

Article

The Impact of Local Green Spaces of Historically and Culturally Valuable Residential Areas on Place Attachment

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Abstract: Environmental qualities significantly affect the behaviors and place attachment of users, especially in residential areas. In addition to creating environmental comfort, local green spaces can increase users' place attachment, improve their mood, enhance friendly company and facilitate social interactions. The study sought to investigate the impact of local green spaces in the historically and culturally valuable residential fabric of Hamadan City in Iran on increasing residents' social attachment. Derived from the literature on the subject, the conceptual model of the study shows the impact of such factors as social, functional, emotional and spatial bonds on place attachment in the residential context. A total number of 410 residents in the old neighborhoods of Hamadan City were selected by random sampling with a balanced proportion of gender and residence duration in the selected area. The designed questionnaire was distributed among the sample population and the collected data were analyzed using the structural equation modeling method. Then, the *t*-test and bootstrapping in Smart PLS software were used for testing the research hypotheses and evaluating the significance of the relationships between the research variables in the structural model. The results indicated that among the four types of bonds examined in relation to place attachment, emotional bonds, functional bonds, social bonds and spatial bonds, respectively, had a direct and significant impact on place attachment from the viewpoint of residents. The stronger the sociocultural bonds in historically and culturally valuable residential areas, the more prominent the role of local green spaces in place attachment based on residence duration becomes.

Keywords: local green spaces; residential areas; local communities; place attachment; urban development; sustainable urban development; smart city; urban planning; public health; land policy



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1. Introduction

The urban development framework influenced and shaped by modernist and post-modernist approaches has failed to fulfill many of the biological and social needs of urban life during the past few decades [1]. In addition to filtering out air and noise pollutants [2,3], urban vegetation and green spaces create resistance against urban floods [4]. On the other hand, despite the fact that cities are attempting to provide advanced urban services such as highways, water resources, etc., a wide range of urban problems are emerging every day, such as air pollution, water pollution, rainwater runoffs, loss of biodiversity, population growth and urban heat islands, and are negatively affecting urban environments. At the same time, the impact of climate change is growing [5]. In the first two decades of the 18th century, urban development, ecology and technology experts revisited the classical definitions of modern infrastructures to address the challenges rising against these infrastructures in the post-industrial era. They also started to analyze and criticize various approaches to the development of modern infrastructures in the post-industrial

era and to provide more fitting definitions for these infrastructures. Numerous solutions and strategies were proposed by these experts including the idea of “green infrastructure” by two sustainability planners, namely Benedict and McMahon, who emphasized the significance of separating natural infrastructures from artificial ones and who underlined the differences in planning and development approaches for these two types of infrastructure. They proposed the term “green infrastructure” as opposed to “gray infrastructure” or “social infrastructure” [6]. Green infrastructure is recognized as a land conservation policy that revolves around green spaces in urban environments. Green infrastructures have various components that improve the quality of drinkable water and air in urban areas [7]. According to Moorish and Brown (2008), green infrastructure should become a context for collective being, identity and presence for humans. It can have a wider sociocultural and ecological application beyond its utilitarian function. In fact, green infrastructures should be used for enrichment purposes rather than merely utilitarian goals, such as for creating a sense of place, linking public interests and public benefits as well as improving ecological performance [8].

One of the most important subjects in this field, which has been discussed or at least mentioned in half of the conducted studies, is cultural heritage and its conservation. The number of studies carried out about this subject significantly grew between 2015 and 2019 [9]. As a part of human cultural, historical and ecological values, green spaces have influenced human social bonds [10].

Modern urban life and the prevalence of environmental degradation have caused problems for townsmen such as isolation and diminished social interaction. For this reason, people need places where they can engage in social interaction and fulfill their psychological needs. Green spaces and natural heritage can act toward enlivening their often boring and gloomy environment. Urban green spaces and natural heritage can act as agents and places to alleviate depressing modes in these environments. In urban green spaces, the proximity of nature to the place of residence, diminished user stress, an increased variety of physical activities, improved morale of people, the ability to talking to friends and the establishment of social interactions among individuals occur [11]. Peters and et al. suggest that green spaces promote social cohesion or solidarity more than non-urban green parks do. The city park is a place where different ethnic groups interact and talk, with these transitional and formal interactions leading to social solidarity [12]. It has also been argued that the design of local green spaces and the image of green spaces in people’s minds, combined with the cultural characteristics of different ethnicities, provide opportunities for interaction between different cultures. Indeed, green spaces are one of the areas that induce a sense of social venue. These spaces provide an opportunity for human beings to learn from each other and to express their personal and social values and to promote their spiritual growth. In general, green space gives users a sense of freedom and independence, which is rarely possible in the home and work environment. Meanwhile, although urban green spaces can be a place for the manifestation of human virtues and social interactions based on their design and planning, they can also be a place for the emergence of various forms of urban crime through emancipation and improper simplistic planning causing detrimental social, cultural and psychological impacts on the urban population. However, many studies have explored the link between urban green spaces and public health in developed countries [13–15]. In countries such as Iran, it is unclear as to how environmental settings can promote health conditions. Limited utilization of parks in Iran is the result of Iran’s following of the style of European urban green spaces which were in fact created based on the culture and climate of the origin countries [16,17].

Nevertheless, historical Persian gardens as well as the green landscapes and natural heritages of Iranian local communities have remained successful urban green spaces [17]. Therefore, gaining a proper understanding of these spaces may help improve the contemporary urban green spaces in Iran [18].

