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Factors Influencing Residents' Satisfaction in Nursing Homes, Isfahan Province, Iran: Structural Equation Modeling (SEM)

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Abstract

Most older adults nowadays live alone, without the help of their children, prompting higher demand for nursing homes than ever before. Thus, this study aimed to identify the factors affecting resident satisfaction in Isfahan province nursing homes through a collaborative approach and based on residents' comments and quantify the type of relationship between these factors. This study employed a mixed qualitative-quantitative approach to evaluate the data gathered through article reviews, in-depth interviews, observation in Sadeghiyeh and Ehsan nursing homes, and the Likert scale questionnaire. The variables affecting older adult satisfaction in nursing homes were identified using MAXQDA software analysis. Subsequently, SPSS 22 and AMOS 26 software were employed to obtain the Pearson test, confirmatory factor analysis, and structural equation model (SEM). According to the results, in nursing homes, elderly satisfaction is affected by three factors. Results from the SEM revealed a direct connection between individual characteristics, the physical environment, and service quality factors: (1) gender, previous habitation status, education, length of residence, and health status affected the physical environment; (2) physical environment components predicted service quality; (3) gender, previous habitation status, education, length of residence, and health status influenced service quality. To enhance residential satisfaction in nursing homes, it is suggested that women's outdoor spaces be private and colored cool and warm, respectively, for men and women. The nursing stations are recommended to be designed to be open; so senior residents have visual access. Increased natural light and green space in nursing homes to improve the social environment.

Keywords: Elderlies: Physical environment; Service quality; Residential satisfaction; Individual characteristics

1. Introduction

The aging trend of the global population is increasing (Kylén et al., 2017) in such a way that 11% of the world population are older than 60 years which will be doubled from 2015 to 2050 based on the predictions (Moreira et al., 2020). Moreover, the population older than 60 years in Iran is incrementally increasing than 20 years ago (Noroozian, 2012, WorldBank, 2019). However, most elderlies in Iran need to improve their quality of life (Tajvar et al., 2008, sajadi and biglarian, 2006, Ghadampour et al., 2018) and the aging process is associated with the functional limitations changing with the pattern of aging. Moreover, these people will have a longer life by science development (Kylén et al., 2017). On the other hand, the World Health Organization (WHO) states that the need for a place for elderly care is felt more by age in these years (Hsu and Wang, 2009, Lundgren et al., 2020, WHO, 2017) because improving the quality of service in a nursing home is closely related to the demands of elders and their expectations of health care (White et al., 2019, Nadash et al., 2019).

It should be noticed that sometimes going to another place to live means crossing boundaries for people(Gustafson, 2001). However, this relocation is associated with depression and mental illness in the case of nursing homes (Hsu and Wang, 2009) and is related to the control of their environment and activities (Kylén et al., 2017). another effective factor is the lack of principled design in meeting the needs of elderlies (Fernández-Portero et al., 2017, Joseph et al., 2016) because most elderlies try to protect their independence and access to the private space (Eijkelenboom et al., 2017, Tuominen et al., 2016, MansourHosseini and JavanForouzande, 2018). On the other hand, physically disabled people are limited in access to such spaces (Park et al., 2019), finally reducing their satisfaction in the environment (Coulombe et al., 2016, Hadavi, 2017).

Compared to the nurses in hospitals, the nurses working in nursing home face more challenges, which leads to their dissatisfaction (Nelson et al., 2020). Furthermore, extensive relationships are formed between elderlies and nurses, for which many variables affect their type (Paudel et al., 2020). The quality of these relationships of nurses always affects the improvement of the quality of service in nursing home (Colón-Emeric et al., 2006, van den Berg et al., 2006).

The physical environment is considered an important place in increasing residents 'satisfaction (Kahana et al., 2003, Lee et al., 2017). In this regard, the perceived quality of the environment is closely related to the health of people living in that environment (Hadavi, 2017, Haywood et al., 2018, Kylén et al., 2017, Moreira et al., 2020, Weenig and Staats, 2010). Moreover, environmental characteristics play an important role in

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meeting the physical (Joseph et al., 2016, Park et al., 2019), mental, and psychological needs of elderlies (Scannell and Gifford, 2017). As a result, elderlies' perceptions about the physical environment are an important factor in increasing their satisfaction with their habitat (Coulombe et al., 2016, Fernández-Portero et al., 2017, Hadavi, 2017, Lee et al., 2017, Rioux and Werner, 2011, Sugiyama et al., 2009).

Elders' satisfaction with their environment depends on improving their quality of life in nursing home (Castle et al., 2018) and the quality of nursing home service, and also, it changes the cultural perspective toward nursing homes (Palmer et al., 2018) because of the important role of people's satisfaction in psychology (Rioux and Werner, 2011) and its effect on the health of the people living there (Kahana et al., 2003). Furthermore, changing the culture of nursing home is effective in improving the quality of life of residents and quality of service (Miller et al., 2010, Tyler and Parker, 2011).

Isfahan province has a growing aging population, but extensive studies have not been conducted to improve the level of satisfaction of the elderly living in nursing homes. Additionally, previous research did not examine the types of influences and relationships between all variables affecting elderly care center residents' satisfaction. They studied only a part of this issue, including examining the relationship between the individual characteristics of the elderly and their physical environment (Kahana et al., 2003), examining the characteristics of the physical environment suitable for the elderly (Fernández-Portero et al., 2017, Haywood et al., 2018, Nordin et al., 2017, Park et al., 2019) and investigating the effect of providing services to the elderly and the environmental characteristics of the elderly care center (Lundgren et al., 2020); however, most of these studies have not been conducted in nursing homes. One of the new aspects of this subject is the methods used by researchers to achieve results. In this regard, the present study uses a mixed method (qualitative-quantitative) to explore the factors affecting elderly satisfaction in nursing homes. Therefore, because Iranian and foreign articles have not examined the relationship between the factors affecting elderly satisfaction in nursing homes, qualitative and quantitative questionnaire analysis and a structural equation model (SEM) were conducted to measure this relationship. Furthermore, this topic is innovative in capturing the relevant micro-components as well as their characteristics and relationships from the perspective of the elderly and nursing facility experts for satisfaction.

2. Research Background

People's satisfaction with their living place is one of the most important aspects of increasing their life quality (Castle et al., 2018, Lundgren et al., 2020) because it is related to important mental health components such as reducing depression (Lee et al., 2020). Satisfaction with living place is obtained when an individual feels adapted to his/her living place(Fernández-Portero et al., 2017)and meets his/her needs (Coulombe et al., 2016, Hadavi, 2017, MansourHosseini and JavanForouzande, 2018). Rioux et al. (2011) defined four aspects for environmental satisfaction of elderlies including home environmental characteristics, quality of service, social interactions, and neighborhood characteristics (Rioux and Werner, 2011). Furthermore, Kahana et al. (2003) stated individual characteristics as an important factor in increasing people's satisfaction with the physical environment (Kahana et al., 2003). Then, each effective variable on residents' satisfaction with nursing homes is examined and analyzed separately.

2.1. Individual characteristics

Park et al. (2019) stated that the individual needs of elderlies and their position are effective in improving the environmental characteristics (Park et al., 2019). According to the results of Xie et al. (2020) who studied the sound quality in China nursing homes, people with certain diseases are more sensitive to environmental characteristics (Xie et al., 2020). People with desired social relationships feel more satisfied in their living environment than others (Lee et al., 2020, Rioux and Werner, 2011). As a result, the presence of social interactions between elders brings a positive emotion in them (Cloutier-Fisher and Harvey, 2009, Tuominen et al., 2016). Cloutier-Fisher et al. concluded that the personal life of each elderly and his/her experiences during life influence his/her social relationships(Cloutier-Fisher and Harvey, 2009). On the other hand, people's self-confidence is directly related to their satisfaction in the environment (Kahana et al., 2003). Also, the perceived aspects of the nursing home have a high effect on reducing depression (Kylén et al., 2017, Lundgren et al., 2020).

