EVALUATING USER SATISFACTION IN STUDENT APARTMENTS BASED ON COMFORT CONDITIONS: BURSA / GORUKLE EXAMPLE

Filiz ŞENKAL SEZER
Uludag University Department of Architecture
filizss@gmail.com

Secil BALLI HEPTASKIN
secilheptaskin@gmail.com

Abstract: Without doubt one of the most important problems for students that start their university education in a city different than the city of their families is "residence". Many students that enroll in universities in Turkey prefer to live in state dormitories, private dormitories or student apartments. Apartments are places that continuously provide residences to students. The goal of this study is to determine the important apartment criteria for students and to provide suggestions that may provide solutions to ensure that these types of buildings provide the necessary performance conditions. It is also aimed to determine dissatisfaction based on user views and based on these views to create design criteria for buildings to be constructed. A hypothesis, which states that increasing structural comfort conditions in apartments will increase the productivity of students, is also put forward. In the scope of this study a survey was made in four student apartments located in the Gorukle District, which is near the exit of the Uludag University Gorukle Campus in Bursa, the 4th largest city in Turkey. The stages of this study are literature research on the subject of this analysis, evaluation of information on indoor comfort conditions, determining comfort conditions and preparing a survey to receive feedback on the experience of users in the designed environment, and evaluating the survey results to understand users' current satisfaction levels and comfort needs. Based on these data, transportation and security, ergonomics, thermal comfort, audial comfort, natural and artificial lighting, indoor air quality were used as evaluation criteria as a means to ensure optimum comfort conditions are met in buildings.
Keywords: Comfort conditions, student apartments, thermal comfort, audial comfort

Introduction

Quality of life is considered as a person's view towards his/her own life, and is used synonymously with terms such as satisfaction from life, well-being, living conditions, and happiness (Cella, 1996). According to World Health Organization, physical functions of people, their psychological status, social relations in and outside the families, their interaction with the environment and their beliefs are also in the scope of the quality of life. Satisfaction from life is an indicator of general well-being and quality of life and includes the decision of a person regarding his/her quality of life and well-being based on the qualities that person has selected (Sahin, 1997). Satisfaction from life in general involves the whole life and various dimensions of life of a person and is influenced from many factors such as age, gender, health, professional life, economic status, educational level, religion, marriage, social support and environmental conditions (Matheny & Curlette & Aysan, & Harrington, 2002).Satisfaction from life is important for university students similar to all age groups. In Turkey most of the students enroll to a university in a city different than the city they used to live with their families. In general, the first and one of the most important problems in university life experienced by students is related to accommodation (Ersoy & Arpacı 2003).

 Accommodation is one of the most important necessities for providing and sustaining the feeling of security. In Turkey accommodation, in addition to student dormitories within universities or private dormitories, is provided via student apartments that are close to campuses. When the needs and arrangements of these buildings are considered it can be seen that privacy conditions should be considered with a higher priority. When these buildings fail to adequately provide the needs of students, student apartment turn to become places where students only go for sleeping. The inability to fully satisfy the individual and social needs of students reduces students' satisfaction levels and reduces their quality of life. This also reduces students' motivation for success. Institutions of higher education are places where knowledge is generated and shared. The ability to carry out high quality research and provision of a comprehensive education does not only rely on the academic environment but also the environment created by the physical and social surroundings. When it is evaluated from such a viewpoint, the environment of the accommodation facilities for higher education students that enable

necessary climatic, acoustic and visual comfort conditions for studying and that provide the infrastructure for social interaction will support the creation of a higher quality education environment.

In this regard, student apartments inside the Gorukle district of the city of Bursa (Turkey), which is where Bursa Uludag University Gorukle Campus is located, were selected as the study field. The research method is composed of the following stages:

- Carrying out research on literature related to the subject area to be analyzed and review of relevant information and knowledge related to indoor comfort requirements,
- Determining comfort conditions and preparing a survey to receive feedback from user experience in the designed environment,
- Evaluation of the survey results to understand comfort needs and the current level of satisfaction of users.