The concept of place attachment has been explored for many decades. Lewicka (2011) has identified a variety of disciplines which have studied place attachment, such as public

health, natural resource management, environmental psychology, etc. [19–22]. Place attachment refers to the emotional and sensational bond between people and spaces [23]. Place attachment is a powerful and positive force in contexts with a local identity. Nevertheless, it is possible that local communities will be overwhelmed by speculative politics and other hidden interests of the real estate sector, which are often either free or protective [24]. These places look different and distinguished as they have grown gradually over time. When the institutionalized values of place attachment are evoked through a certain design process, people are reminded of their shared and common identity and creativity. They feel more empathy for each other and care more about each other's comfort; they further become more aware of their roots and dependence on the local ecosystem and strive to manage their environment [24]. They also act with larger urban thoughts and live more consciously; often free themselves from selfish desires and minor contradictions; seek more noble goals and receive the power required to achieve them from their lives. The tendencies that result from such a process are so distinct and different that they express the nature of each community rooted in each place [24]. Some studies have examined the relationship between events, festivals and place attachment [25–27].

Place attachment stands in the way of economic calculus with emotional conflict and replaces it with a tendency to self-sacrifice [28]. Place attachment may also increase volunteer stewardship [29,30].

Further, place attachment is indirectly related to a mass of multiple values, such as environmental justice and welfare. This attachment creates security, common goals together with reduces severe [24]. Place attachment may also originate from cognitive restoration, social capital, emotions, traditions, goal attainment, stress alleviation, environmental identity or spirituality [31–33]. Place attachment is bonded to the elementary desire for security, new experience, reciprocity and belonging to the place [34]. "Experience of place" can help identify place attachment. Residents' length of stay is effective in increasing their attachment, with older residents often showing greater attachment to the community or neighborhood [34–39]. Citizens with higher education are less likely to be attached to their community and place [35,38,40].

The place attachment can stimulate efforts to improve one's local community; they also consider place attachment and participation in the protection of the neighborhood in social, emotional and behavioral dimensions. This attachment focuses on quality of life [41]. Nature and landscape is part of the tangible heritage that is related to those features of a society that deserve to be preserved. Of course, the natural heritage of neighborhoods are primarily considered as part of the natural environment repertoire, and it is aesthetically and culturally important too. Bonaiuto has researched environmental qualities in Rome for user satisfaction and demographic–social characteristics [42,43]. The role of green spaces has also been examined in this research. Bonaiuto found that the lack of green space has led to a decline in people's attachment [44,45]. Not all parks or green spaces can engender place attachment sentiments. Scale affects how an individual perceives a space and its psychological impacts [31].

Some researchers believe that natural heritage and green spaces are considered an important and special principle in enhancing social attachment. Experiencing nature's proximity to the living environment reduces users' stress, enhances physical activity, improves mood and promotes talks with friends as well as social interactions [11]. In other words, green spaces and gardens provide a positive relationship between local attachment and civic engagement [46]. In addition to the recreational and environmental aspects, green spaces can serve as a context for organizing behavioral patterns and shaping social interactions. Indeed, green spaces are one of the spaces that induce a sense of social place [47]. Also, access to green areas can impact public health through increased physical activity and lower levels of certain diseases [48–50].

Kyle et al. suggests that natural arrangements that allow people to relax and escape from the routine activities of life cause attachment [33]. Researchers on social attachment have found that a high proportion of social attachment groups can enhance the social and

political participation of indigenous peoples in protecting place and social neighborhood characteristics such as green spaces [38,46,51].

Visitors who have a stronger sense of place attachment are more willing to protect an urban park or natural area and feel responsible for these spaces; A recent study carried out about the urban parks and natural areas of New York City after Hurricane Sandy found out that these spaces provide local residents with vital cultural ecosystem services, including connection with nature, refuge from urban living and opportunities to develop social connections [52]. A number of studies have also examined the effect of green-space-related homes on community attachment. By creating a sense of place, urban green spaces can create many social and cultural concepts in the minds of citizens and locals [53].

Urban green spaces can help provide ecosystem services to improve the health and well-being of urban citizens [54]. In addition, ecosystem and service-related regulations can prevent urban residents from becoming ill. In fact, the positive outcomes of healthy behaviors can be achieved mainly through provision of cultural ecosystem services [50–55]. Cultural ecosystem services provided by urban green spaces such as parks, cemeteries, urban gardens, urban forests and other urban spaces include recreation, sports, relaxation and learning from nature. One can meet and socialize with one's friends and family in these spaces; as a result, social cohesion increases among urban residents [54].

Place attachments in public spaces of the neighborhood, such as parks and local green spaces, can reflect the distinct local values used to inspire bold civic action. The nostalgic form of some of the green spaces in the center of old neighborhoods is pleasing to almost all types of audiences apart from their social status, ranging from the noisy teenager to the elderly who may be in a wheelchair and from the longstanding resident to the passer-by who is visiting the park for the first time [24].

Health and its requirements involve complex social factors that can be improved via increasing people's physical activities and social interactions at the neighborhood level and their social participation can be increased by designing better social and physical infrastructures in communal green spaces [56]. Urban green space refers to public or private recreational spaces such as a public parks or other types of vegetated areas such as green roofs.

Urban green spaces and ecosystem services are becoming more significant for elderly citizens as urban populations are growing older as a result of demographic changes, especially in developed countries [56]. Social isolation is a growing challenge among elderly citizens, especially those living in single-family homes [57] as it can harm the physical and mental health of old people [58,59]. There is also a positive and direct relationship between local and easy access to green spaces and place attachment [60].

With this in mind, the present paper seeks to identify the dimensions and components of the sense of place attachment with an emphasis on green natural heritage and landscapes, and to analyze the effect of these components on the degree and quality of the sense of belonging in urban neighborhoods. The aim is to devise a native and contextual model of the role of green natural heritage and landscapes in developing a sense of belonging to place among urban neighborhood residents.