Today, using technology is a part of the individual life of each person. According to Schlomann et al. (2020), elderlies living in private homes use technology more than elderlies living in nursing home. Gender and education are also effective in this regard, as elderlies with higher education and men intend to use technology more (Schlomann et al., 2020). As a result, people's attitudes to their needs and expectations are related to society's culture (König et al., 2019) and their characteristics, because people with varied individual characteristics have different needs (Palmer et al., 2018, White et al., 2019).

2.2. Environmental characteristics

Home indoor and outdoor space conditions influence people's satisfaction (Cloutier-Fisher and Harvey, 2009, Fernández-Portero et al., 2017, Rioux and Werner, 2011). The highest weakness of nursing homes based on their residents' view is the lack of personalization of the environment (Eijkelenboom et al., 2017, Nordin et al., 2017, Tuominen et al., 2016) because elderlies spend most of their time in their private rooms (Xie et al., 2020). Some environmental factors sometimes cause the lack of independence and freedom of elderlies in the environment (Joseph et al., 2016, Tuominen et al., 2016). Rioux et al. (2005) studying the female elderlies concluded that elderlies' lack of control over personal affairs reduces the

participation of these people in group and social affairs thus negatively affecting their health (Rioux, 2005). Therefore, special attention should be paid to the personalization of the environment (Kahana et al., 2003, Shin, 2014) and the ability of elderlies at controlling their habitat (Scannell and Gifford, 2017). As a result, privatization, as well as accessibility, are increased for the elderly (Barnes, 2006).

2.3. Quality of service

Attention to the quality of service in the nursing home improves its quality (Nadash et al., 2019, Nordin et al., 2017) associated with the social relationships between elderlies (Miller et al., 2010) and nurses and the desired teamwork between the nurses (Lundgren et al., 2020, Tyler and Parker, 2011). Thus, attention to this factor increases the quality of residents in a nursing home (Paudel et al., 2020, White et al., 2019). Poey et al. (2017) indicated that extensive personal care for elderlies contributes to their independence (Poey et al., 2017). Therefore, the highest satisfaction of nurses based on research is achieved when they can meet the care needs of residents (Lundgren et al., 2020, Nelson et al., 2020).

According to the research background, elderlies play an important role in extracting effective data on environmental satisfaction (White et al., 2019). The studies in this field emphasize the relationship between the individual experiences of elderlies and their satisfaction with the environment (Coulombe et al., 2016, Kahana et al., 2003, Tuominen et al., 2016). The physical design of the nursing home is one of the important aspects, which should be evaluated from its residents' view (Eijkelenboom et al., 2017, Hadavi, 2017). This research tries to consider the effect of these components. Thus, the main questions are raised about a nursing home in Iran as "which factors are effective on the satisfaction of all residents of a nursing home? Or "Is there any relationship between them? It was tried in this research to reach all aspects with different methods to achieve the nursing home residents" view toward the environment to fill the deficiency of literature. Abass and Tucker investigated the residents' satisfaction with the environment and studied the effect of individual characteristics of the respondents (age, gender, education, residency time) on data (Abass and Tucker, 2018). The present research studies the relationship between the individual characteristics of the participant with the other factors. Moreover, the nurses' interaction and behavior, and service groups are effective on elderlies (Paudel et al., 2020). As a result, according to the analysis of previous research and the effective factors on the satisfaction of elderlies and nurses in a nursing home, this research tries to include all three factors of individual characteristics and expectations, physical characteristics, and service characteristics in the research process.

3. Materials & Method

Through the combined (qualitative-quantitative) data collection method, the data were collected by a librarian, observation, interview, and Likert scale questionnaire and analysed based on the statistical population and data collection method. The results of each step complete the previous step and indicate the factors affecting the satisfaction of the elderly living in a nursing home. Therefore, the research methodology is described in each part (Figure 1).

3.1. First step

The relevant articles were collected in this step to obtain the effective variables on residents' satisfaction with nursing homes. Information and concepts related to elderly satisfaction were coded and analysed using MAXQDA software.

3.2. *Second step*

In this step, individual characteristics, and their expectations were studied based on the environmental characteristics by elderlies' participation in the research. Thus, this research step is open-interview based on the data collection method. The interview framework was indicated by elderlies according to the previous step. As a result, a semi-structured interview was conducted to find the elderlies' ideas about the characteristics of nursing homes and collect the individual information to check its effect on elderlies. The individual interviews lasted between 40 and 60 min. Also, it was tried to study the elderlies' views using the real images of the nursing home environment in proportion to each physical characteristic. Finally, the recorded data were analysed using MAXQDA software.

Time and location: The method consists of an experimental study that investigates a phenomenon; in this study, an individual case is examined (Groat L., 2013). As a result, we attempted to select a sample or samples with varied individual characteristics. this research was conducted in a semi-public nursing home of Isfahan province in two different cities of Isfahan city and Najafabad town which have locational similarities and differences. Sadeghiyeh nursing home was built in a suburb far from the residential places of Isfahan, while Ehsan nursing home was built in a village far from the city centre of Najafabad. Although these centres were built for the maintenance and residence of elderlies, Sadeghiyeh nursing home was built fifty years, while Ehsan nursing home was constructed 5 years ago as some of its floors have not been used (Table 1). Based on the research objectives, the design of these two nursing homes, and the characteristics of their populations, qualitative data were obtained by interviewing the elderly, which helped the researchers gain a deep understanding of the research topic, which is the main purpose of case studies. The interview at this research step began in May 2020 and the data collection was completed in August 2020. Data analysis was completed in October 2020.

Participants: Statistical sample at this step included the residents of semi-public elderlies in Isfahan and Najafabad. Elderlies with proper conditions to answer the questions and intention to communicate with the

researcher were randomly selected. Finally, the data at this step were saturated with 18 elderlies (8 males and 10 females) in both nursing homes (8 in the nursing home (a) and 10 in the nursing home (b)). According to the personal characteristics, among 18 interviewees, twelve were literate, and six were illiterate; eleven interviewees were residents in a private home before entering the nursing home, and seven lived in their family home; eleven were residents for more than 1 year, and seven lived for less than 1 year in the nursing home. Furthermore, twelve and six interviewees were physically healthy and not healthy, respectively (table 2).