The evaluation criteria were examined under the following headings to ensure that the buildings met the optimum comfort conditions: ● Transportation and safety ● Ergonomics ● Thermal comfort ● Auditory comfort ● Natural and artificial lighting ● Indoor air quality

Determining the level of actual user satisfaction is a widely used method to increase the efficiency of current building and to provide directions for future building designs. Accordingly, the reference "Post-Occupancy Indoor Environmental Quality Evaluation of Student Housing Facilities" states the benefits of Post Occupancy Evaluation (POE) as follows;

- To rapidly understand problems and solutions in buildings,
- To increase feedback related to building performance and space usage,
- Creating important cost savings during construction and building lifecycle
- Creating long term improvements in building performance
- Creating a knowledge resource for improving databases, standards and criteria (Hassanain, M. A. 2007).

In order to evaluate the experiences of users related to their living space usage, a "user satisfaction survey" was prepared and the results were analyzed.

Field Study

The area selected for the field study is Gorukle district, which is 18 kilometers from Bursa city center, the 4th largest city in Turkey, and near the Uludag University Gorukle Campus (Image 1). Students in the campus can reach this district on foot and they are also able to use private cars, public and private busses. Student apartments in average have rooms that can accommodate 1, 2, 3, and 4 persons, are usually furnished and have kitchen and bathrooms. There are also apartments that have services such as laundry, private security, breakfast, dinner, social areas, cafés etc. Apartments are usually close to the university campus.
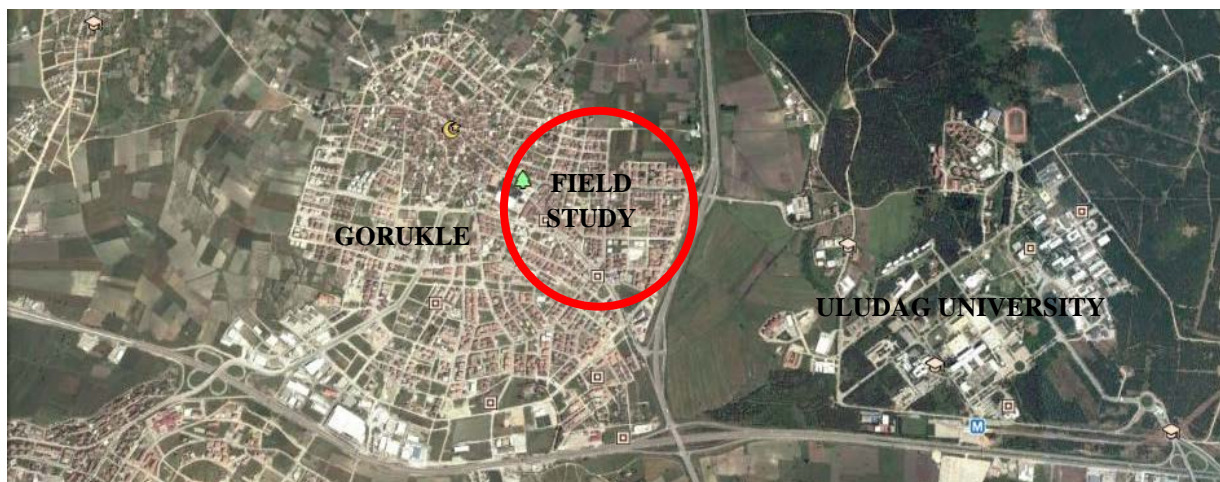

Image 1. Uludag University Campus and Gorukle (Google Earth, 2017)

The apartments selected for this study are defined below.

Apartment A: This apartment was completed and has a total of 62 beds. The building is 1 block and has a ground floor and 4 storeys. There are 3 apartments in the ground floor and 8 apartments each in upper floors, which makes a total of 35 apartments. All the apartments have one living room and one bedroom. A section of the ground floor is allocated to commercial units, kitchen for personnel and a pressing room (Image 2).

