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Investigating the Association between Environmental Quality Characteristics and Mental Well-Being in Public Open Spaces

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Abstract: The issues related to the urban environment and mental well-being have become increasingly important in recent decades. Although this association has been mainly investigated in developed countries, there is limited knowledge on whether similar results can be acquired in the urban environments of developing countries like Iran. This study intends to present a new dynamic and active approach to determine the environmental quality characteristics that influence the mental well-being of urban residents and to engage people to healthy urban public environments. In this respect, the research is directed by both qualitative and quantitative surveys in the public open spaces of Kermanshah, Iran. Firstly, the data are collected by Grounded Theory (GT) to identify significant environmental quality characteristics related to mental well-being by applying 24 semi-structured interviews. Secondly, the questionnaire survey based on Structural Equation Modeling (SEM) is applied to examine the association between each characteristic of the developed conceptual framework. The results reveal that the environmental quality characteristics of public open spaces, directly and indirectly, relate to users' mental well-being. It should be noted that the public open spaces with unique functional and intrinsic features seem to have different impacts on mental well-being.

Keywords: environmental quality; public open spaces; mental well-being; urban environment

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1. Introduction

Contemporary urban life has faced numerous threats and opportunities ranging from rapid population growth, overdevelopment of cities, migration flows to access to resources and services, and a higher standard of living. These are main concern in cities of developing countries as they strive to keep up with global development. All these highlight the need to focus on how cities will adjust to subsequent social and environmental challenges. Therefore, the emphasis on the collaboration of urban design with other disciplines, including psychology, has increased due to the complications of urban life in recent years [1–4]. Mental well-being is a controversial area of psychology that refers to people's emotional and cognitive ability to evaluate their lives [5–7]. Therefore, not only do we witness that the number of studies addressing the underlying factors of individual's mental well-being has steadily increased in the past decades [8,9], but also that built, natural, and social environments are increasingly receiving attention as potentially influential factors of well-being [10–13]. As pointed out by Wu et al., the environmental and social health of a city can represent the mental condition of its residents, and probing urban citizens' mental conditions is a significant factor in better comprehending and managing cities [14]. According to Mouratidis, urban environments have environmental and social challenges, enriching people's lives, resulting in increased quality of life and happiness, and influencing individuals' mental well-being [1].

In that sense, public open spaces are an outcome of ongoing relationships between urban environments and the users, which form through a social process [15–17]. Hence, it sounds logical that environmental quality characteristics of public open spaces not only

affect, but also moderate mental well-being results [18–22]. A deeper understanding of the association between environmental quality characteristics of public open spaces and mental well-being seems essential to contrive effective preventive interventions towards minimizing/offsetting urban environmental risk exposures, and to effectively increase the engagement between users and the urban environment [23–26].

Despite extensive research on mental well-being–place relations [11,14,19,22,23,27–29], little is known about the mechanisms that explain the effective environmental quality characteristics of different public open spaces and complex interaction of them with users' mental well-being, particularly in developing countries. Just taking Iran as an example of developing countries, nowadays, the majority of Iranian cities encounter complicated issues to fulfill the needs of residents, for instance high traffic density, air and noise pollution, lack of urban services, inefficient spaces, and uncontrolled urban development. Lack of well-designed urban spaces and efficient management threatens the quality of urban environments [30]. Therefore, there is an existing gap in deep understanding of the relationship between urban environment and mental well-being in the theoretical findings, and the subsequent practical design, planning, and development of desirable public open spaces in Iran.

Accordingly, this study intends to address the gap by following two steps: (1) developing a conceptual framework of mental well-being in the urban environments of developing countries and (2) assessing the impacts and relations of environmental quality characteristics to examine their direct and indirect effects on users' mental well-being. According to the results, we can entirely derive dynamic relationships between the environmental qualities of public open spaces and the requirements of users' mental well-being in urban environments.

2. Literature Review

Maintaining or promoting the well-being and healthy lifestyles of their citizens is one of the most significant challenges that cities encounter [1,3,7,19,31]. Mental well-being is a multi-faceted term describing the level of well-being people experience in accordance with their subjective evaluations of their lives. These evaluations, which can be both positive and negative, comprise feelings, judgments, and affective reactions that change based on sociocultural, historical, political, and economic context [6,22,27,32,33]. According to Ayala-Azcárraga et al. [34], mental well-being can be described as "a state of the human being that arises when good health is maintained (physical and mental), social relationships of trust and cooperation are established, and individuals and groups can act to pursue their goals so that they are satisfied with their lives." However, this concept is used interchangeably with subjective well-being, mental health, happiness, quality of life, and life satisfaction in various studies [3,7,17,28,35,36]. As pointed out by WHO, mental health is defined as a state of well-being in which every individual realizes his or her potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community [37]. Therefore, the existence of happiness and satisfaction among people in the society leads to the creation of mental well-being, which, nowadays, is regarded as an essential factor of urban health.

Mental well-being is a dynamic concept that is determined by sociodemographic characteristics. Sociodemographic characteristics comprise age, occupation, gender, education, and life satisfaction [38,39]. In addition, there is growing consensus on the notion that urban environments are the potential determinants of the health and mental well-being of individuals. They can act positively as a context for human activities and interactions, and negatively as a catalyst for restricting senses and behaviors and increasing mental disorders [11,21,25,29,32,40,41].

In this regard, public open spaces are the prominent feature of the urban environment, which provide a context for human activities to take place, such as social, economic, and recreational ones [15,42,43]. They are accessible to all people, independent of age, ethnicity, physical disabilities, or other characteristics [44–46]. Public open spaces can improve social

capital, foster community engagement, retrieve the urban mental image, and fulfill the sense of having accessible green spaces. All these generally result in better mental well-being, as it has been proved frequently that the external factors, such as urban environments, influence mental status alongside the internal factor [47,48]. Conversely, an increase in the number of vehicles, crime, crowding, noise and air pollution, and uncontrolled urban development all negatively influenced the different aspects of public open spaces related to mental well-being [14,49,50]. These all indicate the fact that improvement of the mental well-being of citizens is a top priority in planning and designing public open spaces throughout the world [15]. Public open spaces can be understood on different levels. They can be interpreted from historical and cultural, commercial, social and recreational, multifunctional, and temporary markets approaches [51–54].

Some studies have indicated that the environmental quality characteristics of spaces could, directly and indirectly, affect how the city is experienced, interconnected with mental well-being, and can lead to different emotions [18,34,55]. Albeit it is still a controversial issue how environmental quality influences mental well-being. For example, in the empirical research by Cao, it was found that personal characteristics and residential satisfaction (including accessibility and nuisance factors) play a crucial role in life satisfaction [35]. Mouratidis proposed a new conceptual framework in which subjective well-being is influenced by different neighborhood characteristics ranging from physical characteristics (population density, land uses, facilities/services, and public transport) and perceived characteristics (aesthetic quality, place attachment, opportunities for leisure, and opportunities to meet new people) to sociodemographic characteristics [1]. In another study, Dong and Qin found that mental well-being is directly affected by neighborhood environment (physical and social), personal health status, and demographic characteristics [28]. As discussed by some studies, several factors of the urban environment have been associated with mental well-being, such as land use, accessibility and connectivity, attractive aesthetics, safety, public transportation, population density, and nuisances [29,38,56,57]. Some studies indicated the positive and significant correlation of urban green spaces with mental health and well-being [2,16,21,49,58–60]. Based on the results of these studies, this research considers environmental quality characteristics related to users' mental well-being into four interrelated dimensions: physical dimension, social dimension, activity dimension, and ecological dimension.