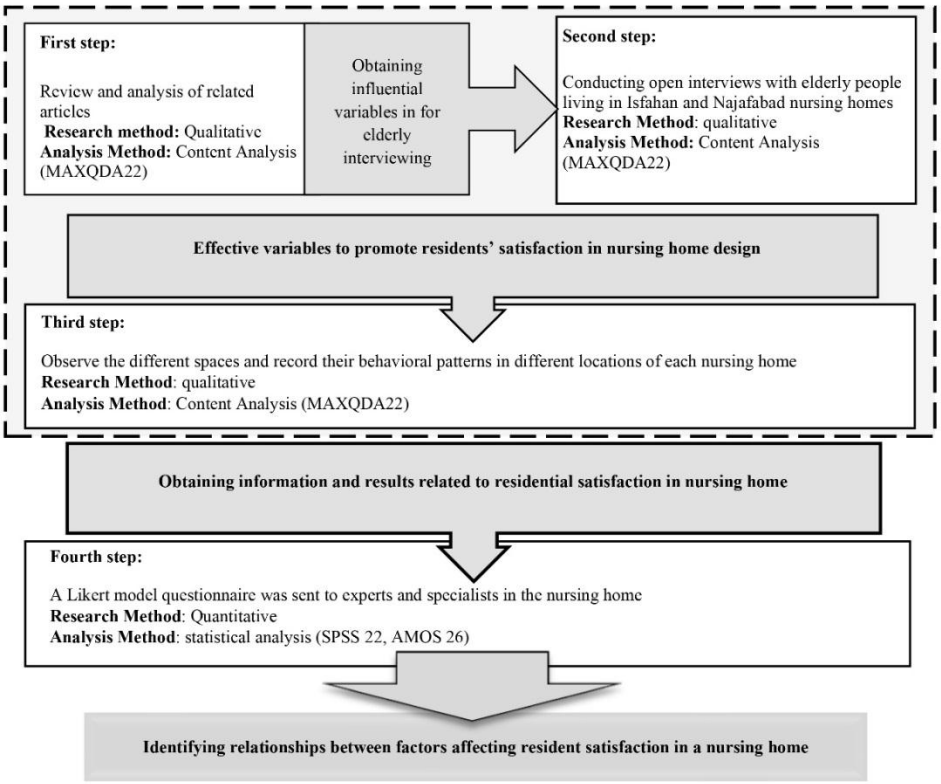

Fig. 1. Research process

Table 1
Structural and environmental characteristics of two research site

Name	Structure properties					Interior and exterior design features					
Code	Nursing home	Location	Infrastructure area	Number of floors	Number of elderlies	Green sapce	Corridor	Lobby	Amphitheater	Office space	Nursing station
(a)	Sadeghiyeh	Isfahan : Suburbs	12,000 m^2	3 floors	292	Large and wide	Without natural light, narrow	Natural light	Large and accessible from the interior of the residential building	Visual access for the elderly	Lack of visual access for the elderly
(b)	Ehsan	Najafabad : Rural area	11,000 m^2	3 floors (2 floors unexploited)	58	Access to the orchard	Without natural light, wide	Wide	-------	Visual access for the elderly	visual access for the elderly

Table 2
Individual characteristics according to the second step

Nursing home	Document name	age	gender	education	living condition before entering the nursing home	health condition	length of residence in the nursing home
(a)	WOMAN 1	72	female	Illiterate	living with family	healthy	3 years
(a)	WOMAN 2	72	female	Literate	living with family	healthy	14 years
(a)	WOMAN 3	66	female	Literate	living with family	healthy	10 years
(a)	WOMAN 4	83	female	Literate	personal home	physical disability	7 months
(a)	WOMAN 5	70	female	Illiterate	living with family	healthy	2 years
(a)	MAN 1	64	male	Illiterate	personal home	healthy	4 months
(a)	MAN 2	68	male	Literate	personal home	physical disability	3 years
(a)	MAN 3	66	male	Literate	personal home	healthy	6 months
(b)	MAN 4	77	male	Literate	personal home	physical disability	1 years
(b)	MAN 5	67	male	Literate	personal home	healthy	1 years
(b)	MAN 6	60	male	Literate	living with family	healthy	10 days
(b)	MAN 7	64	male	Illiterate	personal home	healthy	2 months
(b)	MAN 8	65	male	Literate	personal home	healthy	3 years
(b)	WOMAN 6	66	female	Illiterate	living with family	healthy	2 years
(b)	WOMAN 7	90	female	Illiterate	personal home	physical disability	6 months
(b)	WOMAN 8	67	female	Literate	personal home	physical disability	3 years
(b)	WOMAN 9	60	female	Literate	personal home	healthy	7 months
(b)	WOMAN 10	67	female	Literate	living with family	physical disability	3 years

3.2. Third step

A non-participatory observation technic was used in this step without attention to record the behavioral model, activity and type of elderlies' use of space. Therefore, the participants in the interview were observed during the day, from 8 am to 12 pm (Figure 2). Then the qualitative data was analysed in MAXQDA software.

Time and location: This step took place in the same location as the second step. The data collection started in December 2020 and ended in February 2020. The data analysis was completed in March 2021.

Participants: Elderly people who are mentally healthy and living in a nursing home.

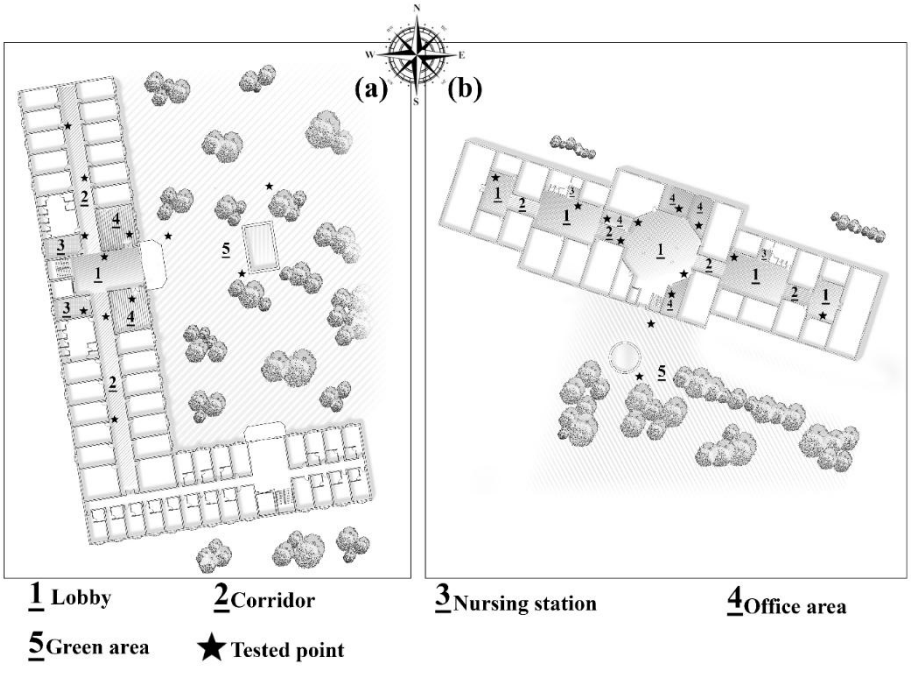

Fig. 2. Architecture plan of two research site (a: Sadeghiyeh nursing home, b: Ehsan nursing home)

3.3. Fourth step

Based on the results of the first, second, and third steps, the factors affecting resident satisfaction in nursing homes were identified. During these steps, the relationship between these factors was determined. Subsequently, a five-point Likert scale questionnaire was developed based on the current study's qualitative findings. The Pearson test and confirmatory factor analysis were then conducted using SPSS 22 and AMOS 26 software, respectively, and the structural equation model (SEM) was obtained.

Time and location: This step was conducted in the Isfahan province and data collection started from May 2021 and ended in January 2021. The results of this step were obtained in August 2021.

Participants: Since older adults lack the physical ability and literacy necessary to complete the questionnaire, it was distributed to 312 people (140 men and 172 women) who were experts and specialists in this field. Due to the limitations imposed by the COVID-19 pandemic, a questionnaire was sent to their email address or LinkedIn profile. Participants were selected by geriatricians or nursing home administrators.

4. Findings

4.1. First step

A total of 112 articles were identified using keywords related to older adult satisfaction, including residential satisfaction, older adult life quality, nursing homes, the physical environment, and the older adults' individual characteristics. The Google Scholar and PubMed databases were used to locate these studies. The restrictions included the publication year (2000-2020) and article type (reviews and research papers), with 41 papers being excluded. After studying the papers, 43 were removed based on irrelevance to the physical environment design or older adult satisfaction.