Image 2. Apartment A, view from inside and outside

Apartment B: This 1 block building was constructed in 2006 and has a ground floor and 3 storeys. There are a total of 30 apartments in the building. 12 of those apartments face the front façade, 12 face the rear façade and 6 face the side façade. All the apartments have one living room and one bedroom and the total bed count is 50. There is a kitchen for personnel and a pressing room (Image 3).
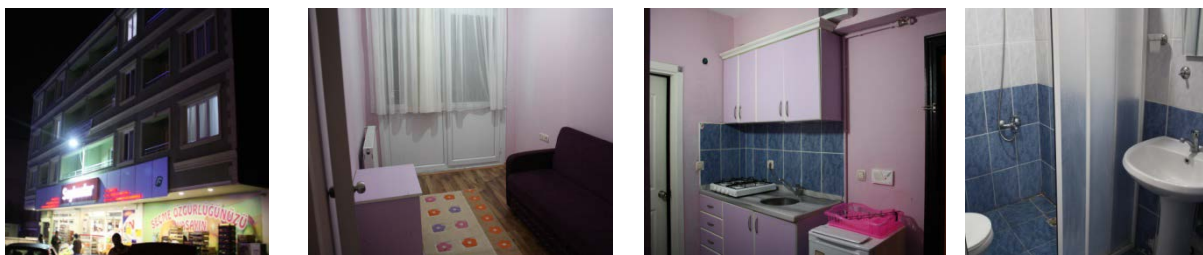
Image 3. Apartment B, view from inside and outside

Apartment C: This 3 block building was constructed in 2007 and has a ground floor and 4 storeys. The apartments are situated around a corridor which is illuminated with an atrium. The building blocks have a total of 149 apartments. 103 of those apartments have one living room and a bedroom and 46 of them have two living rooms and a bedroom (Image 4).

Image 4. Apartment C, view from inside and outside

Apartment D: These buildings were constructed in 1998. There are four blocks, two for females and two for males. All blocks have a ground floor and 4 storeys. There are a total of 108 apartments. 21 of them have a bedroom and two rooms and 87 of them have one bedroom and one room. There are a total of 129 beds in these apartments (Image 5).

Image 5. *Apartment D, view from inside and outside*

The survey was conducted in October 2016 in daytime between 12.00 and 16.00. Within the literature analysis first key concepts to measure physical environment quality were defined and then 17 questions were asked to the building inhabitants. The closed ended questions were evaluated with a three point Likert Scale. The survey was carried out with a total of 120 students (30 students in each building) and were presented proportionally (%) to ensure they could be understood and evaluated easily.

Research Findings

Table 1 shows the demographics of inhabitants of each building that participated to the survey. The demographic findings based on the survey shows that 66% of the participating students were female and 34% of the participants were male. It was seen that %55 of the participants of the survey were aged 21-25, 24% were 18-20, 21% were 25 and over. 88% of the participants of the survey were students and 12% were employees.

Table 1. Demographics

Demographics (%)		Apartment A	Apartment B	Apartment C	Apartment D
Gender	Female	100	67	42	53
	Male	0	33	58	47
Age	18-20	5	33	24	35
	21-25	57	40	62	61
	25 and over	38	27	14	4
Status	Student	100	71	82	100
	Employee	0	29	18	0

67% of the apartments are 1+1, 31% are 2+1 and 2% are 3+1. 51% of the inhabitants live alone in the apartments, whereas 34% have 2, 11% have 3 and 4% have 4 inhabitants. Specifications of the apartments where the survey was conducted are given in Table 2.

Table 2. Specifications of apartment where surveys were conducted

Features of the Apartment (%)		Apartment A	Apartment B	Apartment C	Apartment D
Apartment type	1+1	100	79	26	62
	2+1	0	21	74	28
	3+1	0	0	0	10
Number of inhabitants in the apartment	1 person	100	41	39	24
	2 people	0	45	53	39
	3 people	0	14	8	23
	4 people	0	0	0	14