2. Study Area

Neighborhood has been presented in Persian dictionaries as a social unit meaning *koi*, *barzan* and a segment of several parts of the city (Dehkhoda); in Latin culture it literally means district, quarter or neighborhood. Neighborhoods have been formed based on intellectual, tribal, religious, occupational and other criteria, and such a space is an experience of social life, rather than being a physical structure [61]. The mosque, bazaar and neighborhood center are important non-residential elements of the neighborhood context. Each of the neighborhoods, based on their place, social and cultural characteristics, along with their centers, comprise different forms of physical diversity, activity and consequently, particular socialization.

Neighborhood structure is also influenced by climatic, economic, political and social factors that have been shaped by the community's cohesion. Strong neighborhood and indigenous relationships in neighborhoods have led to the emergence of shared patterns of life, deep local attachment and respect for privacy in the past.

In the neighborhoods of Hamedan in Iran, each neighborhood has a central open space that is linear or nuclear and formed with local green space and old trees, with this open space being surrounded by neighborhood mosques and local markets as well as some beautiful traditional houses. In other words, this open space plays a vital role in the health of the neighborhood; in the past, there were beautiful springs and aqueducts in this open space, many of which are now buried or destroyed. The historical-cultural city of Hamadan (Ekbatan), the ancient Iranian capital, had more than 50 historical districts, each of which had cultural and historical monuments and among which a few have remained healthy.

The study areas are three old neighborhoods of the historic city of Hamedan in Iran with an old structure, with each neighborhood having a neighborhood center called "Chaman" which includes green spaces, old trees and springs located in and around its center. Also, local markets, mosques and other physical as well as local identity buildings have been organized around it (Figure 1). The reason for choosing these three neighborhoods is the existence of a relatively authentic social context along with the presence of the green space as well as old and original trees in the center of these neighborhoods, where these green spaces with old trees have improved the quality of these places. Each of these neighborhoods currently has a population of between 3000 and 4000 inhabitants.

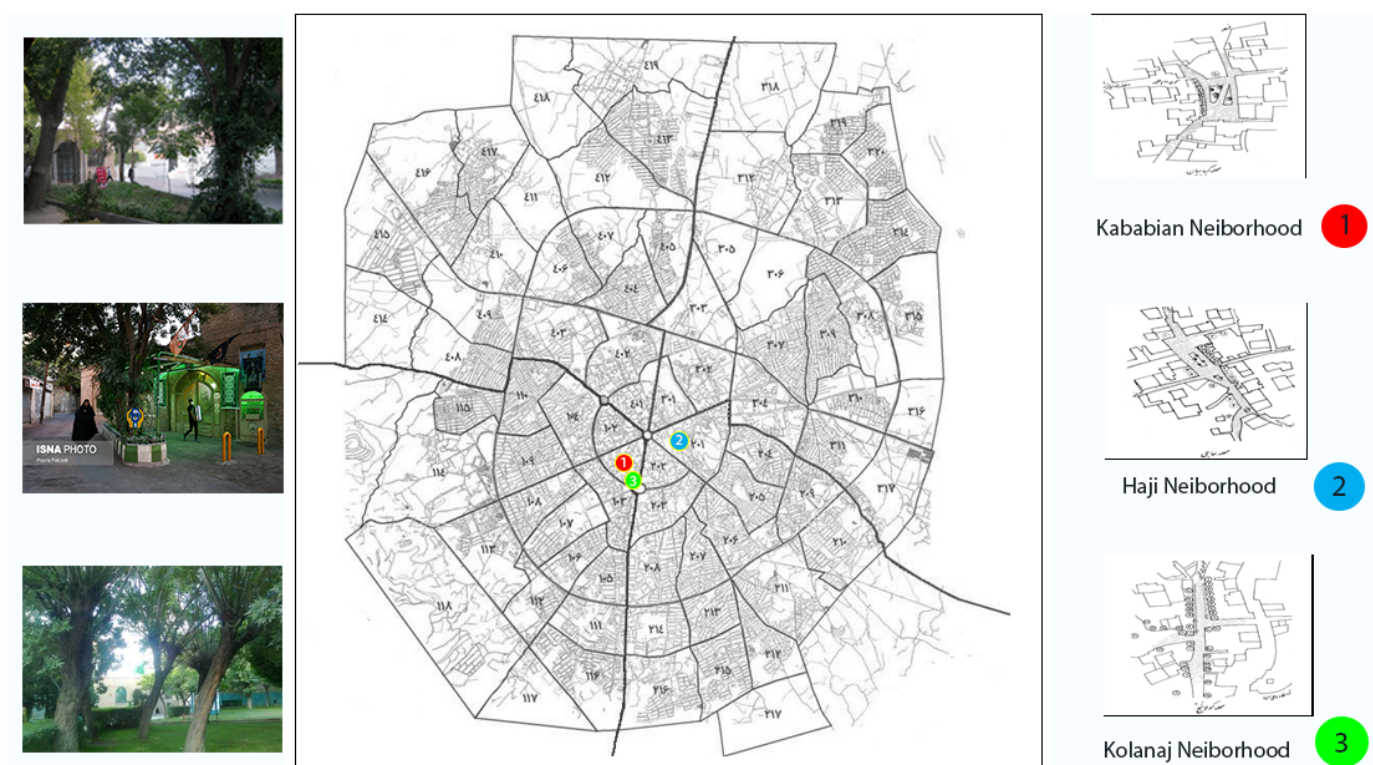


Figure 1. Position of the desired sites.