Accordingly, 28 papers remained relevant to architecture and the factors influencing older adults' satisfaction with their physical environment. Finally, MAXQDA software was used to conduct qualitative content analysis and data analysis (Figure 3). A total of 334 codes were used in this analysis, and each one was assigned to a group based on its definition, which included the older adults' individual characteristics, the physical environment's characteristics, the older adults' demographic profile, and service quality. Frequencies 247, 45, 29, and 13 correspond to codes describing the physical environment, service quality, individual characteristics, and demographic profile, respectively. Table 3 lists the codes associated with each category. The results from this stage were used to reconcile and complete the data from the subsequent steps. As a result, a preliminary organized snapshot of the factors affecting resident satisfaction in nursing homes was obtained.

Fig. 3. A sample of coding and content analyses of the first step

Table 3
Content analysis results of the first step

Category	code	Sub-code	Document
Individual characteristic	health condition	-	(Barnes, 2006, Coulombe et al., 2016, König et al., 2019, Lee et al., 2020, Park et al., 2021, Rioux, 2005)
	different experience	-	(Cloutier-Fisher and Harvey, 2009, Eijkelenboom et al., 2017, Hersch et al., 2003, Kylén et al., 2017)
Physical environment	personal belongings	-	(Eijkelenboom et al., 2017, Hersch et al., 2003, Nordin et al., 2017, Rioux, 2005, Scannell and Gifford, 2017)

	physical activity	physical activity	(Abass and Tucker, 2018, Castle et al., 2018, Hadavi, 2017, Hersch et al., 2003, Joseph et al., 2016, König et al., 2019, Miller et al., 2010, Nordin et al., 2017, Park et al., 2021, Weenig and Staats, 2010)
		security	(Abass and Tucker, 2018, Castle et al., 2018, Coulombe et al., 2016, Eijkelenboom et al., 2017, Hadavi, 2017, Joseph et al., 2016, König et al., 2019, Moreira et al., 2020, Nordin et al., 2017, Park et al., 2021, Rioux, 2005)
	Outdoor	-	(Abass and Tucker, 2018, Coulombe et al., 2016, Eijkelenboom et al., 2017, Fernández-Portero et al., 2017, Hadavi, 2017, Joseph et al., 2016, König et al., 2019, Moreira et al., 2020, Nordin et al., 2017, Park et al., 2021)
	interior design	Interior design	(Barnes, 2006, Castle et al., 2018, Coulombe et al., 2016, Eijkelenboom et al., 2017, Fernández-Portero et al., 2017, Joseph et al., 2016, Park et al., 2021, Weenig and Staats, 2010, Xie et al., 2020)
		private space	(Barnes, 2006, Eijkelenboom et al., 2017, Kylén et al., 2017, Nordin et al., 2017, Shin, 2014, Weenig and Staats, 2010)
		public space	(Eijkelenboom et al., 2017, Hadavi, 2017)
		social communication	(Abass and Tucker, 2018, Castle et al., 2018, Eijkelenboom et al., 2017, Fernández-Portero et al., 2017, Hersch et al., 2003, Lee et al., 2020, Miller et al., 2010, Nordin et al., 2017, Park et al., 2021, Rioux, 2005, Shin, 2014, Weenig and Staats, 2010)
		sound	(Coulombe et al., 2016, Xie et al., 2020)
		variety of spaces	(Barnes, 2006)
		accessibility	(Abass and Tucker, 2018, Barnes, 2006, Nordin et al., 2017)
		color	(Joseph et al., 2016, Nordin et al., 2017, Weenig and Staats, 2010)
		lighting	(Fernández-Portero et al., 2017, Joseph et al., 2016, Moreira et al., 2020, Nordin et al., 2017, Park et al., 2021, Weenig and Staats, 2010)
	independence	independence	(Barnes, 2006, Eijkelenboom et al., 2017, Nordin et al., 2017, Park et al., 2021, Rioux, 2005, Scannell and Gifford, 2017, Schlomann et al., 2020, Weenig and Staats, 2010)
		Smart Mobile	(Schlomann et al., 2020)
Demographic information	education	-	(Abass and Tucker, 2018, Lee et al., 2020)
	gender	-	(Abass and Tucker, 2018, Lee et al., 2020, Rioux, 2005)
Quality of service	social communication between staff and elderlies	-	(Eijkelenboom et al., 2017, Miller et al., 2010, Paudel et al., 2020)
	services	-	(Castle et al., 2018, Eijkelenboom et al., 2017, Hersch et al., 2003, Joseph et al., 2016, Miller et al., 2010, Nelson et al., 2020, Poey et al., 2017, Tyler and Parker, 2011, Weenig and Staats, 2010)

4.2. Second step

At this stage, older adults were interviewed following previous findings. This interview entailed speaking with these individuals and eliciting their personal views and expectations for the nursing home environment. The technique of reminiscence was used at the beginning of the interview, because elderlies are interested in reminiscences including experiences and dealing with problems (Randall et al., 2006). Furthermore, this way increases the elderly's self-confidence and intimacy between the elderly and the interviewer (Gallagher and Carey, 2012, Hsu and Wang, 2009). In addition, the display of images of a nursing home environment was used to elicit information about participant's preferred environmental characteristics during this stage. MAXQDA software was used to analyse the recorded data. The codes gathered in this step were classified into three categories: physical environment characteristics, individual characteristics, and service quality, each of which entails codes (Figure 4). According to the results, 743 codes were identified, of which 571, 115, and 57 were associated with physical environment characteristics, service quality, and individual characteristics of older adults, respectively.

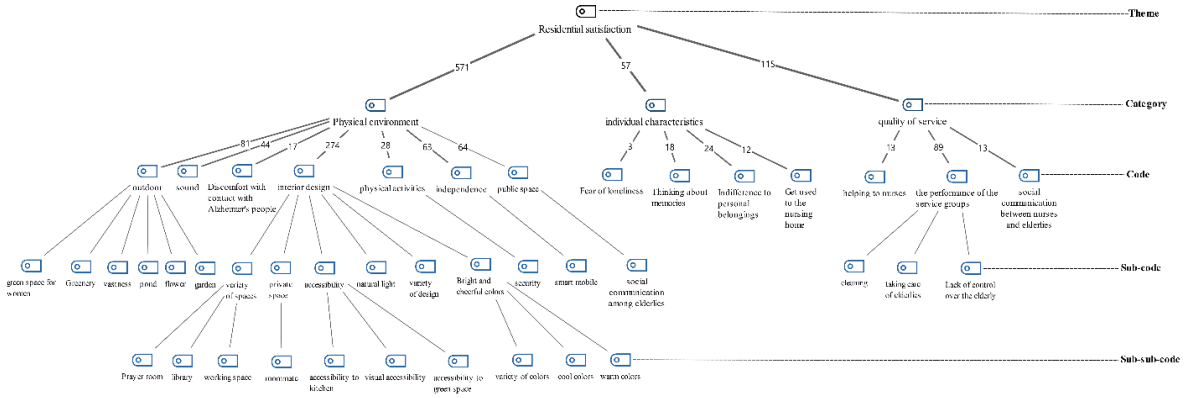

Fig. 4. Coding and content analyses of the second step

According to the findings from this step (Figure 5), certain codes were prevalent among older adults who shared similar characteristics. As shown in the figure 5 and table 2, residents who stayed in the nursing home for more than a year were less stressed and depressed than those who stayed for a shorter period. To this end, older adults with code names WOMAN 1, WOMAN 2, WOMAN 3, WOMAN 5, WOMAN 8, MAN 2, MAN 4, MAN8, who stayed for more than a year expressed that they had grown accustomed to the nursing home and that it is a suitable place. WOMAN 6 stated: "When I first came here, I was ill and upset, but I feel much better now; this is a pleasant location, and I have grown accustomed to it." When the elderly stay in a nursing home for more than a year, they become familiar with its environment and feel satisfied with it.