In the survey, access to the building and safety concepts were taken into consideration as "Accessibility" criteria (Figure 1). Storey height inside the apartments and the size of windows are considered as "Ergonomics" criteria (Figure 2).
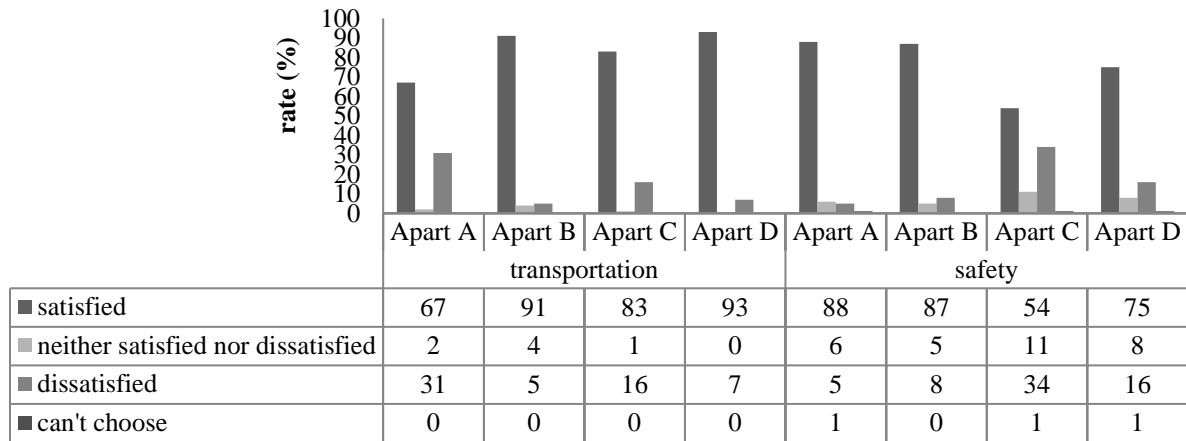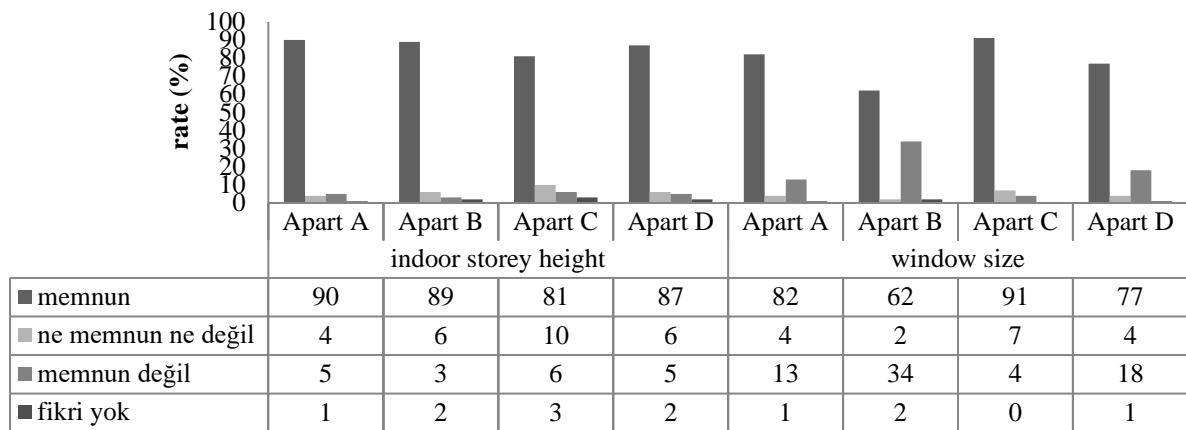
Figure 1. User opinions related to accessibility

	Apart A	Apart B	Apart C	Apart D	Apart A	Apart B	Apart C	Apart D
	transportation				safety			
■ satisfied	67	91	83	93	88	87	54	75
■ neither satisfied nor dissatisfied	2	4	1	0	6	5	11	8
■ dissatisfied	31	5	16	7	5	8	34	16
■ can't choose	0	0	0	0	1	0	1	1

Figure 2. User opinions related to size

	Apart A	Apart B	Apart C	Apart D	Apart A	Apart B	Apart C	Apart D
	indoor storey height				window size			
■ memnun	90	89	81	87	82	62	91	77
■ ne memnun ne değil	4	6	10	6	4	2	7	4
■ memnun değil	5	3	6	5	13	34	4	18
■ fikri yok	1	2	3	2	1	2	0	1

For the physical environmental control and "Thermal Comfort" aspects, opinions were gathered related to indoor temperature both in winter and summer (Figure 3). Thermal comfort is defined by The American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) Standard 55 as satisfaction from the thermal conditions. Optimum thermal environments are defined as environments in which 80% or more of their users agree that the environment is acceptable.