As Ettema and Schekkerman stated, there are notable differences in mental health and affective and cognitive well-being between different urban spaces [61]. Some public open spaces are presented on the basis of universally accepted design principles and guidelines that could not sufficiently satisfy the requirements of all users. This contradiction may be rooted in some factors, such as the research subject, different functional and intrinsic features of public open spaces, and urban characteristics where research is conducted. As previously mentioned, some studies investigated the association between one or more environmental quality characteristics and well-being in different urban contexts. Moreover, many researchers carried out the study in a developed country, which has a principled and clear structure of public space as a part of the whole urban structure. There is a lack of similar research in many of the developing countries. Thus, it is essential to provide regulations for public open spaces in accordance with the particular needs of each context.

Some researchers have applied mixed methods of qualitative and quantitative analysis techniques to examine the association between public open spaces and well-being. Coventry et al. [58], in a mixed-method study, evaluated the health and well-being benefits of different activities in different locations of public green spaces in urban and semi-urban areas. Acun and Yilmazer [62] used the Grounded Theory (GT) and Structural Equation Modeling (SEM) to examine indoor soundscapes in historical spaces. In this study, a mixed-method technique was employed using GT method and SEM method. Using a mixed-method technique is particularly essential in developing countries to design and implement interventions as they are understudied and usually require approaches that differ from those that seem effective in developed countries. For the qualitative method in

this study, GT was used. The benefit of GT is that it can traceably and systematically analyze the qualitative data and present in-depth information about the phenomenon [62]. The GT process includes face-to-face interviews, constant comparison, theoretical saturation, systematic coding, conceptualizing, variation, and integration [63]. SEM, which is known as a quantitative method, examines the complex relations among variables. In the SEM method, the directional relations between indices are demonstrated by path analysis, and inferring the latent indicators underlying observed indicators is depicted by measurement models [64].

3. Materials and Methods

A mixed-method technique is conducted in this study, through qualitative and quantitative methods, to present a context for designing public open spaces based on the citizens' well-being in these spaces. Figure 1 illustrates the encompassing methodology of the research in two steps. This figure specifies the sequential qualitative and quantitative steps of the study. In the first step, the data are collected by GT to identify significant characteristics of environmental quality related to mental well-being, the identified characteristics are refined by experts, and then these results are used in the next step. In the second step, the questionnaire survey based on SEM is done to examine the relations between each characteristic.

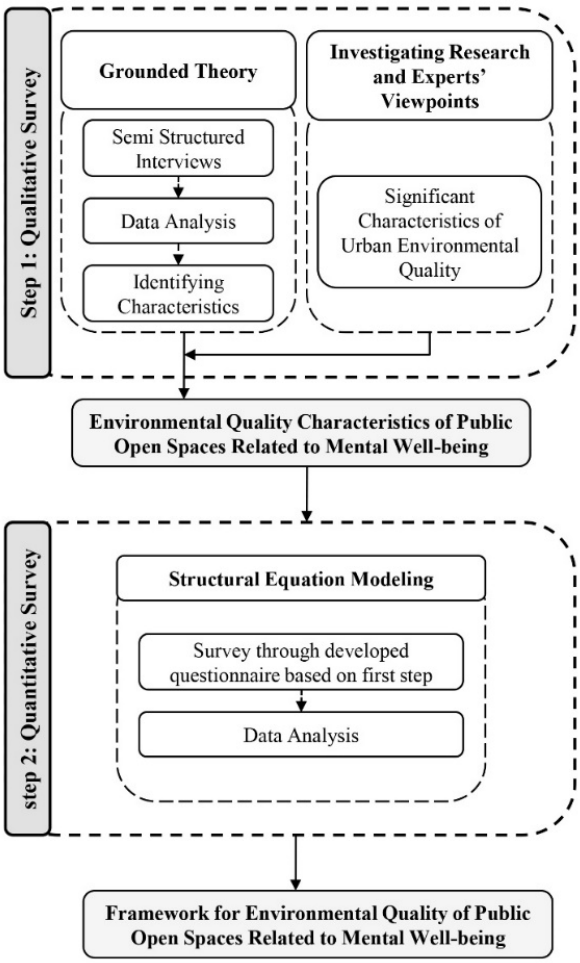


Figure 1. The diagram of encompassing methodology and process of this research.

3.1. Case Study: Kermanshah Public Open Spaces

Analyses are carried out on data collected in four main public open spaces in Kermanshah metropolis, Iran, in 2019. Kermanshah, which is located in the western part of Iran,

has been claimed as a progressive metropolis that has followed a new strategy to provide suitable public open spaces [30]. Recently, the creation of new public open spaces and the improvement and regeneration of existing ones have been considered in the Kermanshah metropolitan area. This strategy helps not only to promote the quality of life in the urban areas, but also to enhance public health levels, particularly mental well-being [65].

Accordingly, this study investigates the environmental quality characteristics of four public open spaces covering diverse locations on the main axis of Kermanshah (known as the Modarres axis). It is worth mentioning that each public open space has unique characteristics, including the local node (Ferdowsi), the commercial center (Mosadegh), the historical texture (Shahrdari), and the multifunctional space (Azadi), which may lead to quite different individual and social experiences [66]. The public open spaces of the study can be seen in Figure 2.



Figure 2. The location of four public open spaces on the map.

3.2. Step 1: Qualitative Survey

In this step, GT was applied for analyzing the data to investigate environmental quality characteristics of public open spaces related to Iranian mental well-being. In qualitative research, the researcher wants to represent the world through observational data, interviews, pictures, etc., and provides a necessary basis for further understanding and making changes of the spaces and places based on the classification and interpretation of the resulting data [67]. The data were analyzed from semi-structured interviews by employing GT approach based on a systematic process. Therefore, this research used GT methods supported by Strauss and Corbin, so that it can increase knowledge and awareness of emerging issues [63].

The interviewees were recruited through purposeful sampling among experts related to the field of urban mental well-being, including professors of architecture, urban design, psychology, and sociology, and officials of the municipality and ministry of cultural heritage in Kermanshah, Iran. We selected participants by consulting with the Department of Architectural and Urban Engineering, Razi University, Kermanshah. Interviewees were designated in classifications of graduates, female and male, and their profession to carry out the semi-structured interviews. The inclusion criteria were the different ages, having research background in urban mental well-being and health, residing in Kermanshah for more than 10 years, having a weekly presence in these public open spaces, and the desire to take part in the interview.

The time and place of the interviews were determined by the participants. Twenty-four in-depth interviews were conducted up to theoretical saturation in the summer of 2019. The sociodemographic status of participants is mentioned in Table 1.

Table 1. The sociodemographic status of interview participants.