One of the older adults' significant characteristics was how they lived prior to entering the nursing home, which resulted in their independence from personal belongings (Figure 5). According to MAN 3: "I donated everything I owned before coming here because I no longer want to have anything personal here." Since the elderly lived in private homes before entering the nursing home, they didn't want to have personal belongings there. Additionally, three out of five older adults who were illiterate expressed a fear of being alone. WOMAN 6 stated: "I am afraid of being alone, especially when I am alone in my room." Literate elderly showed a greater desire to be independent and alone in the environment than illiterate elderly; illiterate elderly, however, showed a greater desire to communicate with others. Furthermore, older men and women assessed their environmental characteristics differently, with older men preferring cool and older women preferring warm colours for their bedrooms, respectively. Due to their religion and culture in Iran, older women requested a private and separate green space where men could not see them. WOMAN 4 said: "I dislike going out when it is crowded outside; in fact, it would have been better if the men had not been there." I do not feel at ease with the men present."

Along with environmental factors, another factor that contributed to older adults' independence in the nursing home was their smartphone; having this device equated to having a sense of independence, and they expressed a desire to purchase a personal computer, as MAN 4 stated: "I have a mobile phone and feel confident; I can call my friends and listen to music whenever I want."

As illustrated in Figure 5, all of the older adults with physical disabilities expressed a need for the assistance and care of nurses and expressed satisfaction after receiving these services, which is something that none of the healthy older adults mentioned. Additionally, based on the results of this step, 7 out of 12 of the healthy participants expressed dissatisfaction with nurse control; as WOMAN 1 stated: "I do all my work here myself; I wear and eat whatever I want; I do not like nurses telling me to eat this and not to eat that." Moreover, more than half of the healthy participants were content with assisting nurses with light duties; for example, WOMAN 2 said, "I want to do some work here and assist nurses; I cannot remain idle." From the older adults' perspective, the cleanliness and hygiene of their physical environment were determined by the services provided by staff and the type and colour of equipment.

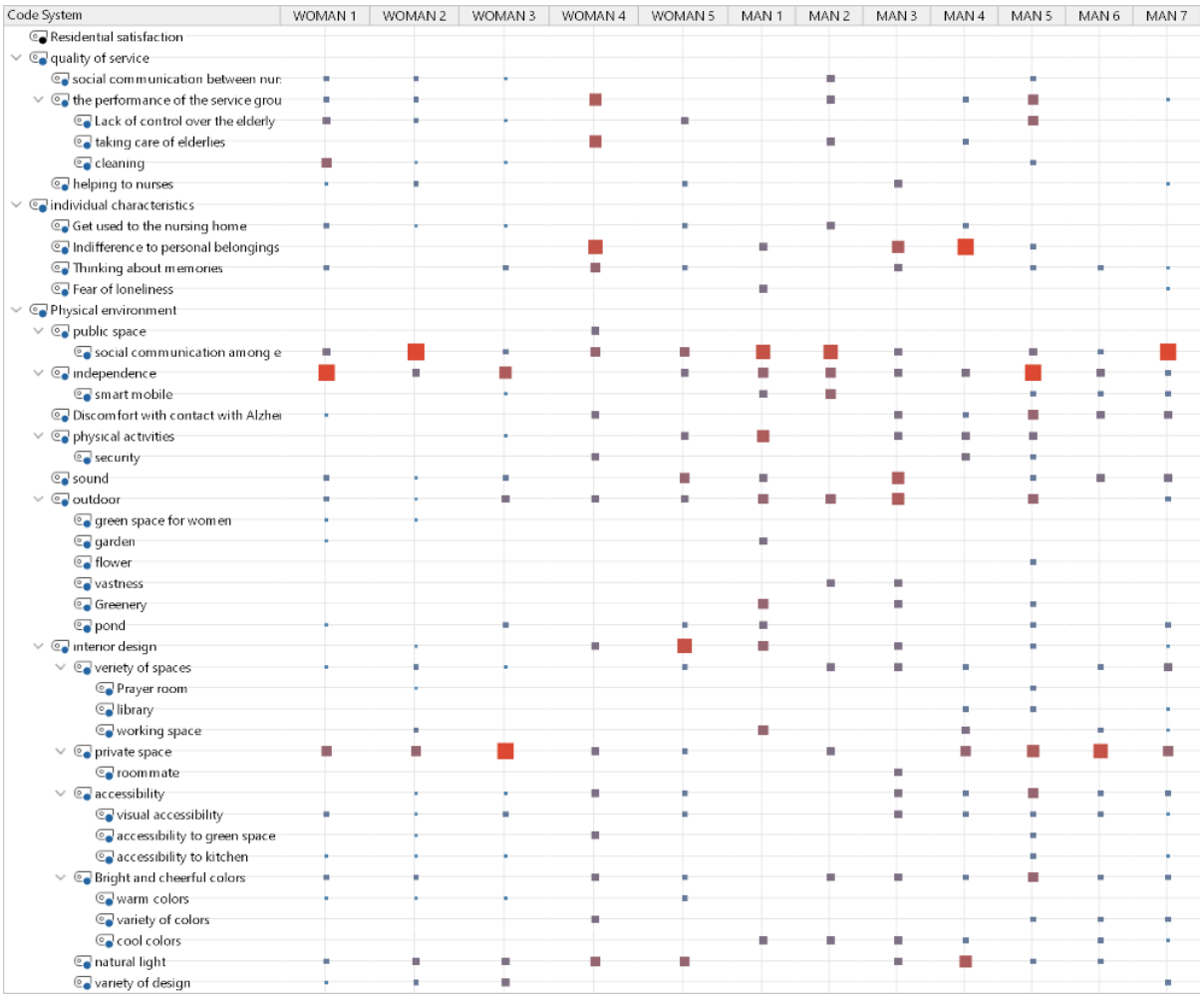

Fig. 5. A sample of coding based on each interviewee of the second step

4.3.Third step

According to the results of this step (Figure 2), a diagram of factors affecting satisfaction was created, and the relationship between individual characteristics, physical environment characteristics, and nursing home service quality was also defined qualitatively. Thus, observations were made in both nursing homes (a) and (b) to ascertain the effect of various physical environment characteristics on the residents.

Table 1 depicts the two nursing home spaces based on the previous step's results. The older adults' behavioural model (sincere or aggressive), their preferred mode of activity (sitting, watching TV, social connections, assisting nurses, and walking), and their preferred mode of space use (crossing, visiting, and residing) were recorded. MAXQDA was employed to analyse the data obtained in this step. This section's content analysis is primarily inductive. As a result, the relationship between the older adults' activity, behaviour, and use of space was quantified using axial coding. During the observation, demographic profiles, including gender and individual characteristics such as physical health status, were also considered.

The results obtained from analysing observations made in a nursing home (a) are depicted in Figure 6. According to this nursing home's results and environmental characteristics, the majority of space used in this nursing home was a lobby with natural light overlooking the green space, which indicated that they communicate with one another and act with an appropriate level of compassion. Additionally, according to the previous step, most people who used this space were older women, which could be due to their demands for women-specific green space. On the other hand, the residents acted nervously in the nursing home's dark corridors (a).

The older adults' behaviour in the nursing home's green space was also aggressive, resulting from the nursing home's overcrowding. The majority of social connections between older adults and nursing home staff occurred in the administrative department of the nursing home, where women visited and left more frequently than men. Physically disabled adults visited nursing stations more frequently than the remaining residents.