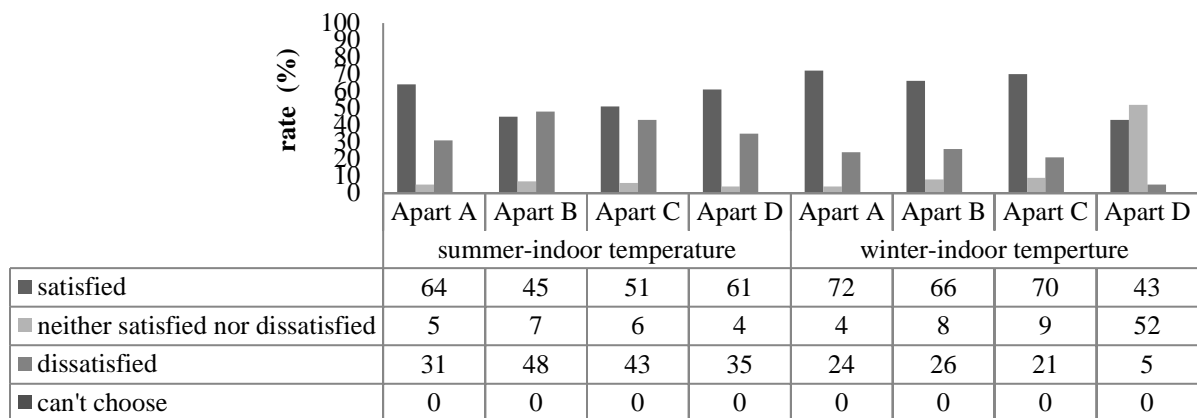|	Apart A	Apart B	Apart C	Apart D	Apart A	Apart B	Apart C	Apart D
	summer-indoor temperature				winter-indoor temperture			
■ satisfied	64	45	51	61	72	66	70	43
■ neither satisfied nor dissatisfied	5	7	6	4	4	8	9	52
■ dissatisfied	31	48	43	35	24	26	21	5
■ can't choose	0	0	0	0	0	0	0	0

Figure 3. User opinions related to thermal comfort

In the study sound transfer between rooms and storeys and noise coming from outside were taken into consideration as "Acoustic Comfort" (Figure 4). Navai and Veitch define acoustic comfort as «a state of contentment with acoustic conditions». Acoustic comfort does not only involve "creating a good acoustic environment" but also defining all factors that "prevent acoustic comfort".
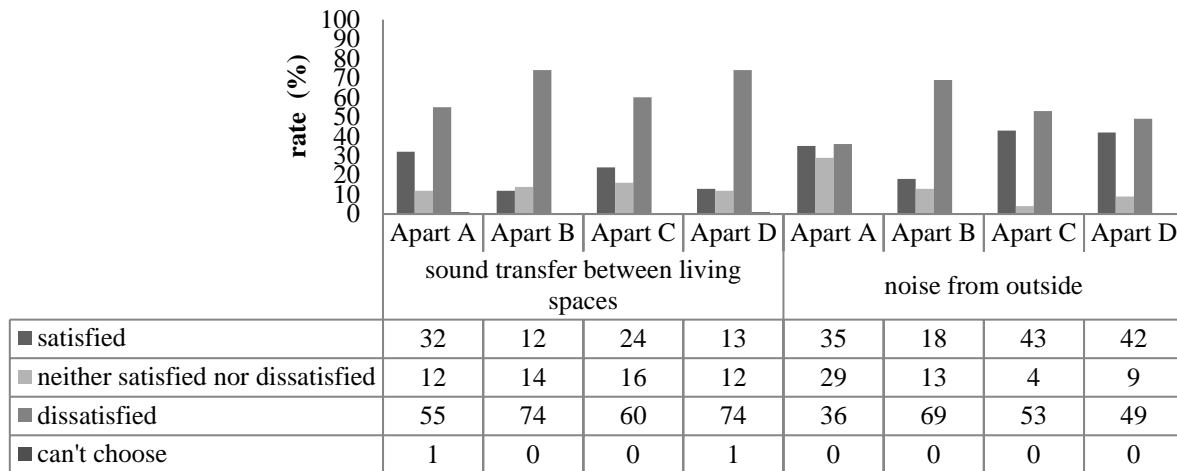
	sound transfer between living spaces				noise from outside			
	Apart A	Apart B	Apart C	Apart D	Apart A	Apart B	Apart C	Apart D
■ satisfied	32	12	24	13	35	18	43	42
■ neither satisfied nor dissatisfied	12	14	16	12	29	13	4	9
■ dissatisfied	55	74	60	74	36	69	53	49
■ can't choose	1	0	0	1	0	0	0	0

