and positive effects on public health.

MATERIALS AND METHODS

The salutogenesis approach and health promotion

In recent decades, perspectives in the health field have moved away from an exclusive focus on harmful factors and toward the identification of the resources and mechanisms that promote well-being. The theory of salutogenesis, proposed by Antonovsky, is one of the most important frameworks for explaining the relationship between the human being, the environment and health (Antonovsky, 1979). Unlike the pathogenic view, which focuses on the origin of disease and its treatment, this approach emphasizes individual and environmental enablers for moving along the disease–health continuum toward health (Warne, Snyder, & Gådin, 2014). In this understanding, health is a dynamic state that takes shape within the interaction of the individual with environmental conditions and available resources (Dilani, 2005). On this basis, the design of built spaces is regarded as an active factor in promoting the physical, psychological and social well-being of users (Golembiewski, 2010). (Fig. 1)

The sense of coherence and its components

The central concept in salutogenesis theory is the "sense of coherence" (SOC), which reflects the degree of a person's confidence that the events around them are comprehensible, manageable and meaningful (Antonovsky, 1987). This concept is composed of three main components: (1) comprehensibility the interpretability and orderliness of environmental stimuli for the individual; (2) manageability the individual's perception of the availability of the resources needed to face challenges; and (3) meaningfulness regarding the challenges and experiences of life as worthy of emotional and cognitive investment (Antonovsky, 1993). In the field of environmental design,

enhancing legibility, spatial order, the possibility of choice and the creation of meaningful experiences are recognised as factors that strengthen the sense of coherence (Golembiewski, 2010).