Feature	Participant (n = 24)	Number	Percentage
Age group	30–39	7	29%
	40–49	11	46%
	50–59	4	17%
	60–69	2	8%
Gender	Female	6	25%
	Male	18	75%
Education level	Graduate (BA)	1	4%
	Graduate (MA)	9	38%
	Postgraduate (PhD)	14	58%
Job	Architect	4	17%
	Urban designer	3	12%
	Sociologist	5	21%
	Psychologist	6	25%
	Employee	6	25%
Duration of residence	10–19 years	2	8%
	20–29 years	2	8%
	30–39 year	7	29%
	40–49 years	7	29%
	50–59 years	4	18%
	More than 60 years	2	8%

The research questions were conducted without direction so that participants could fully express their viewpoints about each of the public open spaces. The general questions asked of the participants are presented in Table 2.

Table 2. The general questions of interviews.

Questions for the Semi-Structured Interview
What is your opinion about the level of urban mental well-being in this space?
What are the positive characteristics of this space?
What are the negative characteristics of this space?
What potential is there to enhance the space?
What needs to be improved?

All interviews were fulfilled in Persian, recorded, transcribed, and confirmed by the participants. The analysis was carried out based on the method proposed by Corbin and Strauss [66]. In the open coding stage, we reviewed all interviews line by line, and made the coding by exerting the related keywords and phrases. To find common links, codes and categories from each interview were compared with the other ones. We also analyzed the collected data by MAXQDA 2018, which can support various approaches of combined data and allows for an analysis of a wide range of data types [67,68]. We controlled the extraction of codes and categories before, during, and after the data were analyzed in MAXQDA.

Considering the opinions of other researchers, the credibility of data was assured for the trustworthiness and conformability of the extracted items. Four academic scholars in urban design and urban planning reviewed the items, and the authors perused more than 150 studies in the field of urban health and well-being to comprise and adapt the findings with similar studies. Moreover, other methods of data gathering, such as field observation (the behaviors and activities of people attending the public open spaces), were done for improved validation of findings.

3.3. Step 2: Quantitative Survey

In the quantitative step, a questionnaire was prepared, and SEM analysis was applied to examine the causal relationships among environmental quality characteristics on the

basis of the proposed conceptual framework in the qualitative step. The questionnaire tested four main dimensions based on a 5-point Likert-type scale (a great deal, much, to some extent, little, not at all). Social dimension was measured by six characteristics, while activity dimension was analyzed by three characteristics. Six characteristics were used to measure physical dimension, and three characteristics covered ecological dimension.

A total of 460 participants who were familiar with four public open spaces in the metropolitan area of Kermanshah, Iran constituted the statistical population. The study participants were randomly selected ranging from commuters to residents and business owners in four public open spaces, and had great diversity in terms of social class, cultural background, jobs, age, and gender. The participants were within the age range of 20–70 years and their period of residence in Kermanshah ranged from 1 to 70 years. The survey was conducted between September and October 2019 (Table 3).

Table 3. The sociodemographic status of participants who answered the questionnaire.

Feature	Cases	Number of Cases	Percentage of Cases
Gender	Female	183	40%
	Male	277	60%
Age	Less than 20 years old	9	2%
	20–29	122	27%
	30–39	185	40%
	40–49	85	18%
	50–60	40	9%
	More than 60 years old	19	4%
Education	School and College	86	19%
	Bachelor	218	47%
	Masters	120	26%
	PhD	36	8%
Job	Student	41	9%
	Employee	152	33%
	Self-Employee	186	41%
	Housewife	47	10%
	Other	34	7%
Number of Visits	Every day	132	29%
	Once a week	145	31%
	Once a month	123	27%
	Once a season	39	8%
	Once a year	21	5%
Duration of Residence	1–5 years	8	2%
	5–10 years	21	5%
	More than 10 years	431	93%

Since the indicators of mental well-being normally have subjective and inner manifestations, the data analysis and evaluation of the relationships between various environmental quality characteristics of public open spaces related to mental well-being were performed by SEM. SEM is a comprehensive multiple analysis technique related to multiple regression or general liner model, which consists of examining a collection of regression models simultaneously. Accordingly, it provides the opportunity to examine the acceptability of theoretical models in particular society since the majority of existing factors in urban design and planning researches are latent ones [68]. Thus, in this study, the questionnaire survey contained two main parts, sociodemographic characteristics of respondents and dimensions of environmental quality, including 22 questions designed according to step one. Each question as observed variable was a clear statement with regard to the four dimensions as latent variables.

4. Results

4.1. Step 1: Qualitative Survey

According to the process of the GT study, the primary categorization of codes was made based on commonalities through experts' experiences and viewpoints related to

the public open spaces. In open coding, a total of 143 initial codes was extracted. After continuous comparison of codes in the axial coding stage, a total of 79 concepts and 18 categories were determined. Comparing the categories of the previous step showed that four main dimensions could be presented in the selective coding stage to extract model characteristics. The core category in this study was the urban mental well-being related to the environmental qualities of public open spaces. According to the study, the four main dimensions were identified as the physical dimension, activity dimension, social dimension, and ecological dimension.

The social dimension is defined as a significant feature to perceive space and place without spatial components, and to recognize the interrelated concepts of society, and the quality of life. This dimension contains of six final categories of security, leisure, sense of belonging, social facilities and services, presence of various age groups and social classes, and public participation. Some of the participants are of the opinion that social interactions promote a sense of attachment to the community and public place. According to the most participants' viewpoints, emotional feelings related to the place associate with having these social conditions and interactions, which have a positive effect on being present and contributing to social activities. In this regard, participant ID. 1011, a psychologist said: "This is the place where people go to stroll or spend leisure time. People participate in volunteer activities like religious and cultural ceremonies, and charity reunion, and have a sense of belonging to that. All this help to have a healthier, more dynamic and better community". Moreover, participant ID.1022, a sociologist, described the positive impact of successful public open space: "You can see the success of the public open space in actively gathering different groups. The place that keeps old memories and expresses the social capital and urban identity".

The activity dimension consists of how people use the public open spaces and emphasizes the use of those, and three categories were known for this dimension: mixed land use, compatible uses, and various activities. Almost half of the participants believed that the existence of a wide variety of required uses, as well as the balance between them, are very influential for the public open space to be comfortable and efficient. "Everywhere you look, you can see people doing different kinds of activities such as, peddling and street performances in addition to sitting and so on." (Participant ID. 1015, an employee of Cultural Heritage and Tourism Office). Furthermore, participant ID.1002, an urban designer, mentioned: "It is undeniable the importance of different uses such as banks, stores, restaurants, hotel, and hospital around this place. The existence of all these uses results in people being able to easily and positively do their daily activities".

The physical dimension indicates how places work and is an explanation of spaces' functions. The dimension includes six categories named safety, aesthetic and attractiveness, accessibility, public transportation, lighting, and walkability. Most of the participants mentioned that place conditions and space functions in a rational context, directly and indirectly, influence the mental and psychological condition of users. In this respect, Participant ID. 1008, an architect, explained the positive effect of physical characteristics of public open spaces on mental well-being: "Because of the sense of safety and proper lighting at night, people feel comfortable in this place. They can move freely in the public open space . . . ". This participant also added: " . . . walkability and appropriate public transportation facilitate access to the public open space. This is important in this machine-oriented life".