Figure 4. User opinions related to acoustic comfort

As the criteria for "Visual Comfort" the adequacy of natural light and the condition of artificial lighting were examined (Figure 5). Visual comfort is defined as a "subjective condition stimulated by the visual surroundings". This definition takes into consideration the psychologic dimension of comfort and includes physical features that effect visual comfort. Visual comfort parameters are amount of natural light, distribution of brightness, amount of glare, color of light, amount of flickering light and the level of luminousness. Visual comfort quality is defined as the quality and quantity of the light source and how it brightens its close surroundings.
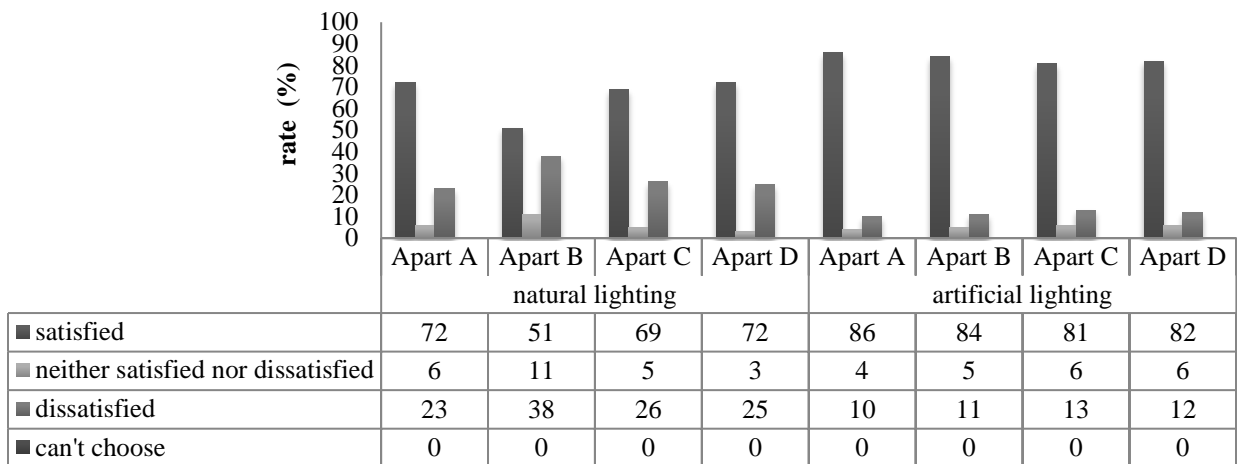
	natural lighting				artificial lighting			
	Apart A	Apart B	Apart C	Apart D	Apart A	Apart B	Apart C	Apart D
■ satisfied	72	51	69	72	86	84	81	82
■ neither satisfied nor dissatisfied	6	11	5	3	4	5	6	6
■ dissatisfied	23	38	26	25	10	11	13	12
■ can't choose	0	0	0	0	0	0	0	0