3. Research Methodology

Considering that residential areas were selected for study and that this research was about an assessment of place attachment, qualitative approaches could not be effectively used for measuring and evaluating the indicators of place attachment. Therefore, the authors decided to use statistical methods to accurately measure the target variables and indices, especially given the fact that most similar studies have also used quantitative

approaches. For example, a study titled “The influence of green space on community attachment of urban and suburban residents” utilized a questionnaire designed based on the 5-point Likert scale to measure the target variables. Another study titled “The impact of urban parks on citizens’ place attachment, case study: Bagh Mohtasham of Rasht” used a questionnaire-based quantitative method and structural equation modeling to achieve its goal.

Data and information were collected in spring 2019 from the population of the three neighborhoods through a questionnaire. The questionnaires were administered among a wide range of age and sex groups with a background of at least 10 years of residence in the neighborhoods.

A total of 410 Likert-spectra questionnaires with a 10% subsample error were used for the structural equation modeling in order to analyze and evaluate the structural model of the research. The questionnaire had four sections: social bond, emotional bond, spatial bond and functional bond. The questions were designed based on the theoretical foundations of the study, field observations and the degree of familiarity of the neighborhoods’ residents. In addition, the demographic section of the questionnaire focused on age, gender, education and length of residence so that the sample population was balanced in terms of said variables. Field observations indicated that the residents who lived in rented houses had a significant sense of indifference toward their neighborhoods. Therefore, these residents were excluded from the sample population. After selecting the sample population, the researchers personally asked the questions of the participants to ensure the answers had the required quality. The participants were asked to provide one of the following answers to each question: “I strongly disagree”, “I disagree”, “I neither agree nor disagree”, “I agree”, and “I strongly agree”.

SEM is a statistical model used for analyzing the linear relationships between independent and dependent variables. SEM is a rigorous technique that combines the measurement model (confirmatory factor analysis) and the structural model via simultaneous statistical test. Using this method, researchers are able to reject or confirm hypothetical structures (models) based on data. The software in this study was used for smart PLS analysis. This software analyzes structural equation models with several variables and includes direct, indirect and interaction effects [62]. In the structural equation modeling methodology, it is first required to study the validity of the study structure to determine whether the selected markers are accurate enough to measure their desired structures. Specifically, the factor loadings of each marker with its structure must be greater than 0.4. If so, the prediction model studied has the necessary accuracy to measure that structure or trait. If the markers of the study structures have factor loadings of less than 0.4, they are not important for measurement and should be excluded from the analysis process [63]. Thus, the construct validity selected for estimating the accuracy and importance of selected markers indicates that all markers for measuring the dimensions have provided appropriate factor structures to measure the dimensions studied in the research model. Convergent validity was used to confirm the validity of the measurement instrument.

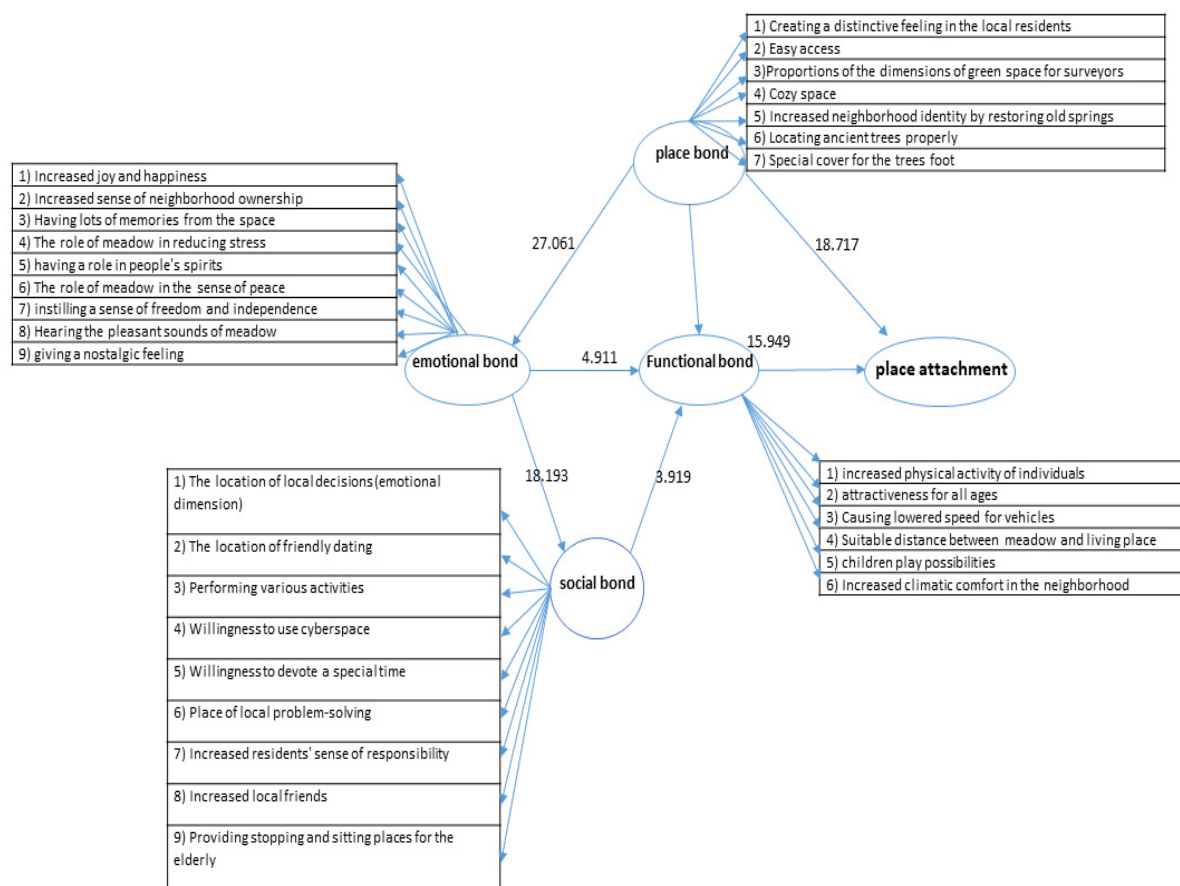
Convergent validity refers to the principle that the indices of each construct are moderately correlated with each other. According to Fornell and Larcker (1981), considering the convergent validity criterion, the average variance of output (AVE) is greater than 0.5 [64]. In this study, Cronbach’s alpha coefficient and composite reliability (CR) have been used to determine the reliability of the tool. Cronbach’s alpha coefficients for all variables should be at least 0.7. Composite reliability, unlike Cronbach’s alpha, which implicitly assumes that each index has the same weight, relies on the actual factor loadings of each construct, thereby providing a better criterion for reliability. In composite reliability, a value of greater than 0.7 must be obtained to show the internal stability of the structure [65]. Table 1 summarizes the reliability and validity of the measurement tools.