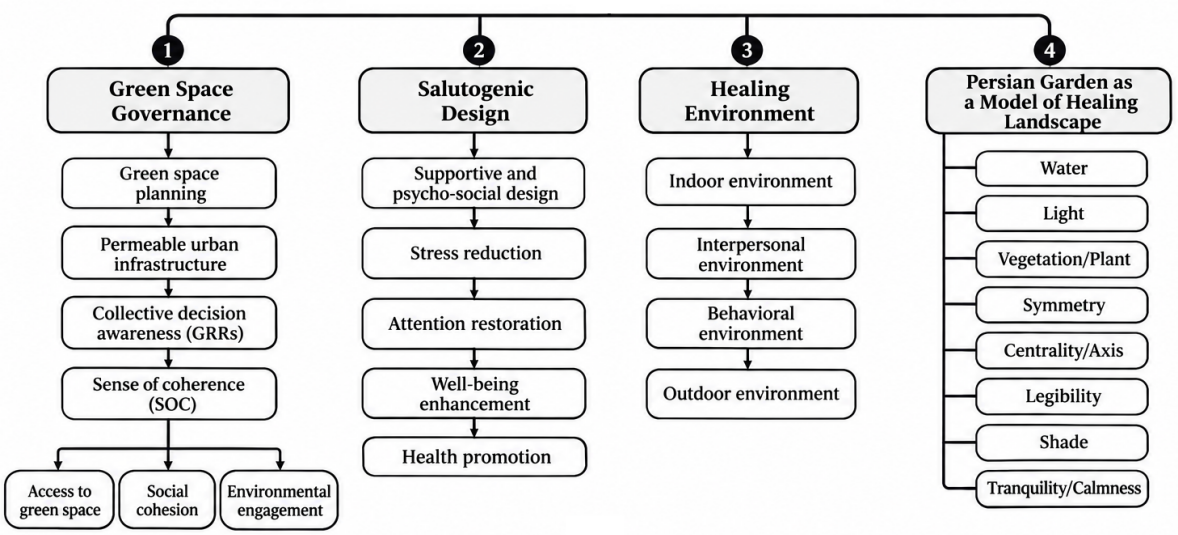

Figure 1: The theoretical framework of the research

Generalized resistance resources

Antonovsky emphasizes the role of "generalized resistance resources" as the biological, psychological, social and material capacities with which a person copes with the pressures of life (Antonovsky, 1979). These resources include knowledge, self-esteem, social support, cultural capital and economic resources (Antonovsky, 1987). Facilitating access to these resources within built environments is regarded as the foundation for strengthening the sense of coherence and moving toward health (Jonas et al., 2014). With the entry of salutogenic concepts into the field of architecture, salutogenic design took shape with the aim of creating spaces that enhance the quality of lived experience (Rynor, 2010). In this respect, Dilani proposed the "psychosocially supportive design" (PSD) model, according to which the environment must have a restorative and healing character and stimulate healthy behaviours (Dilani & Sia, 2008). The presence of natural light, visual quality, access to nature and the creation of spaces for social interaction are introduced as the main indicators of this approach (Dilani, 2008).

The healing environment and its four dimensions

A healing environment is a space that supports the health and well-being of the individual in four dimensions (Jonas et al., 2014). These dimensions are as follows: (1) the internal environment the individual's intention, hope and belief in recovery; (2) the interpersonal environment social relationships and the quality of supportive interactions; (3) the behavioral environment lifestyle, stress management and health-oriented behaviours; and (4) the external environment-built spaces, nature, light, water and physical stimuli (Jonas et al., 2014) (Schweitzer et al., 2004). (Fig. 2)

Nature, green space and mental health

Contact with nature is introduced as one of the most fundamental components of health-oriented design, leading to the reduction of stress and the recovery of cognitive capacity (Grahn & Stigsdotter, 2010) (Barton & Pretty, 2010). In this regard, urban green spaces, in addition to their aesthetic aspects, play a fundamental role in enhancing citizens' welfare (Salehifard, 2008) (Velarde et al., 2007). (Fig. 3)

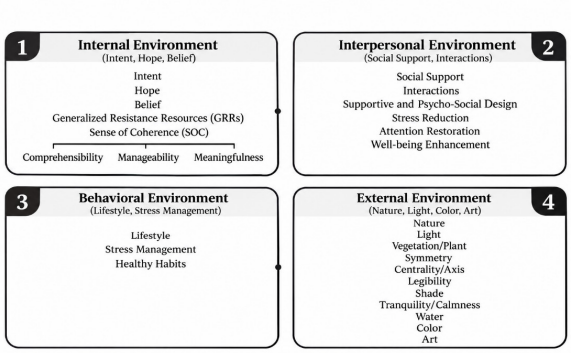

Figure 2: The four dimensions of the healing environment

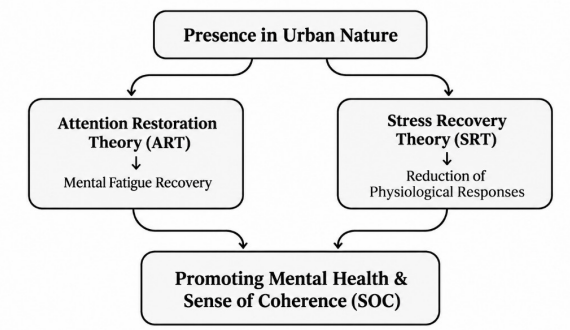

Figure 3: The psychological mechanisms of nature in the city

The stress-reduction theory (SRT) holds that natural landscapes reduce the physiological reactions caused by stress (Roe & Aspinall, 2011). At the same time, attention-restoration theory (ART) shows that natural environments, by activating involuntary attention, repair mental fatigue (Hartig et al., 2003) (Hartig & Fransson, 2009).