Figure 5. User opinions related to visual comfort

Related to "Indoor Air Quality", the conditions of natural ventilation, satisfaction from indoor air quality were taken into consideration (Figure 6). Indoor air quality is defined based on the dissatisfaction (odor, sensual discomfort) of inhabitants. According to ASHRAE Standard 1999-62 indoor air quality is achieved when there are no harmful air pollutant concentrations and most of the users (80%) feel satisfied from an environment.
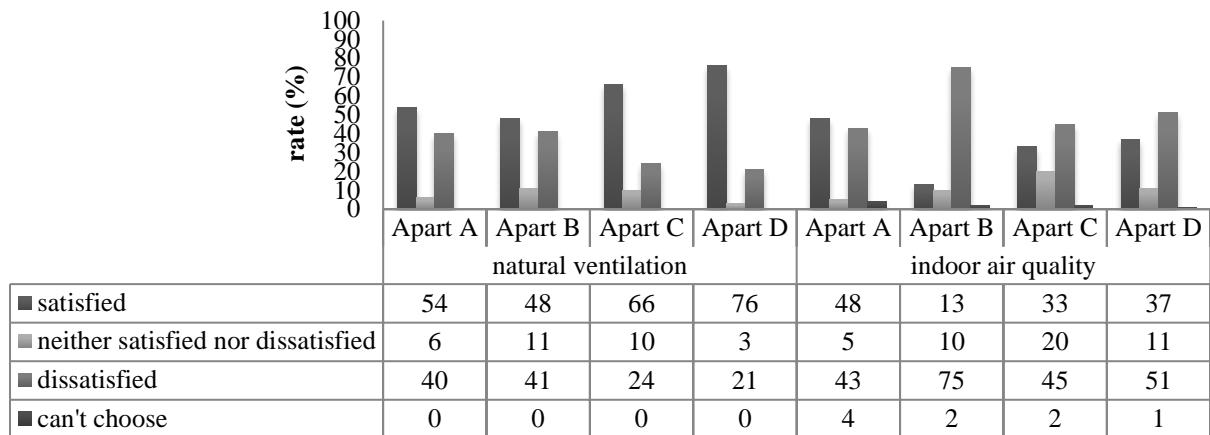
	Apart A	Apart B	Apart C	Apart D	Apart A	Apart B	Apart C	Apart D
		natural ventilation				indoor air quality		
■ satisfied	54	48	66	76	48	13	33	37
■ neither satisfied nor dissatisfied	6	11	10	3	5	10	20	11
■ dissatisfied	40	41	24	21	43	75	45	51
■ can't choose	0	0	0	0	4	2	2	1

Figure 6. User opinions related to indoor air quality

Results

In the scope of the study, it is very important to define the issues that users are dissatisfied to establish design criteria for future buildings and to establish main goals for future designs. In this regard, the results of the study are summarized in the table below (Table 3).

Table 3. Comparative satisfaction levels of users

Satisfaction Criteria		Apartment A		Apartment B		Apartment C		Apartment D	
		Satisfied	Not Satisfied	Satisfied	Not Satisfied	Satisfied	Not Satisfied	Satisfied	Not Satisfied
Accessibility	Transportation	36		86		67		86	
	Safety	83		79		20		59	
Ergonomics	Indoor storey height	85		86		75		82	
	Windows size	69		28		87		59	
Thermal comfort	Summer-indoor temperature	33			-3	8		26	
	Winter-indoor temperature	48		40		49		38	
Acoustic comfort	Sound transfer between living spaces		-23		-62		-36		-61
	Noise from outside		-1		-51		-10		-7
Visual comfort	Natural lighting	49		13		43		47	
	Artificial lighting	76		73		68		70	
Indoor air quality	Natural ventilation	14		7		42		55	
	Indoor air quality	5			-62		-12		-14

● **Accessibility:** In the accessibility indicator related to the apartment that the users inhabited only 15% and 16% have indicated dissatisfaction with transportation and safety respectively. In general, it has been understood that inhabitants were very content with transportation and safety.