Table 1. Convergent validity and reliability of the measurement tool.

Variable	Extracted Variance (AVE)	Composite Reliability (CR)	Cronbach's Alpha Coefficient
Functional bond	0.546	0.763	0.700
Emotional bond	0.613	0.867	0.826
Social bond	0.605	0.841	0.785
Place identity	0.592	0.727	0.706
Place attachment	0.553	0.903	0.889

3.1. Evaluation of the Research Structural Model

Subsequently, T-value was used to evaluate the hypotheses and examine the significance of the relationships between variables in the structural model as obtained in the PLS software using the automatic bootstrapping algorithm. The T-value statistic indicates the significance of the effect of variables, with values greater than 1.96 indicating a significant relationship between variables [66]. Considering the T-value statistic higher than 1.96 for all three paths, the significance of the relationship between this index and the three components in the sample was confirmed. Figures 2 and 3 displays the results of the structural coefficients of the model.

**Figure 2.** T-test results.

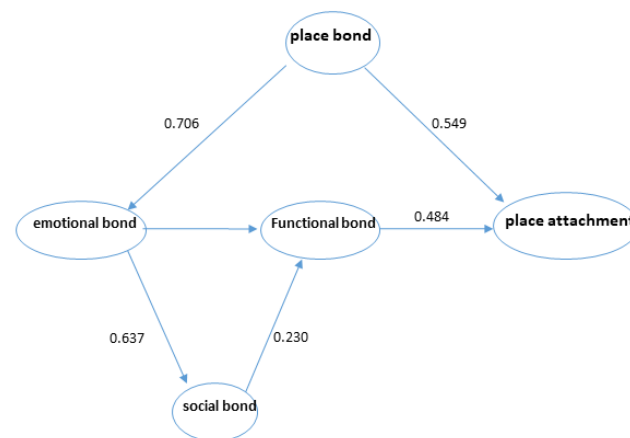


Figure 3. Model structure path coefficients.

As can be seen in Table 1, the path coefficient value of 0.706 for the relationship between the place bond and the emotional bond reveals a stronger relationship with the two variables of place identity and place attachment. Also, the path coefficient of 0.637 for the relationship between the emotional bond and social bond indicates a stronger relationship compared to the relationship between emotional bond and place identity.

3.2. The Status of Each Research Sub-Index Using a Single-Sample T-Test

This study has used a single-sample *t*-test to investigate each of the variables and items of research. If the T-value is greater than 0.05, the variable under study has no significant difference with the test value (i.e., number 3) and the component is at a moderate level; if the T-value is less than 0.05, the component evaluated is significantly different from the test value (i.e., number 3). In this case, if the average value of the factor was higher than 3, the factor under study would be strong in the statistical population. Finally, if the average factor was lower than 3, the factor under study would be weak in the statistical population. The research variables are explained and interpreted in the following section (Table 2).

Table 2. Status of each research sub-index using a single sample *t*-test.

Social					
Question	Average	T-Value	Significance Level	Mean Difference (Mean = 3)	Status
(1) The location of local decisions	2.26	−13.73	0.000	−0.740	Weak
(2) The location of friendly dating	2.57	−6.18	0.000	−0.434	Weak
(3) Performing various activities	2.55	−7.77	0.000	−0.450	Weak
(4) Willingness to use cyberspace	2.98	−0.35	0.723	−0.018	Weak
(5) Willingness to devote a special time	3.33	5.29	0.000	0.332	Strong
(6) Place of local problem-solving	2.20	−12.90	0.000	−0.802	Weak
(7) Increased residents' sense of responsibility	3.27	4.25	0.000	0.267	Strong
(8) Increased local friends	3.00	0.073	0.942	0.000	Moderate
(9) Providing stopping and sitting places for the elderly	3.97	21.65	0.000	0.974	Strong
Place Bond					
Question	Average	T-Value	Significance Level	Mean Difference (Mean = 3)	Status
(10) Creating a distinctive feeling in the local residents	3.04	0.65	0.517	0.041	moderate
(11) Easy access	3.98	19.55	0.000	0.977	Strong
(12) Proportions of the dimensions of green space for surveyors	2.67	−5.38	0.000	−0.334	Weak
(13) Cozy space	2.58	−6.74	0.000	−0.424	Weak

Table 2. Cont.