The ecological dimension is claimed as the appearance of public open spaces, and the relationship between humans and nature. This dimension particularly involves the five human senses, and comprises three categories of green elements, cleanness, and no air and noise pollution. The majority of the participants confirmed the air quality, a great number of green spaces besides clean environment affect the dynamic presence in the public open spaces. "If there was a space wherein a person could be present at a clean and natural environment with plants and water and would be away from noise and smoke of vehicles, then she or he would prefer to relax in this place and could reduce tensions of her or his

life. Otherwise, in places with densely rubbish and lack of plants, the person encounters different kinds of stress . . . so, there is no time left to enjoy the place." (Participant ID. 1001, an urban designer).

Results indicated that the 18 major categories related to these four main dimensions mentioned by the participants. Specific codes and categories associated with each dimension are tabulated in Table 4. Table 5 also demonstrates the percentage of interviewees mentioning each category.

Table 4. The concepts, categories, and dimensions of environmental quality of public open spaces related to urban mental well-being by interviewees.

Conditions	Concepts	Categories	Conditions	Concepts	Categories
Context Condition: Physical dimension	Easy access to the surrounding areas Connecting different streets Linking several parts of the city Linking several surrounding neighborhoods	Accessibility	Casual Condition: Social dimension	Attractive urban elements Various fountains and elements Much attention to these public open spaces Sanitary service Appropriate urban furniture children's playground	Social facilities and services
	Appropriate public transportation A large amount of public transportation Easy access to public transportation	Public transportation		No nuisance No crime No drug dealer The place for the secure presence of women and children The place for the secure presence of elderly The place for the secure presence of disabled people	Security
	Need for safe urban trafficNeed for traffic control Safe sidewalk Safe for vulnerable groups	Safety		The place for hanging out The place for spending time The place for talking and face-to-face relationships children's playground The place for strolling Spending leisure time The place for rest and entertainment The place for gathering	Leisure
	Visual order Proportional scale Coziness Legibility Well-designed details Spatial variety Beautiful urban space	Attractiveness and Aesthetic		Special personality and identity Cultural space Social capital Keep old memories Lovely space	Sense of belonging
	Appropriate lighting Proper lighting at night Enough lighting	Lighting		Social interaction Social relations Friendly relations Participating in voluntary activities	Public participation
	Easy pedestrian access to public open space Proper pavement Walkability for vulnerable groups	Walkability		The presence of women The presence of children The presence of elderly The presence of young peopleThe presence of disabled people Social and sexual mixing	Presence of various age groups and social classes

Table 4. *Cont.*

Conditions	Concepts	Categories	Conditions	Concepts	Categories
Context Condition: Activity dimension	Different stores Appropriate uses Proper local and urban uses Attractive micro-uses The main shopping center of the city	Mixed land use	Intervening Condition: Ecological dimension	Attractive green space Need for large number of trees Beautiful flowers A wide variety of green spaces A great sense of natural space	Green elements
	Congruous uses Compatible uses	Compatible uses		Tidiness Clean public open space Law and order	Cleanness
	Street vendors The place for seating The place for street performance The place for kids to play	Various activities		Noise pollution Car smoke Air pollution	No air and noise pollution

Table 5. Dimensions, categories, and scores of them.

Dimension	Category	Percentage of Interviewees Mentioning this Category
Physical dimension	Accessibility	81%
	Public transportation	76%
	Safety	79%
	Attractiveness and aesthetic	96%
	Lighting	65%
	Walkability	78%
Activity dimension	Mixed land use	92%
	Compatible uses	60%
	Various activities	79%
Social dimension	Social facilities and services	89%
	Security	80%
	Leisure	96%
	Sense of belonging	77%
	Public participation	61%
	Presence of various age groups and social classes	91%
Ecological dimension	Green elements	83%
	Cleanness	63%
	No air and noise pollution	67%

In the next step, according to the decoding analysis and results, the type and relations between categories and conditions are clarified. Results showed that mental well-being as the core category is influenced by the urban environmental quality, and categories and conditions form this relation (Figure 3).

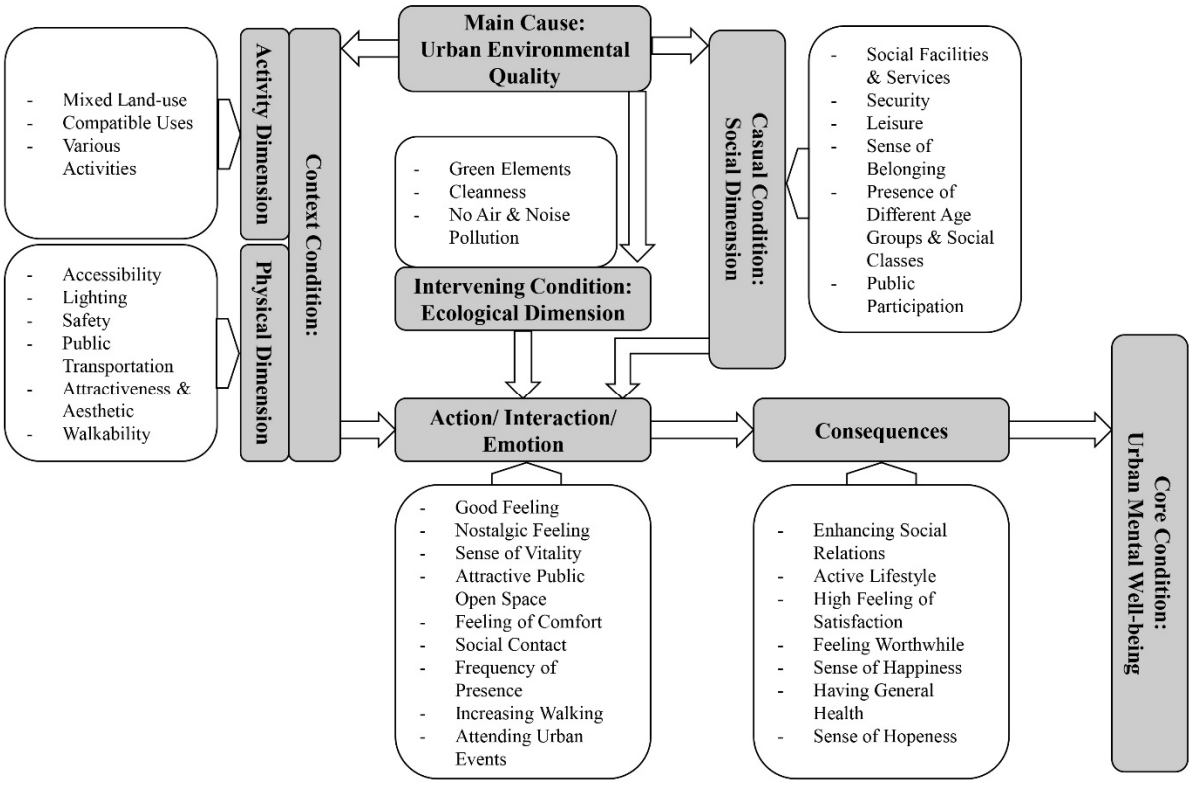


Figure 3. The final model of how the environmental quality of public open spaces affects the users' mental well-being.