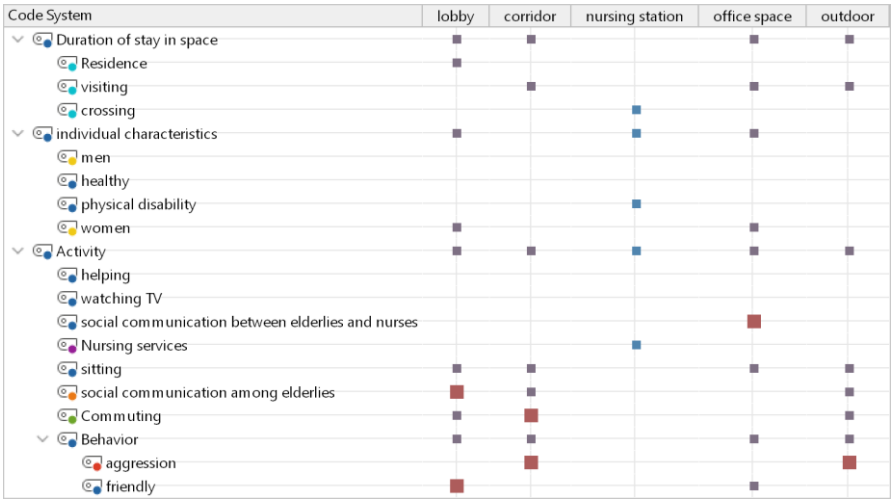

Fig. 6. Coding based on any observed space of the third Step (Sadeghiyeh nursing home)

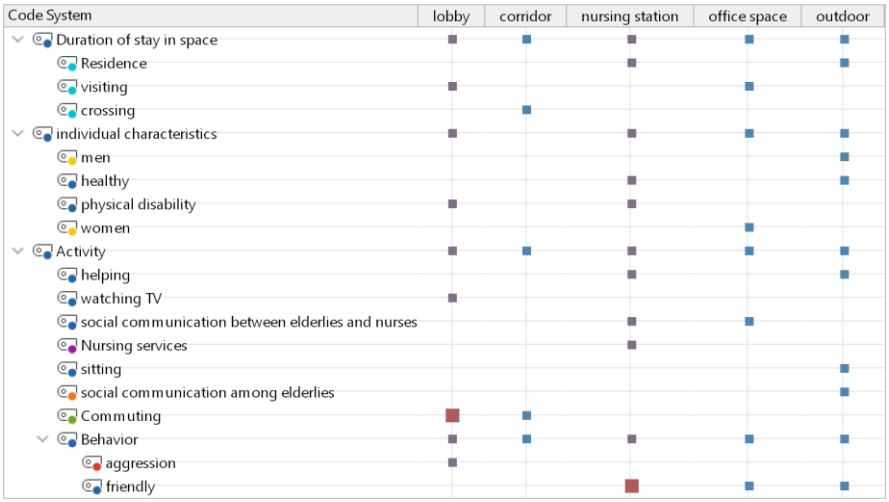

Fig. 7. Coding based on any observed space of the third Step (Ehsan nursing home)

Figure 7 shows the findings from the qualitative content analysis of the observations made in the nursing home (b). According to the results of this step and the environmental characteristics of this nursing home (Table 1), the residents spent the majority of their time in the nursing station and outdoor green space; given the open design of the nursing station in this nursing home, the residents interacted with and assisted the nurses, or the nurses caring for older adults with physical disabilities. A fruit tree stood in the open space of this nursing home (Table 1), where the older men mostly worked or communicated. The residents' nervous behaviour in the nursing home's lobby was also recorded, as the space was dark and lacked natural light. Finally, the qualitative findings from these three steps painted a clear picture of the factors influencing older adult satisfaction in nursing homes. As a result of the findings from these three steps, a quantitative Liker questionnaire was developed to examine the relationship between the variables affecting satisfaction and create a communication model between them.

4.4. Fourth step

This step consisted of a five-point Likert scale questionnaire divided into three sections: individual characteristics of the residents, physical characteristics of the nursing home, and service quality. This was a 30-item questionnaire with response options ranging from "strongly agree" to "agree," neutral, disagree, and strongly disagree. This questionnaire was initially distributed to 30 specialists in this field, and after the required reviews, several questions were eliminated, added, or modified, and the questionnaire's final form was obtained. As part of this research, we are working with communities of experts in geriatrics and designers of medical centers whose population is limited and cannot be accurately identified, and who must also be selected systematically. The statistical population was not precisely known in this case, so Cochran's formula was used without a population size to determine the sample size.

$$n = \frac{s^2 z^2}{d^2}$$

In this case, S is the variance of the first group of experts that were examined; Z is the level of confidence in the calculation, which is checked here with 95% confidence. Finally, d is the error rate, which was 0.05 in this case. The sample size was approximately 298. In this study, 319 experts were examined, but only 312 experts were included in the final analysis after removing those with

errors. Cronbach's alpha was >0.8 in each section, which is acceptable, meaning the questionnaire exhibited acceptable reliability.

First, the Pearson test was used in SPSS 22 to establish a linear relationship between the questionnaire variables. There was a significant relationship between each of the variables (individual characteristics, physical environment characteristics, and service quality) with a 99% confidence interval (P<0.01). Positive numbers indicated that all variables were directly correlated (Table 4). The following step involved conducting a confirmatory factor analysis using AMOS 26 software.

Table 4
Pearson correlation matrix between main variables

		Physical environment	Individual characteristics	Quality of service
Physical environment	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	312		
Individual characteristics	Pearson Correlation	.300**	1	
	Sig. (2-tailed)	.000		
	N	312	312	
Quality of service	Pearson Correlation	.284**	.241**	1
	Sig. (2-tailed)	.000	.000	
	N	312	312	312

**. Correlation is significant at the 0.01 level (2-tailed).

At this stage, confirmatory factor analysis was conducted to determine the factor loading results for each question in each section of the questionnaire (Figure 8-10). The factor loadings exhibited a correlation between each item (observed variable) and each variable (latent variable). A factor loading of 0.3 was considered the minimum, and questions demonstrating an equal or greater factor loading were retained in the final analysis. As illustrated in Figures 8 to 10, the factor loadings associated with each question were placed on connector lines greater than 0.3 and contained the initial condition. The average variance extracted (AVE) index was used to assess convergent validity; this index quantifies the latent variable's variance from its markers.

The goodness of fit test results for each section of the questionnaire are presented in Table 5, except the amount of AVE for the service quality variable, which was 0.44; however, this value was negligible given that all other conditions are met. Moreover, the P-value for all items was less than 0.001, confirming the reliability and validity of all questions.

Table 5
Convergent and discriminant validity

Factors	Fit index	Acceptable threshold (Meyers et al., 2016)	SEM result	Results supporting model fit
Physical environment	RMSEA	<0.08	0.058	✓
	Chi-Square /DIF	<3	2.05	✓
	CFI	>0.9	0.984	✓
	TLI	>0.9	0.977	✓
	C.R.	C.R.>AVE C.R.>0.7	0.86	✓
	AVE	AVE>0.5	0.54	✓
individual characteristics	RMSEA	<0.08	0.065	✓
	Chi-Square /DIF	<3	2.29	✓
	CFI	>0.9	0.967	✓
	TLI	>0.9	0.960	✓
	C.R.	C.R.>AVE C.R.>0.7	0.923	✓
	AVE	AVE>0.5	0.53	✓
quality of service	RMSEA	<0.08	0.047	✓
	Chi-Square /DIF	<3	2.47	✓
	CFI	>0.9	0.957	✓
	TLI	>0.9	0.947	✓
	C.R.	C.R.>AVE C.R.>0.7	0.885	✓
	AVE	AVE>0.5	0.44	-