Place Bond					
Question	Average	T-Value	Significance Level	Mean Difference (Mean = 3)	Status
(14) Increased neighborhood identity by restoring old springs	3.96	20.55	0.000	0.961	Strong
(15) Locating ancient trees properly	3.71	15.62	0.000	0.712	Strong
(16) Special cover for the trees foot	2.21	−13.79	0.000	−0.787	Weak
Functional					
Question	Average	T-Value	Significance Level	Mean Difference (Mean = 3)	Status
(17) Increased physical activity of individuals	2.60	−6.30	0.000	−0.398	Weak
(18) Attractiveness for all ages	2.43	−9.48	0.000	−0.571	Weak
(19) Causing lowered speed for vehicles	3.15	2.37	0.018	0.152	Strong
(20) Suitable distance between meadow and living place	3.79	15.55	0.000	0.789	Strong
(21) Children play possibilities	2.71	−4.57	0.000	−0.288	Weak
(22) Increased climatic comfort in the neighborhood	3.49	9.82	0.000	0.488	Strong
(23) Increased joy and happiness	3.39	6.98	0.000	0.388	Strong
Emotional					
Question	Average	T-Value	Significance Level	Mean Difference (Mean = 3)	Status
(24) Increased sense of neighborhood ownership	3.35	5.72	0.000	0.347	Strong
(25) Having lots of memories from the space	3.14	2.11	0.035	0.144	Strong
(26) The role of the meadow in reducing stress	3.17	2.85	0.005	0.167	Strong
(27) Having a role in people's spirits	3.42	7.41	0.000	0.422	Strong
(28) The role of meadow in the sense of peace	3.38	6.67	0.000	0.380	Strong
(29) Instilling a sense of freedom and independence	2.60	−6.73	0.000	−0.396	Weak
(30) Hearing the pleasant sounds of the meadow	3.27	4.69	0.000	0.272	Strong
(31) Giving a nostalgic feeling	3.51	8.76	0.000	0.509	Strong

Finally, R2 was used to measure structural model fitness. The necessary criterion for measuring the structural pattern of the coefficient of determination (R2) is variable-dependent [67]. The values of R2 of 0.19, 0.33 and 0.67 are weak, moderate and significant, respectively, in the Smart PLS software path pattern. As can be seen in Table 3, the values of R2, which represent the model's ability to describe each structure, were obtained as medium and high. In conclusion, these results suggest that the proposed model has a good fitness and the research components have been able to well predict the changes in the place attachment index.

Table 3. Fitting the structural model.

Variable	R ²
Functional bond	0.867
Emotional bond	0.499
Social bond	0.406
Place identity	0.499
Place attachment	-

3.3. Investigation and Comparison of Research Indicators in Each Residential Neighborhood

A one-way ANOVA test was used to compare the indices studied in each neighborhood. Following each variance analysis, and if the mean difference was significant (significance level less than 0.05), Tukey's post hoc tests would be used to determine precisely which levels of response variable have a significant difference [68].

As observed in Table 4, the results of the ANOVA test for the social bond variable confirm the significant difference in the mean response of this index across the studied samples ($\text{Sig} < 0.05$). Hence, people's perceptions of the social bond of each sample have a significant difference. Accordingly, Tukey's post hoc tests were used to determine the levels of response of the variable with a significant difference with the results presented in the following table. As one of the results of this test, the grouping of the studied samples has been shown in the table above. In interpreting the results of the Table 4, it can be stated that there is a significant difference between people's attitudes towards the social bond index in the Haji neighborhood as compared with the Kulanj and Kababian neighborhoods ($\text{Sig} < 0.05$).

Table 4. One-way ANOVA for comparison of place, functional, emotional and social bond indices.

Social Bond			
Neighborhood	Mean	F	Sig
Kulanj	2.388	26.991	0.000
Haji	2.972		
Kababian	2.950		
Place Bond			
Neighborhood	Mean	F	Sig
Kulanj	2.836	21.387	0.000
Haji	3.257		
Kababian	3.170		
Functional Bond			
Neighborhood	Mean	F	Sig
Kulanj	3.109	2.590	0.076
Haji	3.207		
Kababian	3.061		
Emotional Bond			
Neighborhood	Mean	F	Sig
Kulanj	2.866	38.482	0.000
Haji	3.437		
Kababian	3.531		

According to the mean values obtained, this index was better in the Haji neighborhood. There was no significant difference between people's attitudes towards this indicator in the Kababian and Kulanj neighborhoods. As observed in Table 4, the results of the ANOVA for the place bond variable show a significant difference in the mean response of this index in the studied samples ($\text{Sig} < 0.05$). Hence, people's perceptions of the place bond of each sample examined have a significant difference. Accordingly, Tukey's post hoc tests were used to determine which levels of response variable have a significant difference with the results, and these are presented Table 4. Based on this grouping test of the studied samples, in interpreting the results of the table above, it can be concluded that there is a significant difference between people's attitudes towards the place bond index in the Haji and Kababian neighborhoods ($\text{Sig} < 0.05$). Also, given the mean values obtained, this index was better in the Haji neighborhood. There was no significant difference between residents' attitudes towards this index in the Kababian and Kulanj neighborhoods. As observed in the table above, the results of the ANOVA for the functional bond variable show no

significant difference in the mean response of this index in the studied samples ($\text{Sig} > 0.05$). Thus, people's perceptions of the functional bond of each sample studied did not have a significant difference and were influenced by the neighborhood in almost the same way. Again, based on Table 4, the results of ANOVA for the emotional bond variable prove a significant difference of the mean response for this index in the studied samples ($\text{Sig} < 0.05$). Thus, there is a significant difference between people's perceptions of the emotional bond of each sample studied. Accordingly, Tukey post hoc tests were used to determine which levels of response variable have a significant difference with the results reported in Table 4. Based on the test of grouping the studied samples, in interpreting the results of the above table, it can be stated that there is a significant difference between people's attitudes towards the emotional bond index in the Haji and Kababian neighborhoods ($\text{Sig} < 0.05$). Also, based on the mean scores obtained, this index has had better status in the Haji neighborhood. There was no significant difference between residents' attitudes towards this indicator in the Kababian and Kulanj neighborhoods.