4.2. Step 2: Quantitative Survey

In this step, the SEM analysis was implemented to analyze the validity, accuracy, and relations of the specified dimensions and characteristics of the developed framework. First, the reliability of the variables was checked by Cronbach's Alpha, which is suggested to have a value of 0.7 and above [69]. The results indicated that Cronbach's alpha was 0.717 for the physical dimension, 0.822 for the activity dimension, 0.874 for the social dimension, and 0.771 for the ecological dimension, indicating good scale reliability. Maximum likelihood estimation was used in the measurement and structural models based on the correlation matrix in AMOS 24 within the framework of SEM [70]. Figure 4 represents the developed framework of the study, including 22 observed variables for the 4 latent variables of environmental quality and urban mental well-being. In the figure, the rectangles indicate observed variables, circles show measurement error, and ovals illustrate latent variables.

The results show that the model fit is appropriate (Table 6). The *p*-value indicates the weak value that can be explained by the chi-square sensitivity of the sample size. The parameters such as Root Mean Square Error of Approximation (RMSEA) (0.07), Fit Test of Chi-Square (3.32), Consistent Akaike Information Criterion (CAIC) (default model < saturated model), Standardized Root Mean Square Residual (SRMR) (0.06), Root Mean Square Residual (RMR) (0.06), Comparative Fit Index (CFI) (0.9), and Incremental Fit Index (IFI) (0.9) are in a good range. Other parameters show moderate fit.

In the next step, to investigate the direct and indirect effects of environmental quality characteristics on mental well-being, the factor loading of variables was measured (Table 7). The range of factor scores for variables is considered as Score (S) < 0.3, $0.3 \leq S < 0.5$, $0.5 \leq S < 0.7$, $0.7 \leq S < 0.9$, and $0.9 \leq S$, and are described as weak, moderate, relatively strong, strong, and very strong, respectively.

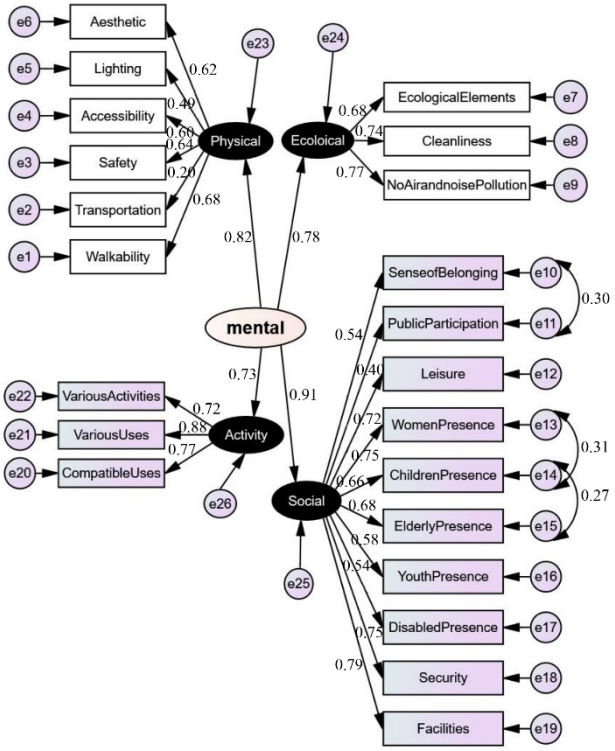


Figure 4. The developed framework of the study indicating the association of environmental quality characteristics of public open spaces related to users' mental well-being.

Table 6. Intervals of the goodness-of-fit indices for the SEM model and the goodness-of-fit values related to path analysis.

Goodness of Fit Criteria	Fit Indices	Good Fit	Acceptable Fit	Moderate Fit	Goodness-of-Fit Values Obtained	Fit Situations
Statistic of Chi-Square Test	χ^2	$0.00 \leq \chi^2 \leq 2.00 \times$ * sd	$2.00 \times$ sd $\leq \chi^2 \leq 5.00 \times$ sd	$5.00 \times$ sd $\leq \chi^2 \leq 7.00 \times$ sd	$404 \leq 670.7 \leq 1010$	Acceptable
Fit Test of Chi-Square	χ^2/sd	$0.00 \leq \chi^2/sd \leq 2.00$	$2.00 \leq \chi^2/sd \leq 5.00$	$2.00 \leq \chi^2/sd \leq 7.00$	$2.00 \leq 3.32 \leq 5.00$	Acceptable
Root Mean Square Error of Approximation	RMSEA	0.00 ≤ RMSEA ≤0.05	0.05 < RMSEA ≤ 0.10	0.10 < RMSEA ≤ 0.15	0.05> < 0.07 ≤ 0.10	Acceptable
Root Mean Square Residual	RMR	$0.00 \leq RMR \leq 0.05$	$0.05 \leq RMR \leq 0.08$	$0.08 \leq RMR \leq 0.10$	$0.05 \leq 0.06 \leq 0.08$	Acceptable
Standardized Root Mean Square Residual	SRMR	$0.00 \leq SRMR \leq 0.05$	$0.05 \leq SRMR \leq 0.10$	$0.10 \leq SRMR \leq 0.15$	$0.05 \leq 0.06 \leq 0.08$	Acceptable
Normed Fit Index	NFI	$0.95 \leq NFI \leq 1.00$	$0.90 \leq NFI \leq 0.95$	$0.80 \leq NFI \leq 0.90$	$0.80 \leq 0.90 \leq 0.90$	Moderate
Comparative Fit Index	CFI	$0.95 \leq CFI \leq 1.00$	$0.90 \leq CFI \leq 0.95$	$0.80 \leq CFI \leq 0.90$	$0.80 \leq 0.90 \leq 0.90$	Acceptable
Goodness of Fit Index	GFI	$0.95 \leq GFI \leq 1.00$	$0.90 \leq GFI \leq 0.95$	$0.80 \leq GFI \leq 0.90$	$0.80 \leq 0.90 \leq 0.90$	Moderate
Adjusted Goodness of Fit Index	AGFI	$0.95 \leq AGFI \leq 1.00$	$0.90 \leq AGFI \leq 0.95$	$0.80 \leq AGFI \leq 0.90$	$0.80 \leq 0.90 \leq 0.90$	Moderate
Incremental Fit Index	IFI	$0.95 \leq IFI \leq 1.00$	$0.90 \leq IFI \leq 0.95$	$0.80 \leq IFI \leq 0.90$	$0.80 \leq 0.90 \leq 0.90$	Acceptable
Relative Fit Index	RFI	$0.95 \leq RFI \leq 1.00$	$0.90 \leq RFI \leq 0.95$	$0.80 \leq RFI \leq 0.90$	$0.80 \leq 0.90 \leq 0.90$	Moderate
Consistent Akaike Information Criterion	CAIC	Default Model	Saturated Model		Default < Saturated	Good
		1034.4	1804.20		1034.4 < 1084.20	

* Standard deviation.

Table 7. Factor score weights: direct and indirect effects.