The Persian Garden as a model of the healing landscape

The Persian Garden is a cultural and architectural phenomenon in which natural and artificial elements are organized in a harmonious order to provide a safe and comfortable environment (Shahcheraghi, 2009). The physical characteristics of the Persian garden such as geometric order, symmetry, the presence of water, plant diversity and spatial legibility create an exceptional capacity for producing a calming and meaningful environment (Pirnia, 1994). This geometric and spatial structure gives rise to a multisensory experience for the human being (Mirfendereski, 2005), and the harmony among its natural elements at the functional and spiritual levels shows a high degree of conformity with the principles of salutogenic design (Nasr, 1990) (Falamaki, 2004). (Fig. 4)

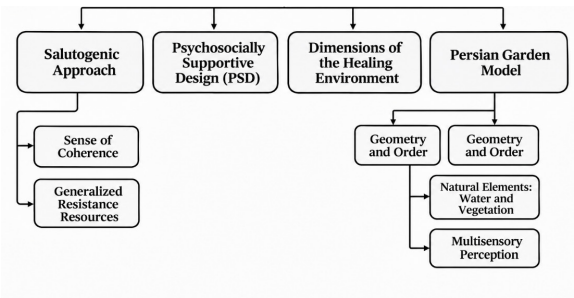

Figure 4: The theoretical framework of the salutogenic healing garden

Methodology

The present study, entitled "Modeling sustainable urban management with a salutogenesis approach: the role of Shiraz gardens in energy optimization and public health," is, in terms of subject, an interdisciplinary study, since it lies at the intersection of sustainable urban management, energy and environmental engineering, landscape architecture, environmental psychology and public health. Accordingly, a precise account of the research methodology was fundamental to attaining the study's aims in a valid manner. In this study, methodology was regarded not merely as a tool for data collection but as a systematic framework linking the theoretical foundations, aims, questions, variables, study field and mode of analysis. Within this framework, the main aim of the research is to present a model for sustainable urban management that shows how the physical, spatial, ecological and semantic potentials of the gardens of Shiraz can lead to the enhancement of sustainable liveability in the urban context—on the one hand by optimizing environmental energy parameters (moderating the microclimate and reducing

thermal effects) and, on the other, by strengthening public-health indicators (such as the sense of coherence, mental calm and social interaction) through a salutogenic approach.

Given the multi-layered nature of the subject, this research was based on a pragmatist paradigm. In this paradigm, the choice of method was made not on the basis of an exclusive commitment to positivism or interpretivism, but according to its fit with the research problem and its effectiveness in answering the research aims (Saunders et al., 2009). The study therefore adopted a mixed-methods approach in order to draw simultaneously on the capacity of quantitative and qualitative data for a comprehensive understanding of the phenomenon. This choice was appropriate because the subject of health promotion in urban gardens had both objective, physical dimensions and dimensions dependent on the perception, lived experience and subjective interpretation of users. In terms of purpose, the study was applied–developmental; in terms of nature and mode of implementation, it was descriptive–analytical. The overall research design was organized as a multiple case study. This design allowed the researcher to study several selected gardens as independent but comparable cases and, through comparison, to identify shared patterns and meaningful differences related to environmental health promotion (Pirnia, 1994) (Golembiewski, 2010). The spatial domain of the research was the city of Shiraz, which owing to its rich background in Persian garden-making, its historical gardens, its spatial diversity and its prominent cultural status offered a suitable field for studying the relationship between nature, urban space and health. Four notable gardens of Shiraz Eram Garden, Jahan-Nama Garden, Afif-Abad Garden and the Naranjestan-e Qavam were selected as the study field. These gardens varied historically, spatially, functionally and in urban location, thereby enabling a comparative analysis among the cases. Eram Garden, with its axial structure, prominent presence of water and diverse vegetation; Jahan-Nama Garden, with its geometric balance and historical continuity; Afif-Abad Garden, with its socio-cultural function; and the Naranjestan-e Qavam, with its wealth of artistic, sensory and architectural elements, each reflected different dimensions of health promotion in the context of the Persian garden. The temporal domain of the research was defined as 2024–2025, and field data collection was carried out mainly in the spring and summer of 2025, when the gardens were at their most favorable climatic and vegetative condition and visitor numbers were higher. The conceptual domain rested on integrating the theory of salutogenesis with the principles of Persian healing gardens. Within this framework, the sense of coherence was regarded as the most important psycho-environmental mechanism, comprising the three dimensions of comprehensibility, manageability and meaningfulness (Dilani & Sia, 2008) (Jonas et al., 2014). (Fig. 5)