3.4. Measurement of Research Indicators Based on Gender

In this section, the effect of gender on each of the research indicators will be compared using two independent two-sample *t*-tests (Table 5).

Table 5. Independent two-sample *t*-test for evaluation of the effect of gender.

<i>t</i> -Test for Equality of Means						
Variable	Gender	T-Value	Degree of Freedom	Significance Level (Sig)	Mean Difference at 95% Confidence Level	
					Lower Bound	Upper Bound
Functional bond	Male	3.202	3.436	0.001	0.079	0.293
	Female	3.016				
Emotional bond	Male	3.556	2.539	0.011	0.422	0.331
	Female	3.169				
Social bond	Male	3.025	8.827	0.000	0.462	0.750
	Female	2.419				
Place identity	Male	3.163	3.075	0.002	0.064	0.294
	Female	2.984				

In the following, the interpretation of the results of the independent two-sample *t*-tests will be discussed regarding the mean difference of research indicators. For this interpretation, the T and Sig values across all indicators indicate a significant difference between the two genders (M./F.) ($\text{Sig} < 0.05$). Higher mean values of all research indicators for the male gender suggest that the status of these indicators is better in men than in women.

4. Discussion

The preliminary results from this study are indicative of the importance of the social and affective role of green natural heritage and landscapes in developing a sense of belonging to place among the residents of the studied neighborhoods.

The results of this study revealed that local green spaces and old trees as part of natural heritage play an important role in promoting local communities' attachment to their homes through emotional, social, functional and place dimensions. Among them, "emotional bond" had the greatest, while "place bond" had a minimal effect on enhancing place attachment. Also, Hernandez et al. maintain that, despite its social aspect, place bonding is essentially an affective type of bond [69]

Social bonding: As stated by Devine-Wright and Howes, place bonding is central to the social sense of belonging to place [70], so social bonding is more pronounced due to the presence of local green spaces in neighborhoods whose population composition is more

intact. In the Haji and Kababian neighborhoods, the role of emotional and social bonds in attachment to the neighborhood was also greater due to the fact that they had more original residents than other neighborhoods. This suggests that the length and duration of residence in the neighborhood, according to past findings, is directly related to the promotion of attachment to the environment. Lo and Jim believe that local inhabitants have a stronger sense of belonging to natural heritage, and regard green natural heritage as part of their collective memory [71]. The presence of the same green space and landscapes has provided the perfect place for social interaction as well as sitting and chatting with locals, especially the elderly. As the findings in Table 2 reveal, other effects of the presence of local green spaces and natural heritage as well as old trees can promote a sense of responsibility for maintaining neighborhood environmental quality. In other words, the presence of environmental green elements provides a part of social identity and underpins the promotion of social trust [72]. This finding is in line with the views of Uzzel et al. who believe that communities that are socially more cohesive and have stronger spatial and social identity tend to show more stable environmental behavior than communities with weaker spatial and social identity [73].

Due to sociocultural values and considerations, mosques are the most important places in the selected neighborhoods for making decisions about how the neighborhoods' problems should be approached and solved. As such, green spaces play no substantial role in the meetings and sessions held for development of these neighborhoods because these meetings are often held in religious places such as the mosques. These green spaces do not play an important role in establishing friendly or two-way interactions because of the special privacy as well as the religious and cultural biases of its inhabitants. Thus, permanent or nocturnal presence in these areas is not recommended and emphasized.

Functional bond: As these neighborhoods are in the heart of historic and dense urban contexts, and there is usually little green space or urban parks in such neighborhoods, with these neighborhoods being congested in traffic, the presence of these green spaces in the center of neighborhoods is a privilege in terms of reducing environmental pollution. According to Table 2, the presence of these trees and green spaces has an important role in climatic comfort and ecosystem services in the neighborhood context, and especially in the neighborhood center, which provides shade, pauses and rest for residents and passers-by in the neighborhood, particularly in summer. Note that as the dimensions, proportions and sizes of these green spaces have been designed with old neighborhood capacities and now access to them has diminished for all age groups, especially children because of the larger population of neighborhoods, this requires some form of proper urban planning. Also, considering the existential nature of these green spaces, which have more aspects of environmental comfort and identity, there is less opportunity for sport and physical activity. Another good function of these green spaces, especially with regard to the morphology of the neighborhoods, is their role in reducing vehicles' speed, while promoting relaxation and walking as well as pedestrian orientation in neighborhoods; the neighborhoods with these linear green spaces, such as the Haji neighborhood, have a better feeling as well as greater mental and emotional peace. Thus, functional bonding with the green space is mainly based on the sense of belonging to place in the studied neighborhoods. Raymond et al. have also defined the sense of belonging to place as a functional relationship that particularly revolves around an individual's physical contact with the place [32].

Nowadays, the utilization of different models of urban greening such as green walls and roof gardens improves social belonging in residential complexes in addition to increasing environmental sustainability. The results of many studies indicate that all types of vertical vegetation are useful in reducing the temperature of building surfaces and consequently decreasing energy consumption for cooling purposes [74]. In addition to its functional aspect, planting vegetation on vertical surfaces can enhance the visual quality of buildings and walls [75].

Emotional bond: One of the important reasons for the strong role of emotional bonds in place attachment in traditional neighborhoods in terms of green space and natural

heritage can be the presence of old trees in neighborhoods as part of the identity of the neighborhood. On this basis, the presence of green spaces and trees, in addition to a sense of vitality among residents, promotes a sense of place ownership in the neighborhood, and most citizens always keep a perceptual image of neighborhood events and even old photos of the neighborhood. Examples include natural and green heritage as a mental image and they express a kind of emotional and nostalgic sense about these memories. In the same vein, Lewicka (2005) has also stated that individuals and communities with a stronger sense of belonging to the environment tend to be more willing to improve the quality of life in their local community through social participation and environmental conservation [38]. Manzo and Perkins, too, consider participation in the preservation of the neighborhood as the main affective dimension of place-related behavior [41].