Factor Score Weights	Direct Effect										Indirect Effect	
Construct	Mental		Activity		Social		Ecological		Physical		Mental	
Variables	* st	** un	st	un	st	un	st	un	st	un	st	un
Activity	0.726	0.480	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Social	0.914	0.601	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ecological	0.785	0.552	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Physical	0.823	0.609	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Various Activities	0.000	0.000	0.720	1.055	0.000	0.000	0.000	0.000	0.000	0.000	0.522	0.506
Mixed Land Use	0.000	0.000	0.884	1.221	0.000	0.000	0.000	0.000	0.000	0.000	0.641	0.586
Compatible Uses	0.000	0.000	0.766	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.556	0.480
Social Facilities and Services	0.000	0.000	0.000	0.000	0.681	1.444	0.000	0.000	0.000	0.000	0.722	0.868
Security	0.000	0.000	0.000	0.000	0.749	1.196	0.000	0.000	0.000	0.000	0.685	0.719
Disabled Presence	0.000	0.000	0.000	0.000	0.536	0.607	0.000	0.000	0.000	0.000	0.490	0.365
Youth Presence	0.000	0.000	0.000	0.000	0.580	0.893	0.000	0.000	0.000	0.000	0.530	0.537
Elderly Presence	0.000	0.000	0.000	0.000	0.684	1.156	0.000	0.000	0.000	0.000	0.626	0.695
Children Presence	0.000	0.000	0.000	0.000	0.660	0.884	0.000	0.000	0.000	0.000	0.604	0.532
Women Presence	0.000	0.000	0.000	0.000	0.749	1.227	0.000	0.000	0.000	0.000	0.684	0.737
Leisure	0.000	0.000	0.000	0.000	0.725	1.215	0.000	0.000	0.000	0.000	0.663	0.730
Public Participation	0.000	0.000	0.000	0.000	0.397	0.720	0.000	0.000	0.000	0.000	0.363	0.433
Sense of Belonging	0.000	0.000	0.000	0.000	0.541	1.000	0.000	0.000	0.000	0.000	0.495	0.601
No Air and Noise Pollution	0.000	0.000	0.000	0.000	0.000	0.000	0.770	1.023	0.000	0.000	0.605	0.565
Cleanliness	0.000	0.000	0.000	0.000	0.000	0.000	0.744	1.019	0.000	0.000	0.584	0.563
Ecological Elements	0.000	0.000	0.000	0.000	0.000	0.000	0.681	1.000	0.000	0.000	0.535	0.552
Attractiveness and Aesthetic	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.621	0.866	0.511	0.527
Lighting	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.493	0.658	0.406	0.401
Accessibility	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.604	0.818	0.497	0.498
Safety	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.641	0.861	0.528	0
Public Transportation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.199	0.241	0.164	0.147
Walkability	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.680	1.000	0.560	0.609

* Standardized, ** Unstandardized.

The results demonstrate that all four variables have a significant effect on mental well-being, and the social variables (0.914 in standardized and 0.601 in unstandardized) and physical variables (0.823 in standardized and 0.609 in unstandardized) have more of an effect on mental well-being.

The factor loading of activity variables shows that all three variables have a strong relation. For the factor loading of social variables, including social facilities and services, security, women's presence, and leisure have strong relations, while disabled presence, youth presence, elderly presence, children's presence, and sense of belonging have a relatively strong relation (acceptable), and public participation has a moderate relation with its construct. The factor loadings of no air and noise pollution and cleanliness have a strong relation, while ecological elements have a relatively strong relation (acceptable) with ecological construct. Results of the factor loading of physical variables indicate a relatively strong relation for attractiveness and aesthetic, accessibility, safety, and walkability variables, a moderate relation for lighting, and a weak relation for public transportation.

Additionally, investigating the indirect effect of variables shows a strong relation between the social facilities and services variables and mental well-being, and a weak relation between the public transportation variable and mental well-being. Furthermore, the public participation variable has a moderate relation, while other variables have a relatively strong relation with mental well-being.

In the following, the relationships between constructs are probed to better understand environmental quality effects on users' mental well-being. As shown in Figure 5, the relation between the social–physical construct (0.738) and social–ecological construct (0.704) is strong and other relations between constructs are relatively strong.

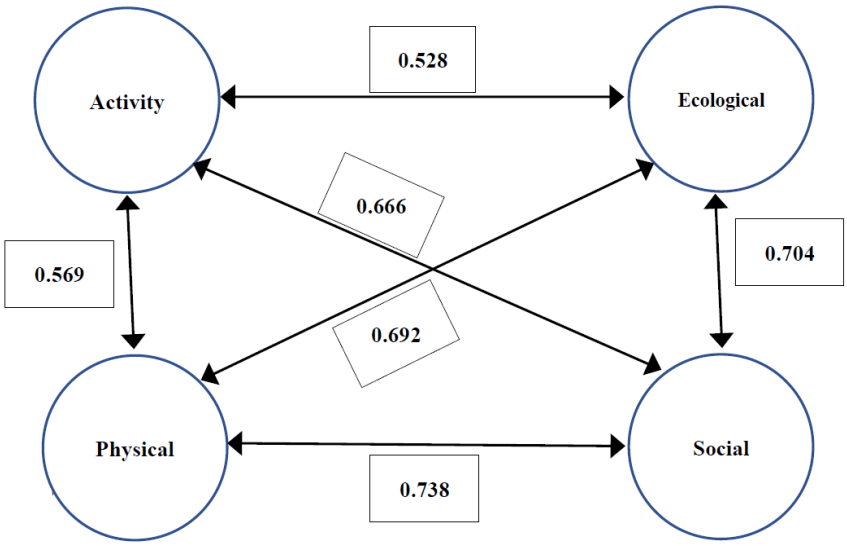


Figure 5. The relations between environmental quality constructs affecting users' mental well-being.

For the next step, the impacts of each dimension and characteristic of four public open spaces were investigated to identify the specific effects of each public open space with unique functional and intrinsic features on users' mental well-being and their perception of the desired place. The results of the analysis of environmental quality dimensions for each public open space are presented in Table 8.

As shown in Table 8, the following aspects are considered significant in the four public open spaces:

- In the public open spaces with the trait of local node (Ferdowsi) and commercial characteristics (Mosadegh), the activity dimension and social dimension have more of an effect on users' mental well-being;
- In the public open space with historical texture (Shahrdari), the social dimension and ecological dimension have more of an effect on users' mental well-being;

- In the public open space with a multifunctional spirit (Azadi), the physical dimension and social dimension have more of an effect on users' mental well-being.

Further, among the mentioned dimensions, the social dimension has the highest effect on the users' mental well-being, a very strong effect with a total score of 0.914. Additionally, the highest effect of the activity dimension on the users' mental well-being is recognized in the Ferdowsi space (0.902), while in the Azadi space, it has the least effect (0.543). In addition, the effective rate of the activity dimension in the Azadi space is identified as 0.932, which is higher than that of the other public open spaces. Further, the ecological dimension's effect in the Ferdowsi space (0.790) is regarded as the highest effect in the perception of people, whilst the least effect is perceived by people for the Azadi space (0.462).

Next, the factor loading was evaluated for the variables of each public open space (Table 9).

Table 8. The effects of environmental quality dimensions for each public open space on mental well-being.

Construct	Coefficients of Effects on Mental Well-Being				
Variables	**Total**	**Azadi**	**Shahrdari**	**Mosadegh**	**Ferdowsi**
Activity	0.726	0.543	0.646	0.802	0.902
Social	0.914	0.912	0.882	0.811	0.880
Ecological	0.785	0.462	0.764	0.519	0.790
Physical	0.823	0.932	0.733	0.653	0.815

Table 9. The effects of environmental quality characteristics for each public open space on mental well-being.