The statistical population comprised two parts. The first was the users of the gardens Shiraz citizens, local residents and tourists who visited the selected gardens who formed the main population for the quantitative part, since their perception, satisfaction and experience were the basis for measuring the realization of health-generating components in the space. The second part comprised experts and specialists in landscape architecture, urban planning, environmental health and garden management, whose views were used for the content validity of the instruments and the interpretation of some findings (Saunders et al., 2009) (Robinson, 2014). The sampling method, in keeping with the mixed nature of the study, was designed as a combined procedure. Purposive sampling was used to select the gardens and the experts, since their selection had to be based on specific criteria such as historical value, public access, the presence of characteristic Persian-garden elements and social function. For the garden users, stratified random sampling was used so that different groups by gender, age, type of garden use and other demographic characteristics were represented. Quali-

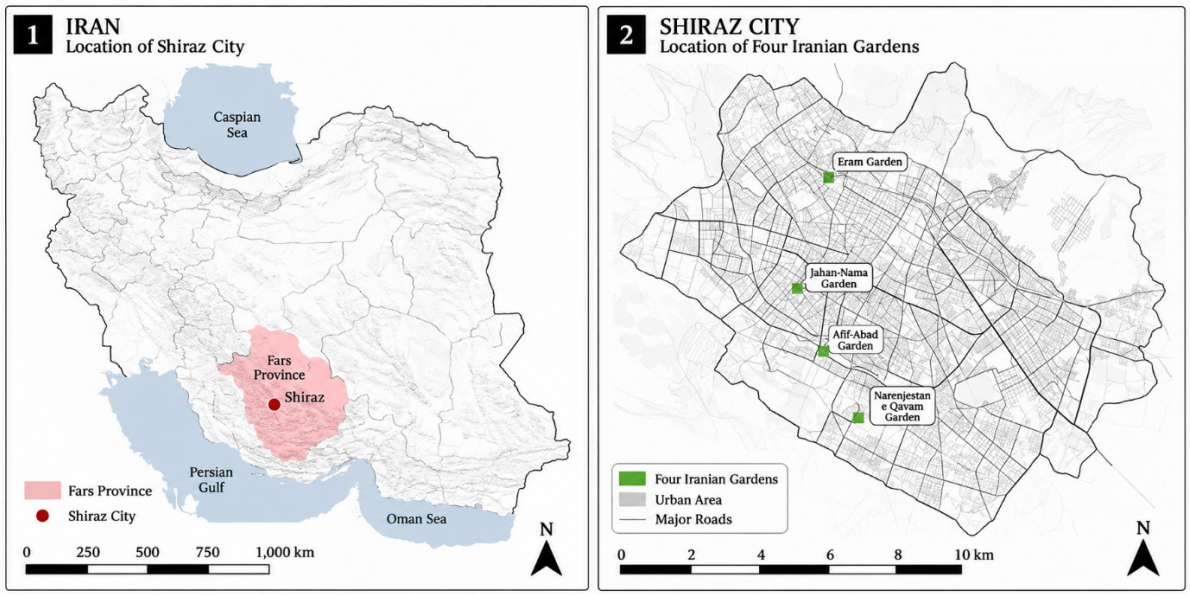

Figure 5: Location of Four Shiraz city gardens as case studies

tative data collection continued until theoretical saturation. In the questionnaire part, the sample size was determined using Cochran's formula for large populations; with a 95% confidence level, an estimated proportion of p = 0.5 and a permissible error of e = 0.05, the sample size was estimated at about 384 and was increased to 400 to improve the precision of the analysis. This sample size was sufficient for correlation, regression, factor analysis and even structural equation modelling; and, according to green's rule for multivariate analysis, the selected sample exceeded the minimum required (Green, 1991). The distribution of the sample across the gardens was proportional to the volume of visitors and the field capacity of each garden.