The other role of green space emotional bonding in neighborhoods is to induce a sense of life while also reducing everyday stress in neighborhoods, as most residents consider the view of the green space and trees as healing and relaxing. This is because it associates a kind of natural green landscape on the neighborhood scale. Note that this kind of emotional bond is stronger among the elderly and those who have been living longer in the neighborhood. In this way, collective memories have created a more vibrant and powerful role in emotional bonds than personal memories, though the presence of green spaces and old trees in these neighborhoods, which can be attributed to the same cultural characteristics and social contexts in neighborhoods with Iranian and Islamic contexts. Because of the intrinsic characteristics of these neighborhoods, personal and individual presence in neighborhood centers has not received much attention, while due to the privacy of space, communal and religious events play a greater role. Due to the introverted atmosphere and the predominant component of privacy in these neighborhoods, the presence of individuals in neighborhood centers is not important and, instead, collective and ritual events play a more crucial role. This is in contrast to Benito et al. who have asserted that individual identity can be shaped, maintained and modified through the features and uses of everyday environments [76].

Place and perceptual bond: In the place dimension, short and easy access to green spaces and trees proved to play an important role in residents' place attachment to the neighborhood because of the place scale of the neighborhood. By placing these spaces in the center of the neighborhood, it has become possible to have equal access to green spaces from different parts of the neighborhood. This, in turn, has created a greater place bond, especially for children and the elderly, and has somehow played an important role in the realization of environmental justice. Similarly, Arnberger and Eder (2012) have also emphasized the role of access to green spaces in developing a sense of belonging to residential environments. Interestingly, both the place and physical pattern of the neighborhoods themselves, as well as the pattern of planting and deploying green spaces and trees, follow the paths of springs and aqueducts that previously flowed [60]. Another point is the organic design and adherence to the principles of designing these green spaces and trees based on natural patterns and infrastructures in the neighborhoods; they have created a sense of place and aesthetic perception in the readability of neighborhoods. Interestingly, the height and density of old trees make the neighborhoods readable and can be distinguished as landmarks of the neighborhoods.

5. Conclusions

The aim of this research was developing a model for explaining the role of local green spaces in improving place attachment in historically and culturally valuable residential areas. The conceptual model developed in this study describes the social dimensions, the emotional dimensions, the physical identity and the functional bonds in relation to residents' sense of attachment to their living environment in association with the duration of their residence. The priority of these dimensions and how these dimensions interact with the sense of place attachment is deeply and directly associated with cultural and social contexts as well as the scale of residential spaces. According to the results of the

study, emotional bonding had the greatest impact on place attachment to residential space. This is because for the people, the local green space has played an important role in their happiness and vitality and has enhanced their sense of ownership over their place of residence. The results also indicated that green spaces enhance the spatial readability, identity and collective memories of residential spaces in addition to playing an environmental role. According to the users, such spaces contribute to boosting the morale of the people living in the neighborhood while also giving them a sense of nostalgia. The other aspect identified as important in this research is the functional dimension. Easy and local access to neighborhood green spaces enhances mental comfort and public health in local open spaces in addition to establishing environmental justice and providing opportunities for stopping by, sitting and chatting. At the same time, it is effective in reducing environmental stress and promoting the peace of the population. The next influential factor is the social component. The green spaces and landscapes of residential neighborhoods have increased people's sense of responsibility and the sense of pride in the neighborhood. In addition, based on the results, residents also like to spend some time per week in the meadow of the neighborhood to discuss their neighborhood together and make local friends. Finally, the place bond factor, following the emotional and social bond factors, was effective in increasing the sense of place attachment in residential environments.

In addition, this study showed that paying due attention to the functional and environmental role of green spaces in urban development plans, especially in residential contexts, for promoting place attachment is highly significant. If climatic considerations, environmental comfort and proper emplacement are taken into account in the process of designing and implementing green spaces in urban public open areas, urban residents' sense of belonging to residential environments will improve and their participation in maintaining and developing the environmental quality of residential complexes will increase.

A green space network can be created by linking a neighborhood's sidewalks to a green space at the center of the neighborhood. This network can improve the environmental quality and public health of the neighborhood and prove useful and effective at the time of crises resulting from floods, water pollution and temperature fluctuations. It is also suggested that a map of urban green spaces at the local scale be produced. Many policymakers advocate changes, including the provision of urban green spaces, in the built environment to have a healthy population. There are many benefits to using urban green spaces as a type of health, social and environmental intervention.

Green spaces at the center of neighborhoods are a subcategory of restorative environments that can improve residents' moods and reduce their stress [77]. The results of the questionnaire used in this study confirm the same. Considering the increasing daily stress of modern life for urban citizens, urban brownfields can be renovated and transformed from unused spaces into local green spaces to provide substantial benefits to urban residents in the four dimensions discussed herein.

In addition, historical and natural green landscapes play an important role in urban plans and interventions for promoting citizens' mental health in urban residential neighborhoods as indicated by the results of this research. Natural green landscapes have a positive effect on improving quality of life, engendering a sense of pride and arousing emotional feelings in various spaces. In the future, new models of green spaces such as green walls, roof gardens and green roofs will enhance the sense of place attachment in residential environments all over the world. As such, the maximum use of natural resources and landscapes will be the main focus of urban planning and interventions in the near future, especially from the environmental and social perspective.

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