● **Ergonomics:** the performance criterion in this category was whether stores height and window size were sufficient. 5% of the users expressed discontent with inadequate storey height and 17% of the users expressed that they did not believe window sizes were ergonomic. In general, the satisfaction levels of this category were very high.

● **Thermal comfort:** Users participated in the survey expresses discontent with the indoor air temperature during summers (39%) and during winters (19%). In general users were satisfied with thermal conditions.

● **Acoustic comfort:** 66% of the users indicated dissatisfaction because of the high level of sound transfer between living spaces and 52% of the users indicated that they felt discontent because of outside noise reaching inside. These views indicate that users were dissatisfied from the acoustic comfort aspect.

● **Visual comfort:** In the survey, which has taken adequacy of daylight and comfortable usage of artificial lighting inside the apartments as a performance criterion, only 28% of the users indicated that they found natural lighting insufficient and 12% of the users indicated that they found artificial lighting insufficient. In general users were satisfied with visual comfort conditions.

● **Indoor air quality:** the performance criterion under this category was related to the conditions of natural ventilation and indoor air quality. Only 32% of the users indicated that natural ventilation was inadequate; the dissatisfaction from indoor air quality was 54%. Even though there wasn't dissatisfaction with natural ventilation, the users were dissatisfied with the indoor air quality.

When the students were asked to present general positive features of the apartment, they answered with "a good design example", "meets climatic, visual and acoustic comfort conditions". "I like its location in the city", and "transportation is easy". When negative aspects were asked, the participants provided the following answers "I believe the structural quality is subpar", "I believe relations with neighbors are inadequate", "I believe there are many shortcomings of the architectural design", "I am dissatisfied with the noise", "I cannot heat the building enough", "I gets very hot in summers", and "I feel the living space in the apartment is inadequate".

When open ended questions on which architectural changes were needed to create optimum comfort conditions were asked the following answers were provided: heat insulation should be installed for thermal comfort; special joineries should be used in window and door frames and cases that provide sound insulation; providing high quality artificial lighting and lighting systems that do not strain eyes when students work at their desks; installing sunshades at the south façade of the building both for thermal and visual comfort; and installing air conditioning systems to provide optimum air quality.

When the students were asked to comment on the apartments from a social viewpoint they indicated that the amount of space per person in the sports hall, mess hall, guest house and social areas, and landscaping were inadequate. Also, the students were discontent with circulation areas and the lack of fire escape. However, being close to other friends was expressed as a positive aspect.

The data collected in this study will provide new dimensions to future buildings to be designed and will help those who will make architectural adjustments to current buildings.

References

ASHRAE, Standard 55 (2013). Thermal Environmental Conditions for Human Occupancy

ASHRAE, Standard 62-1999 (2000). Ventilation for Acceptable Indoor Air Quality

Cella, D. F. (1996). Quality of life: concepts and definition. Journal of Pain-Symptom Management, 9(3): 186 - 192, file:///C:/Users/user/ AppData/Local/Microsoft/ Windows/INet Cache/IE/9S5WTO65/543.pdf

Ersoy, A. F., Arpacı, F. (2003). Universite Öğrencilerinin Konut Kosullarının ve Konutta Yasamayı Tercih Etme Nedenlerinin İncelenmesi, Milli Eğitim Dergisi, 158.

Hassanain, M. A. (2007). Post-Occupancy Indoor Environmental Quality Evaluation of Student Housing Facilities. Architectural Engineering And Design Management. 3, 249–256.

Matheny, K. B., Curlette W. L., Aysan, F., Harrington, A. (2002). Coping resources, perceived stres and life satisfaction among Turkish and American university students. Int J Stress Management 9: 81-97.

Navai, M, Veitch, J. A. (2003). Acoustic satisfaction in open-plan offices: review and recommendations. Research Report RR-151. Ottawa, Canada: Institute for Research in Construction. National Research Council Canada.

Sahin, H. (1997). Eski Bir Kavram Yeni Bir Ölçüt: Yaşam Kalitesi. Toplum ve Hekim;12: 40-6.