Data were collected using three main categories of instrument: documentary and library study, systematic field observation and a structured questionnaire. In the first stage, the library and documentary method were used to formulate the theoretical foundations, extract indicators, identify previous research and design the conceptual framework. In the second stage, systematic field observation was used to evaluate the objective environmental and spatial characteristics of the gardens; this observation was organized on the basis of a public-space study model (Gehl & Svarre, 2013) and carried out through structured checklists covering indicators such as the quality and presence of water features, the density and diversity of vegetation, the clarity of routes, the quality of pause spaces, comfort, lighting, cleanliness, natural sounds, social activity and accessibility. Where possible, some environmental data (the location of key points, temperature, humidity and sound intensity) were recorded and used for spatial analyses in ArcGIS. In the third stage, the quantitative part was carried out through a structured questionnaire designed on the basis of the theoretical foundations of salutogenesis, the literature on healing gardens and the characteristics of the Persian garden. The main items used a five-point Likert scale. For the sense of coherence, an adapted version of the SOC-13 scales, suited to the Iranian cultural context, was used to measure the three dimensions of comprehensibility, manageability and meaningfulness (Antonovsky, 1993) (Jonas et al., 2014).

The independent variables comprised the

physical, natural, spatial and service components of the gardens such as the quality of water elements, the density and diversity of vegetation, spatial organization and legibility, accessibility and spatial connectivity, cultural and aesthetic elements, amenities and sensory–acoustic comfort. The dependent variables comprised the perception of the health-generating quality of the environment, the sense of coherence, psychological improvement after the visit and the level of social interaction. Variables such as age, sex, education, duration of presence, frequency of visits, motivation for the visit and the climatic conditions of the visit day were included as control or mediating variables. The content validity of the instruments was assessed through expert judgement; face validity was assessed in the pretest stage; and construct validity was examined through exploratory and, where necessary, confirmatory factor analysis. Internal reliability was assessed using Cronbach's alpha, with a value of 0.70 or above taken as acceptable. Before the final implementation, the questionnaire was piloted on about 30–50 respondents to identify and correct possible problems. The data-analysis method, in keeping with the mixed nature of the study, was designed at two levels. In the quantitative part, the questionnaire data were entered into SPSS and, after cleaning, examination of missing data, identification of outliers and testing the normality of the distribution, were analyzed. Descriptive statistics (mean, standard deviation, frequency and percentage) were used first, followed by Pearson or Spearman correlation and multiple regression; independent-samples t-tests, analysis of variance and, where necessary, non-parametric tests were used to compare groups and gardens. Where the theoretical model required the simultaneous testing of relationships among observed and latent variables, structural equation modelling was performed in AMOS/SmartPLS, using indices such as χ^2/df, RMSEA, CFI, TLI, AVE and CR to evaluate the measurement and structural models. In addition, to analyses the spatial characteristics of the gardens and their relationship with the health-generating experience, spatial analyses in ArcGIS and, where needed, Space Syntax measures such as Integration and Choice were used to clarify the relationship among legibility, accessibility and the perception of health (Gehl & Svarre, 2013).

In the qualitative part, the textual data from open-ended responses and observation notes were examined using thematic analysis: the data were reviewed and initially coded, the codes were organized into conceptual categories, and finally the main themes such as "psychological calm," "connection with nature," "beauty and cultural identity," "safety and comfort" and "a sense of meaning in space" were extracted. In the final stage, a convergent parallel mixed strategy was used to combine the quantitative and qualitative findings: the two data strands were collected in parallel and analyzed separately, then compared and integrated at the interpretation stage. The convergence of the results strengthened the explanation, while divergences served as clues for deeper analysis. The study observed research-ethics principles: participation was entirely voluntary; the aim and nature of the research were explained to participants beforehand; the information collected was confidential and no individual identifiers were recorded; sources were used with scholarly integrity and precise citation; and the necessary permits for field presence were obtained from the relevant authorities.