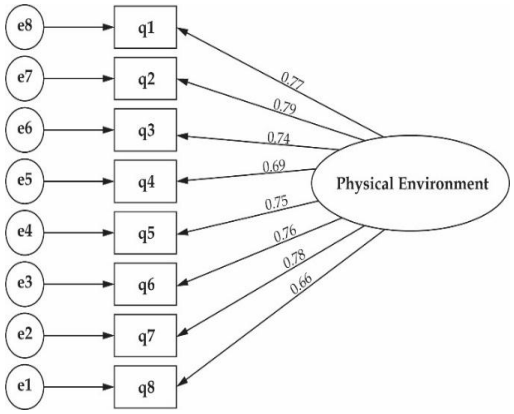

Fig. 8. Confirmatory factor analysis of the physical environment

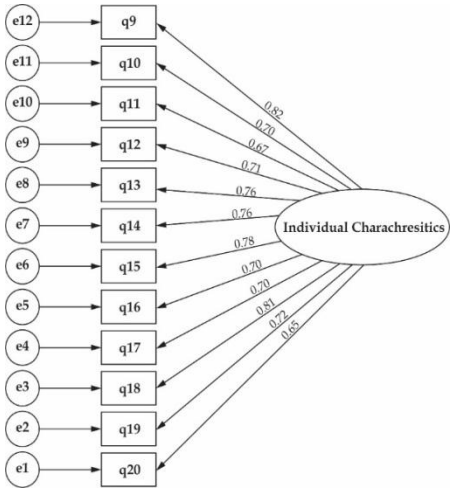

Fig. 9. Confirmatory factor analysis of the individual characteristics

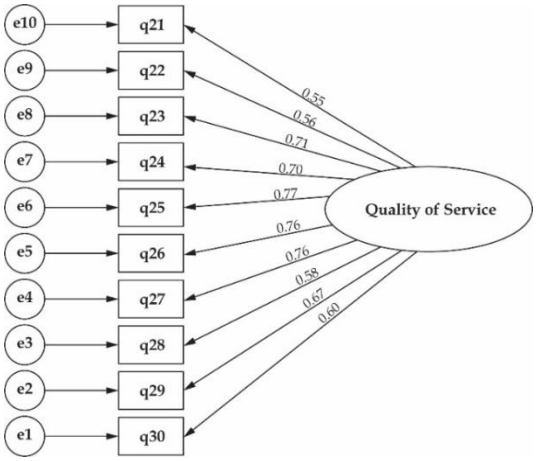

Fig.10. Confirmatory factor analysis of the quality of service

Finally, the research model was developed using the Pearson test and confirmatory factor analysis results, and the relationship between the variables was determined. The structural equation model (SEM) and model fit indices are depicted in Figure 11 and Table 6, respectively. To assess model fit, four widely used robust indices were employed: Root Mean Square Error of Approximation (RMSEA), Chi-square (χ^2)/Degrees of freedom (df), Tucker–Lewis Index (TLI), and Comparative Fit Index (CFI) (Browne and Cudeck, 1992). Based on the acceptable values in Table 6, the structural equation model (SEM) exhibits admissible goodness of fit (Meyers et al., 2016). Thus, the structural equation model (SEM) in Figure 11 was acceptable due to the significance level (P-value<0.001).

Table 6
Fit indices for the proposed measurement model and their acceptable thresholds

Fit index	Acceptable threshold (Meyers et al., 2016)	SEM result	Results supporting model fit
RMSEA	<0.08	0.047	✓
Chi-Square /DIF	<3	2.19	✓
CFI	>0.9	0.914	✓
TLI	>0.9	0.907	✓

The coefficient of lines connecting rectangular to elliptical shapes indicates the factor loading of each variable identifier in measuring that variable, which is greater than 0.3. The values on the lines connecting the elliptical shapes represent the variables' net effect on one another. As illustrated in Figure 11 of the structural equation model, there is a significant and direct relationship between the variables; thus, it is possible to improve the physical environment and service quality of the nursing home by considering the individual characteristics of older adults and by enhancing the physical environment's characteristics.

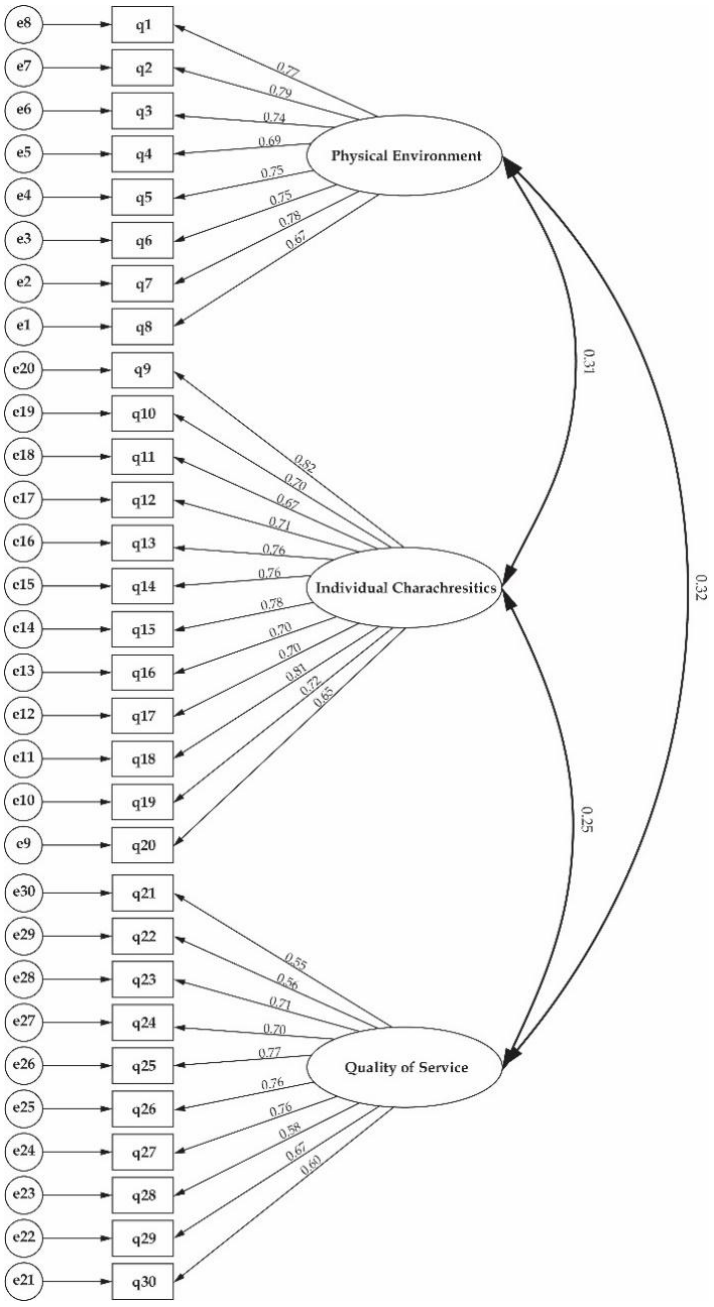

Fig. 11.An Experimental model of research in the mode of standardized path coefficients

5. Discussion

In the present work, the effective factors on elderlies' satisfaction and the relationship between these factors were indicated in the nursing home of Isfahan province. The results showed that the most important variable in increasing the elderlies' satisfaction from their nursing home is the environmental characteristics as the elderlies paid the most attention to the physical environment characteristics of the nursing home. The indoor environment is the most influential variable according to the recent studies about improving the mental health of people living in the elderlies' care centre (Phillips et al., 2010). Furthermore, Fernandez-Portero et al. concluded that the indoor characteristics of building have the strongest relationship with increased satisfaction level in elderlies (Fernández-Portero et al., 2017). Based on the results of a study titled "The role of physical-semantic components of residential public places in accommodating of the elderly", environmental comfort is one of the most important characteristics of the physical environment, but according to the findings of this study, accessibility in the environment is the most significant factor for nursing home residents(MansourHosseini and JavanForouzande, 2018). Additionally, colour varieties in the interior space of a building are very important especially the bedroom and lobby. In this regard, Weenig and Staats (2010) concluded that the components of interior design impress the mental health of people, among which, colours are one of the most important elements. Moreover, elderlies older than 65 have a better mood and temperament with white and cold colours combination (Weenig and Staats, 2010), as the female elderlies in this research often liked warm colours and male elderlies liked the cool colour space.