		Coefficients of Effects on Mental Well-Being				
Constructs	**Variables**	**Total**	**Azadi**	**Shahrdari**	**Mosadegh**	**Ferdowsi**
Activity Dimension	Various Activities	0.720	0.507	0.695	0.779	0.778
	Mixed Land Use	0.884	1.000	0.831	0.858	0.883
	Compatible Uses	0.766	0.650	0.814	0.799	0.767
Social Dimension	Social Facilities and Services	0.790	0.714	0.808	0.667	0.642
	Security	0.749	0.712	0.794	0.472	0.739
	Disabled Presence	0.536	0.524	0.457	0.476	0.594
	Youth Presence	0.580	0.596	0.477	0.417	0.724
	Elderly Presence	0.684	0.388	0.605	0.607	0.729
	Children Presence	0.660	0.511	0.513	0.486	0.693
	Women Presence	0.749	0.581	0.678	0.719	0.710
	Leisure	0.725	0.623	0.686	0.614	0.553
	Public Participation	0.397	0.387	0.295	0.451	0.559
	Sense of Belonging	0.541	0.547	0.394	0.453	0.529
Ecological Dimension	No Air and Noise Pollution	0.770	1.000	0.811	0.576	0.782
	Cleanliness	0.744	0.463	0.759	0.626	0.706
	Ecological Elements	0.681	0.273	0.781	0.601	0.509

Table 9. *Cont.*

		Coefficients of Effects on Mental Well-Being				
Constructs	**Variables**	**Total**	**Azadi**	**Shahrdari**	**Mosadegh**	**Ferdowsi**
Physical Dimension	Attractiveness and Aesthetic	0.621	0.597	0.533	0.273	0.675
	Lighting	0.493	0.246	0.578	0.446	0.514
	Accessibility	0.604	0.740	0.620	0.786	0.553
	Safety	0.641	0.758	0.561	0.627	0.776
	Public Transportation	0.275	0.584	0.309	0.407	0.059
	Walkability	0.680	0.734	0.767	0.489	0.621

As can be seen in Table 9, all the characteristics of Ferdowsi space have significant effects and make a great contribution to the mental well-being of users as well, especially mixed land use (0.883).

Furthermore, the high effect of characteristic related to mental well-being for the Mosadegh and Shahrdari spaces belongs to mixed land use (0.858) and (0.831), respectively. However, attractiveness and aesthetic (0.273) in the Mosadegh space and public participation (0.295) in the Shahrdari space are declared having weak effects on mental well-being.

Concerning the Azadi space, characteristics like mixed land use (1.000) and no air and noise pollution (1.000) are determined as the effective characteristics on the evaluation of this public open space in terms of promoting the mental well-being. Conversely, some weak effects of characteristics are specified, such as lighting (0.246) and ecological elements (0.273).

5. Discussion

The research reported in this article was aimed to test the impacts of environmental quality characteristics of public open spaces on mental well-being among users in an Iranian metropolis. Overall, according to the results of the qualitative survey, the environmental quality characteristics related to mental well-being we could find are mostly in line with outcomes reported by other researchers [1,14,29,34,61,71]. In addition, the findings of our models revealed that all four dimensions of environmental quality had significant effects on mental well-being. Among these dimensions, the social dimension and the physical dimension are of the highest precedence, each one shows citizens' perception of and presence in urban spaces, respectively.

The nine characteristics of social dimension were found to have direct and positive effects related to urban mental well-being in this research, including social facilities and services, security, women's presence, leisure, disabled presence, youth presence, elderly presence, children's presence, and sense of belonging. Considering the input gathered from the survey, the security characteristic drastically improved the desirability of any space for users. It has been determined that a high risk of crime and nuisance decreases people's motivation to walk through certain areas [34,35]. Furthermore, this research emphasizes the study by Chen et al. on the associations between urban mental well-being and health and security for acting reported by users [72]. Places that have these features are perceived as being desired to use. In addition to security, sense of belonging is found to be a key mediating characteristic creating individual and social mental well-being in Iranian urban environments. Likewise, some research studies found that, more specifically, this characteristic is positively associated with frequent social interaction, sense of attachment, and social capital [49,58]. Besides, leisure characteristics of public open spaces afford opportunities to engage in activities and promote social relationships. The above findings are similar to previous studies, indicating that socialization, places to accompany people, and spaces for community resorts are considered as the necessary factors for enhancing the sense of happiness and stress release [73–75]. The insertion of diverse facilities into public open spaces also leads to frequent lingering and walking behaviors and establishes the sense

of comfort and contentment. This was compatible with previous studies that indicated the importance of this characteristic on mental well-being promotion [76]. For example, Arifwidodo and Perera reported that accessibility of urban facilities was associated with well-being [77]. According to the results, a continuous and active presence of different age groups and social classes in public open spaces results in a deeper sense of worthwhile for the citizens. Social isolation and barriers of presence diminish people's mental health and increase psychological tensions [78]. Moreover, results showed that citizens would not prefer to contribute frequently to public activities. This finding partially contradicts previous studies, in which public participation is one of the most significant factors to evaluate the sustainability of a society. Just taking Western countries as an example, people pay more attention to society and participated in public activities, such as artistic and sport activities, carnivals and various events, and collaboration with government agencies and municipalities for local and urban regeneration to enhance the quality of the urban environment, while the statistics show the rate of public participation in urban public spaces of Iran does not reach to the world standard [65], which may, directly and indirectly, affect life satisfaction and mental well-being. In terms of urban policy, a collaborative design is one of the best solutions to enhance the rate of public participation in urban public spaces of Iran in which urban practitioners and policymakers make up a team with community members at local and urban levels.

According to the determining characteristics of the physical dimension related to urban mental well-being, there were three interesting findings. First, four characteristics, namely attractiveness and aesthetic, accessibility, safety, and walkability, were positive and relatively strong, suggesting that citizens could be more willing to visit public open spaces to gain psychological recovery, so these factors could play an important role in promoting general health and a sense of happiness and hopefulness. Among the physical dimension' characteristics, walkability matters the most for participants. Besides the benefits of physical health, walking also improved subjective mood. Similar to other research findings, we found that taking a walk in urban open environments is better for well-being than comparable activity in indoor environments [38,79]. Moreover, consistent with previous studies [38,80], the attractiveness and aesthetic characteristic is associated with individual and social well-being. Factors such as landscape designing, visual order, well-designed details, and legibility are known as the significant stimulant for people to have an active presence in public open spaces. The findings also confirm that users' mental well-being is more implicitly influenced by accessibility and safety characteristics. Safe urban traffic, the ability to connect several surrounding areas, and low vehicle traffic can bring about effortless presence in the urban environment, and diminish mental problems and negative emotions [29,35,36]. Second, the results of this research also demonstrated that lighting condition was reported in moderate relation to mental well-being. Thus, there is a need for further consideration in this case because, according to the results of some studies, appropriate lighting results in the sense of safety and security and enhancement of night presence [81,82]. Third, the public transportation characteristic was found to have a weak influence on mental well-being. Our study does not confirm earlier findings of the positive effect of public transportation on mental well-being. Unlike Iranian people, residents in some countries tend to use public transportation more frequently. Just taking the study in Denmark as an example, 75% of the citizens commute with public transportation [83]. This could be partly explained by the fact that public transportation in such countries consisted of more physically challenging facilities that could encourage people to use public transportation, such as high quality of public transportation vehicles, a large number and easy access to public transportation, proper traffic design, etc. Conversely, fewer appropriate contexts are witnessed for more use of public transportation in Iran [84]. Lack of a good public transport network, in a careful and equal manner, throughout the city results in social isolation and an increase in ecological pollution. It can be said that it is related to the lack of quality in designing infrastructures in Iran, and also the lack of the place-making approach to create urban public open spaces. However, it has been proved

frequently that public transportation not only reduces the effects of climate change, but also helps people to enhance the sense of welfare, which is associated to the mental well-being.