FINDINGS AND DISCUSSION

In this section, the findings are organized in several tables so that the pattern of users' perception of the gardens in the dimensions of physical–spatial quality, environmental safety and comfort, and aesthetics and cultural identity is reported coherently. Because inconsistencies were observed in part of the data particularly in the natural-elements construct and in the naming of the studied gardens only findings with sufficient internal consistency are reported at this stage.

Findings on the physical–spatial constructs

To examine the perceived quality of the environment in the physical–spatial dimension, three components spatial legibility, route accessibility and spatial diversity were analyzed. The results showed that all three were rated at a relatively favorable level, with means above the mid-point of the scale; route accessibility had the highest mean. (Tab. 1)

Table 1: Descriptive indicators of the physical–spatial components

Component	Mean	SD	Min	Max
Spatial legibility	3.91	0.68	2.0	5.0
Route accessibility	4.07	0.59	2.5	5.0
Spatial diversity	3.85	0.71	2.1	5.0

Table 1 shows that respondents generally assessed the spatial structure of the gardens as appropriate. The higher mean for route accessibility indicates that the possibility of movement, the connection of routes and ease of use of the space were favorable for users. The relatively lower mean for spatial diversity shows that, although the spatial experience was assessed positively, there remained room for improvement in spatial richness.

Findings on environmental safety and comfort

To analyses the perceived quality of the environment, three indicators perceived safety, acoustic comfort and thermal comfort were examined. Perceived safety had the highest mean, followed by thermal comfort and acoustic comfort. (Tab. 2)

Table 2: Descriptive indicators of the environmental safety and comfort components.

Component	Mean	SD	Min	Max
Perceived safety	4.18	0.55	2.8	5.0
Acoustic comfort	3.74	0.77	2.0	5.0
Thermal comfort	3.89	0.69	2.3	5.0

According to Table 2, the sense of environmental safety was experienced at a high level. In contrast, acoustic comfort had the lowest mean, indicating that users' auditory experience was less favorable than the other dimensions of this construct. Overall, the garden environment was assessed positively in terms of safety and comfort, but acoustic quality could be regarded as one axis for improvement in health-promoting design.

Findings on aesthetics and cultural identity

To examine the perceptual and semantic dimensions of the space, three components visual quality, historical identity and sense of belonging were analyzed. Historical identity had the highest mean, followed by visual quality and sense of belonging. (Tab. 3)

Table 3: Descriptive indicators of the aesthetics and cultural-identity components.

Component	Mean	SD	Min	Max
Visual quality	4.26	0.53	3.0	5.0
Historical identity	4.41	0.49	3.2	5.0
Sense of belonging	4.08	0.62	2.6	5.0

Table 3 indicates that the gardens stood out above all in terms of their historical and identity value in users' minds. The high mean for historical identity shows that the space was able to connect with collective memory and cultural meaning. Visual quality was also perceived at a high level.

Although the sense of belonging likewise had a favorable value, it was slightly lower than the other two components, showing that strengthening users' emotional bond and lived experience with the space still merits attention.

Within-construct comparison of the confirmed dimensions

To provide a more compact picture of the confirmed constructs, the range of means and the spread of dispersion in each construct were compared. This comparison showed that the aesthetics and cultural-identity construct had, overall, the highest range of means, followed by environmental safety and comfort and then the physical–spatial components. (Tab. 4)

Table 4: Summary comparison of the confirmed constructs by range of means and dispersion

Construct	Highest-mean component	Value	Lowest-mean component	Value	SD range
Physical–spatial	Route accessibility	4.07	Spatial diversity	3.85	0.59–0.71
Environmental safety & comfort	Perceived safety	4.18	Acoustic comfort	3.74	0.55–0.77
Aesthetics & cultural identity	Historical identity	4.41	Sense of belonging	4.08	0.49–0.62

Table 4 shows that, among the confirmed constructs, the aesthetics and cultural-identity dimension received the most favorable assessment. Environmental safety and comfort were also in a good position, although within it acoustic comfort appeared weaker than the other components. In the physical–spatial dimension, routes and legibility were in a more favorable position than spatial diversity.