According to the results of this research, the undesired characteristics of the physical environment of the nursing home have a negative effect on residents 'satisfaction with the nursing home, for example, elderlies have no desire to spend their time in a dark environment without adequate light. They also feel uncomfortable hearing annoying noises and odours which are often associated with mental challenges and with Alzheimer's disease. Based on the studies, elderlies are sensitive to noises in a nursing home more than others (Xie et al., 2020). Furthermore, according to recent studies, light is an important element in reducing stress and improving the elderlies' mental health (Joseph et al., 2016, Weenig and Staats, 2010).

In this study, the importance of a green environment for elderlies to increase residents' satisfaction was proved. According to the elderly, a green environment is also one of the most important places to be alone or spend time with others. Researches showed that the outdoor green space increases the social interaction between people (Abass and Tucker, 2018, Biedenweg et al., 2017, Sugiyama et al., 2009). Meanwhile, the results of this research showed that people living in a nursing home generally tend to have easy access from the indoor to the outdoor green space. Biedenweg found that individual and social factors are involved in linking the two variables of easy access to space and improved mental health (Biedenweg et al., 2017). Since a green environment increases people's peace , it is important to change it to a desirable environment for social and physical activities (Hadavi, 2017). Guéguen and Stefan concluded that spending time in the green space increases people's sense of benevolence so that the presence of flowers has a positive effect on people talking to each other and their benevolent behaviour (Guéguen and Stefan, 2016).

Individual characteristics play an important role in people's satisfaction. Therefore, elderlies with longer residence time than others in the nursing home have a higher level of satisfaction based on the results of this research. Similarly, using modern means of communication and technology by elderlies has a positive effect on the degree of independence of male and female elderlies in the nursing home. On the other hand, the technology users are mostly male elders and highly educated people (Schlomann et al., 2020). The results of the Karimi et al. study indicate that the level of education of the elderly living in homes is related to their level of satisfaction with their place of residence, according to a study entitled "Comparing life satisfaction of elderly between nursing home residents and seniors living in their own homes in Isfahan"(Karimi et al., 2014). In the present study, literacy and illiteracy of the elderly were only measured according to the studied samples, indicating that the literate elderly was more independent than others, and the illiterate elderly did not want to be alone. Moreover, Karimi et al. show that aging and satisfaction are not related(Karimi et al., 2014), as confirmed in this study. However, Mollaoğlu et al. found that older people are less satisfied with their physical environment(Mollaoğlu et al., 2010). Furthermore, people with physical disabilities have a higher tendency to communicate with nurses and pay more attention to safety in walking. Thus, security is an important factor in people's sense of satisfaction (Lee et al., 2017). The effect of gender on elderly satisfaction was examined by Liu & Guo, who found that elderly women are more satisfied than elderly men(Liu and Guo, 2008); however, in Subasi & Hyran's study, gender did not significantly affect satisfaction(Subaşı and Hayran, 2005). According to this study, elderly women and men have different expectations of the environment, and the cultural component also strengthens this difference. Consequently, elderly men and women have different attitudes regarding how nursing homes should be designed, and in addition, elderly women are less likely to communicate with men they don't know. Regarding the difference between the characteristics of male and female elderlies, females have a higher level of satisfaction than males (Lee et al., 2020). McMullin et al. (2020) found that female elderlies have higher levels of self-esteem than males (McMullin and Cairney, 2004). However, there is no difference between the self-confidence of male and female.

Different residential experiences in elderlies put a specific effect on their expectations from the nursing home environment. Considering the results of this research, elderlies living in the private and independent home before entering the nursing home were more depressed than others, while they were indifference to personal belongings. Eijkelenboom et al. (2017) concluded that individual experiences have a vital role in Making sense of home in people. Therefore, people's bedrooms and their personal space are very important with access to public spaces. As a result, personal belongings play an important role in enhancing people's sense of home (Eijkelenboom et al., 2017).

In recent studies, the cultural characteristics of each society are effective on the needs of its people. This was indicated by a comparative study about the elderlies' expectations in Germany and the USA where people pay more attention to environmental access . However, the German elderlies attend more to the environmental variable of access to the green space. Therefore, it is better to study the effect of culture on the elderlies' expectations in two different societies (König et al., 2019). Alternatively, based on the results of this research, Iranian female elderlies ask for specific space for themselves without men's presence and focus on the existence of female green space.

6. Conclusion

As Iran's population grows, particularly in Isfahan, comprehensive planning is needed to improve the lives of the elderly. However, Isfahan has not conducted sufficient research on this subject. Moreover, previous research has not examined all of the variables affecting elderly residential satisfaction in care centers comprehensively. There has been little research on nursing homes, and only a partial examination of the factors affecting elderly satisfaction has been conducted. This study focuses on factors affecting the satisfaction of elderly residents in nursing homes. First, with the help of a rich background in this field, important components were extracted, but because the majority of these components are from English articles, this study did not stop at this part and considered in-depth interviews and observation of the elderly to extract the important components of satisfaction. According to the SEM model, three factors affecting resident satisfaction are interconnected: resident characteristics (gender, previous habitation status, education, length of residence, and health status), physical environment characteristics, and the quality of nursing home services. Placing a premium on all factors increases resident satisfaction.

The length of residence in nursing homes correlates with their satisfaction. Thus, elderly people who stay in nursing homes for more than a year become familiar with their environment and feel comfortable in it. Moreover, the personalization or non-personalization of the environment is related to the previous habitation status of the elderly. Also, gender played a role in the design of the nursing home, especially in selecting the color spectrum of the physical environment. Based on the results of this study, the second and third steps show that individual and environmental characteristics are correlated. The same result was also obtained in the SEM model with a correlation coefficient of 0.300. In addition, all elderly people with physical disabilities considered the availability of services and nurses' assistance important; Also, healthy elderly people did not only not like being controlled by nurses, but also thought that helping nurses were important. Thus, the structural equation model proved the relationship between service characteristics and individual characteristics with a correlation coefficient of 0.241. In addition, there is a relationship between quality of service and the physical environment proven in the SEM model with a correlation of Pearson 0.284. In this regard, the visual access of the elderly is high in the nursing home with open design; so, it causes a positive social relationship between the staff and the elderly. The green spaces improve social interactions between residents and motivate the elderly to help the nursing home staff. As a result, according to the qualitative results of interviews and observations and quantitative questionnaire, the results of SEM indicate integrated relationships between the physical environment, individual characteristics, and service variables. One of the important results of this article is that the satisfaction of the elderly living in elderly care centers is influenced by the different individual characteristics of the elderly; Therefore, the quality of service and the design of the nursing home should be based on the different individual characteristics of the elderly, and the influence of the culture component should be considered. These findings have practical implications for health care architects, and service providers of care centers, considering the identification of the main factor affecting residential satisfaction and their impact on each other.

Even though the impact of the older adults' individual characteristics on the research process was considered, there was no difference in the older adults' level of literacy. They were classified into two groups of literate and illiterate, despite the fact that the difference in their level of education could affect other variables and their level of satisfaction. Thus, it is critical to assess the effect of this case in future research. Additionally, data collection from several nursing homes was anticipated, but this was not possible due to the COVID-19 pandemic, and the nursing homes' management did not grant the necessary permissions to conduct the research. As a result of the effect of individual characteristics and diverse cultures, it is recommended that future research concentrate on the effect of these two categories on older adult satisfaction and consider the physical environment's various characteristics.

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