With respect to the activity dimension of environmental quality, all three characteristics showed a significant and strong impact on the users' mental well-being, and the important role of these has been demonstrated in previous research [85]. Based on the findings, mixed land use and compatible uses are essential to meet the people's needs and encourage them to be present in public open spaces. Moreover, dynamic public open spaces tend to have more street vendors, places for kids to play, and seating, which offer more opportunities and attractiveness for different activities [86]. This is especially true in Iranian public open spaces since active interactions in such spaces have long been part of culture and tradition. Taking part in various activities promotes mental well-being related to decline in stress and increase in life satisfaction. Therefore, values and intentions contributing to mental well-being that citizens hold for public open spaces' uses and activities have been related to these characteristics, which clarify the results in this study.

Another significant finding of this research understood the determining characteristics of the desirability of public open spaces, manifesting itself as an ecological phenomenon among the people that have strong and positive relation to mental well-being. The effect of green elements on mental well-being has been frequently identified, and they have also been found it not only to be an absorbing factor to visit urban spaces, but also lead to relaxation and comfort. Furthermore, apart from encouraging more social interactions, green space provides opportunities for visitors to be come near to the natural environment, which is a unique resource in crowded and polluted metropolises. Moreover, people need to be exposed to clean air and environment and have no noise pollution in public open spaces to feel a sense of pleasure and enjoyment [2,21].

The results of indirect effect analysis indicated that the social facilities and services characteristic had a strong relation to mental well-being, while the public transportation characteristic had weak relation same as that of direct effect analysis. Thus, these findings demonstrate the importance of more attention to public transportation infrastructures in public open spaces of Iran.

Regarding relationships between dimensions, our study found that the social dimension contains a stronger relationship with the physical and ecological dimensions than the others. Apparently, appropriate context of ecologically and physically related environmental quality leads to better social relations and influences life satisfaction and affective mental well-being. These findings are in line with studies by Rugel et al. and Coventry et al., who also found social factors related to physical and ecological factors in the spaces [49,58].

Finally, we found some indication that environmental quality dimensions and their characteristics have different impacts on users' mental well-being conceptualizations on public open spaces with different functional and intrinsic features. While the effects of social dimension on all of the public open spaces are rather similar, the causes of them differ. For example, in the local nodes like the Ferdowsi space, the social dimension is shown to improve users' mental well-being via casual interactions with neighbors, whereas in other urban spaces, the social dimension positively affects by social ties and social capital. On the other hand, among determinant characteristics, mixed land use significantly contributes to users' mental well-being in all of the public open spaces. It may be as a result of the spirit and mood of the Middle East, since trading, shopping, bargaining, and window shopping are some of the favorite activities, which can promote the sense of satisfaction and sociability. We also found that all characteristics in this study have a great impact on well-being in the public open space with the trait of the local node (Ferdowsi). As mentioned before, this may be due to the fact that the neighborhood dwellers feel comfortable and satisfied in such local nodes by which there is a possibility of forming supportive relationships and having better psychological states. These spaces provide appropriate circumstances for informal social interaction with neighbors. The residents can meet their daily needs in a secure and safe place, so they are more satisfied with their environment. This was in line with previous studies that indicated local public open spaces

generally promote the quality of life, e.g., [87,88]. This study argues that in commercial spaces like Mosadegh, various social activities, mixed land use, and easy access influence individual's mental well-being as such spaces have social challenges, foster community engagement, and result in the quality of life and happiness [89,90]. Furthermore, providing social facilities and services, and sense of security, existing compatible and mixed land use, and creating connectivity with nature besides walkability seems to be more effective for the public open space with historical texture (Shahrdari). These findings describe an essential context in the previous research [51,91]. In the multifunctional public open space like the Azadi space, different functional characteristics act positively as a context for effectively boosting the engagement between users and the urban environment, such as safety and security, accessibility, walkability, social facilities and services, mixed land use, and so on. These public open spaces could serve as a locus of social interaction and correlate with different benefits, activities, and uses associated with psychological health [92,93].

Some potential limitations of this study should be mentioned. First, when applying cross-sectional information, we restricted the feasibility of deriving any causal associations between the different sociodemographic status and environmental quality characteristics. The reverse direction is possible, i.e., that individuals with bad personal conditions have a negative attitude about the specific aspect of their environment. Therefore, it is better to use longitudinal studies that involve multiple measures over an extended period in future research. Second, mental well-being is a sensitive and complicated issue, and it is essential to apply the in-depth method to comprehensively and completely investigate this. Although we utilized both qualitative and quantitative surveys in this study, using other tools and methods for field study might have been more appropriate for mental well-being topics in future studies. Third, considering the nature of the study, our findings illustrate the psychological needs and preferences for specific age groups and social classes may be very different in public open spaces, which highlight the necessity of using socio-culturally tailored measurement tools in future studies. For example, children are particularly vulnerable to the effect of urban-related stressors such as lack of safety or lack of space for playing [94,95]. There is also emerging evidence that older adults required encouraging an active lifestyle in public open spaces to prevent mental ill-health [96,97]. Finally, we encountered different challenges to gather comprehensive data and statistics because there is not much research in the context of urban well-being in Iran.

The findings of this study develop on the previous findings and provide new insights into the ongoing theoretical context for public open spaces' development. These offer a new perspective for explaining how environmental quality characteristics influence individual mental well-being in developing metropolises. Thus, the findings indicate the role of urban planning and design in place-making processes for people and help the policymakers to apply practical design advances on public open space.

6. Conclusions

The results of this research show that four main dimensions (social, physical, activity, and ecological) organize the framework of the research which social dimension has the most influence on users' mental well-being. It is of particular significance that mixed land uses and various activities, the presence of women and children in secure places for leisure time, and clean air and environment can enhance the opportunities for developing, organizing, and interacting in public open spaces for a healthy city. On the other hand, the study's findings suggest that special attention should be paid to public transportation and public participation. Finally, it should be taken into consideration that the public open spaces with unique functional and intrinsic features seem to have different impacts on mental well-being.

These results describe the health-oriented approach to urban design and planning. Using the criteria and the priorities discussed in the present study, scheduled and coherent contrivances can be set up for urban infrastructures. It can be helpful to perform urban plans gently and subsequently promote quality of life and mental well-being by considering

the economic, social, and other limitations in developing countries. It should be noted that close cooperation must be developed among public health professionals, urban planners, policymakers, and urban populations to create health-supportive urban environments.

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