Overall ranking of the confirmed components

To identify the components that received the highest and lowest assessments from users, all confirmed components were ranked by mean. (Tab. 5)

Table 5: Overall ranking of the confirmed components by mean

Rank	Component	Construct	Mean	SD
1	Historical identity	Aesthetics & cultural identity	4.41	0.49
2	Visual quality	Aesthetics & cultural identity	4.26	0.53
3	Perceived safety	Environmental safety & comfort	4.18	0.55
4	Sense of belonging	Aesthetics & cultural identity	4.08	0.62
5	Route accessibility	Physical–spatial	4.07	0.59
6	Spatial legibility	Physical–spatial	3.91	0.68
7	Thermal comfort	Environmental safety & comfort	3.89	0.69
8	Spatial diversity	Physical–spatial	3.85	0.71
9	Acoustic comfort	Environmental safety & comfort	3.74	0.77

According to Table 5, "historical identity" obtained the highest rank among all confirmed components, followed by "visual quality" and "perceived safety." In contrast, "acoustic comfort" had the lowest rank. This pattern shows that users valued the gardens above all in terms of historical identity, visual quality and environmental safety, whereas the auditory quality of the environment required greater attention.

Structural-equation-model findings

After reporting the descriptive findings and the ranking of the confirmed components, the relationships among the main constructs were examined using structural equation modelling in order to explain how the perceptual dimensions of the environment affected the outcomes associated with users' experience of the gardens. This stage of the analysis went beyond a mere de-

scription of the components and made it possible to examine the pattern of relationships among the research variables, showing that the studied components operated not in isolation but as a meaningful relational network. Figure 5 shows the final model of the structural relationships among the research constructs and the standardized path coefficients. (Fig. 6)

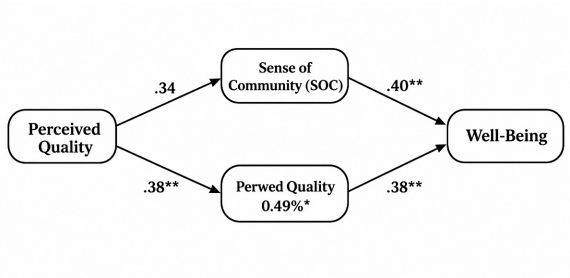

Figure 6: The final model of the structural relationships among the research constructs (standardized path coefficients; * P < 0.05, ** P < 0.01)

As shown in Figure 5, significant relationships existed among the main constructs, and the overall pattern of the model indicated that perceived environmental quality, the sense of community and well-being were structurally linked. The path coefficients indicated that a more positive perception of environmental quality could be accompanied by a strengthening of users' social experience and by an enhancement of their sense of well-being. The position of the sense of community in the model showed that this construct was not merely a secondary outcome but played an important role in explaining how the effects of the perceived environment were transmitted to users' lived experience.

Overall, the results of the structural model confirmed that the gardens were important not only in terms of their physical or aesthetic characteristics but also, by shaping users' perception, social interaction and psychological experience, played a role in producing a health-generating and meaningful quality. This finding was consistent with the theoretical framework of the study, since it showed that the health-promoting experience in the garden space resulted from the simultaneous interaction of spatial, perceptual and social dimensions rather than from a single environmental feature.

RESULTS AND CONCLUSION

The findings of this study showed that the gardens of Shiraz were not merely green spaces or urban aesthetic elements but possessed multidimensional capacities for enhancing perceived health, environmental satisfaction and the quality of users' lived experience. The integrated interpretation of the quantitative, qualitative and spatial data showed that health promotion in these gardens arose from the interaction of physical, perceptual and social factors, and that none of these dimensions alone fully explained the health-generating experience. In the quantitative part, the results of the structural equation model showed that the three main components of salutogenesis comprehensibility, manageability and meaningfulness—had a positive and significant relationship with health-oriented outcomes. Accordingly, the more legible, predictable and mentally meaningful the environment was perceived to be, the greater the likelihood that users would experience calm, satisfaction and psychological health. This finding was consistent with the theoretical framework of salutogenesis (Dilani, 2008) and agreed with previous studies on the role of the sense of coherence in promoting mental health in urban environments (Jonas et al., 2014) (Golembiewski, 2010). The qualitative findings also confirmed this pattern. Themes such as mental calm, a sense of safety, connection with nature, finding meaning in the space, stress reduction and a return to the self-showed that users experienced the garden not merely as a recreational place but as an environment for psychological recovery and emotional regulation. These findings were consistent with the literature on healing landscapes (Sternberg, 2009) and with more recent research on the restorative effects of natural spaces on mental health (Dobson et al., 2021) (Roe & Aspinall, 2011). In addition, Iranian interpretations of the garden as a meaning-ori-

ented, life-world-centred space also confirmed this reading (Shahcheraghi, 2009). Overall, the findings showed that the gardens of Shiraz operated at three main levels. The first was the physical–ecological level, encompassing elements such as vegetation, water, shade, spatial order and microclimatic quality. The second was the perceptual–psychological level, in which a sense of safety, calm, predictability and coherence was experienced. The third was the social–semantic level, relating to interaction, belonging, identity and the meaningfulness of the space. The importance of these three levels was that they showed environmental health promotion to be the outcome of an integrated system rather than the result of the isolated presence of a single natural or spatial element. From a theoretical standpoint, the results showed that salutogenesis theory was capable of being adapted to the context of the Persian garden and could be translated from the conceptual level to the level of physical, spatial and perceptual indicators. In other words, in this study the Persian garden was interpreted not merely as a historical heritage but as a model for a health-generating environment one in which spatial order, semiosis, the presence of nature, sensory quality and cultural resonance together strengthened the sense of coherence. From this perspective, the present findings help to reduce the gap between the literature on the "healing landscape" and that on "health-oriented urban design" (Kabisch et al., 2017).

This study aimed at modelling sustainable urban management with a salutogenesis approach and explaining the role of the gardens of Shiraz in energy optimization and public health showed that these gardens possess multidimensional and meaningful capacities for enhancing environmental sustainability and the public health of users. The results of integrating the quantitative, qualitative and spatial data indicate that sustainability and health promotion in these gardens arise through the interaction among the optimal management of ecological parameters (microclimatic energy efficiency), the physical organization of space and the psychological and social perception of users. BOn the basis of the modelling findings, the studied gardens were able to provide a suitable ground for strengthening the components of salutogenesis (the sense of coherence) by moderating temperature conditions and heat islands (environmental energy optimization), improving the sensory experience, providing a continuous bond with nature and enhancing spatial legibility. Accordingly, the garden is interpreted in this study not as a passive green space but as a vital, health-generating infrastructure that plays a key role in optimizing urban energy flows and supporting the psychological and social welfare of citizens.

The overall conclusion of the study is that the realisation of sustainable urban management is not achieved merely by a quantitative increase in green spaces but requires the formulation of management models and the design of spaces that can simultaneously enhance comprehensibility, environmental manageability (including energy efficiency) and meaningfulness for citizens. In this respect, the gardens of Shiraz—owing to their intelligent spatial structure, climate-moderating natural elements, identity quality and capacity for social interaction can be regarded as an indigenous, applicable model for sustainable, health-oriented development in the cities of Iran. It is therefore recommended that, in urban policy and management, gardens and similar spaces be regarded not only as heritage or recreational elements but as part of the multi-purpose infrastructure for energy management and public health.

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