Requirements and opinions of three groups of people (aged under 35, between 35 and 50, and over 50 years) to create a living space suitable for different life situations

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ABSTRACT

The role of this study was to determine which changes people think they need to make in their home in response to getting older. At an advanced age, the likelihood of different limitations, such as vision impairment, hearing impairment, or physical inability, are increased. At present, when faced with such limitations, tenants are often forced to leave their long-term living spaces, as these spaces cannot serve their "new" individual needs. This transition from the privacy of their home to a new environment is often a painful change. They must leave a well-known environment, as their homes cannot be adapted to their new needs. The aim of this paper is to develop a comprehensive approach for the design of an exterior and interior space which can serve people through all stages of life, particularly in terms of mobility. This means that, even if an unexpected situation incurs changes in an individual's movement abilities or physiological limitations not only by natural aging, but also according to accidents or disabilities their living space can be adapted to the given conditions. The results of a survey conducted in Germany and Slovakia are presented. In the survey, respondents expressed their opinion on what they considered important in creating an adaptive environment, considering various life changes. The results of the survey are statistically processed and analyzed by the ANOVA method, a form of statistical hypothesis testing. The results are processed graphically and presented in tables, along with explanations. The results could be of an interest to the architects and designers of such environments. Based on the results of the survey, studies of possible modifications of flats and houses are developed. These results are analyzed in terms of three age groups: people aged below 35, those aged 35–50, and those aged over 50. People under 35 are considered to be quite young, with different views on life and on the environment. Their priorities typically differ from those of people around 50. People aged 50 more; have been under medical treatment for a consistent amount of time. This group of people is still active; however, they experience different design requirements for their potential home.

1. Introduction

According to U.N. statistics, around 7 billion people inhabit the Earth at present, and the average age of the population is steadily rising. Fig. 1 shows the evolution of the population over the age of 65 in three parts of the world: developed/industrialized countries, developing countries, and the poorest countries in the world. The graph illustrates the situation over the course of a hundred years, from 1950 to 2050, with projected figures into the future. It is clear from Fig. 1, which the proportion of older people population is constantly increasing.

Additionally, the average age changes as people live longer. In 1950, the average age globally was 23.6 years; in 2050, it has been estimated to be 36.2 years (Brown et al., 2014). An example of the evolution of the average age of the population in all parts of the world is shown in Fig. 2.

This changing structure in Europe poses special problems for designers and house builders. A new interior/housing design approach must be designed and implemented to suit the future needs of people in all stages of life, as well as enabling residents to remain self-sufficient in their "house" for as long as possible (Birg, 1996). At the earliest stages of the proposal, the typical requirements for each phase of a citizen's
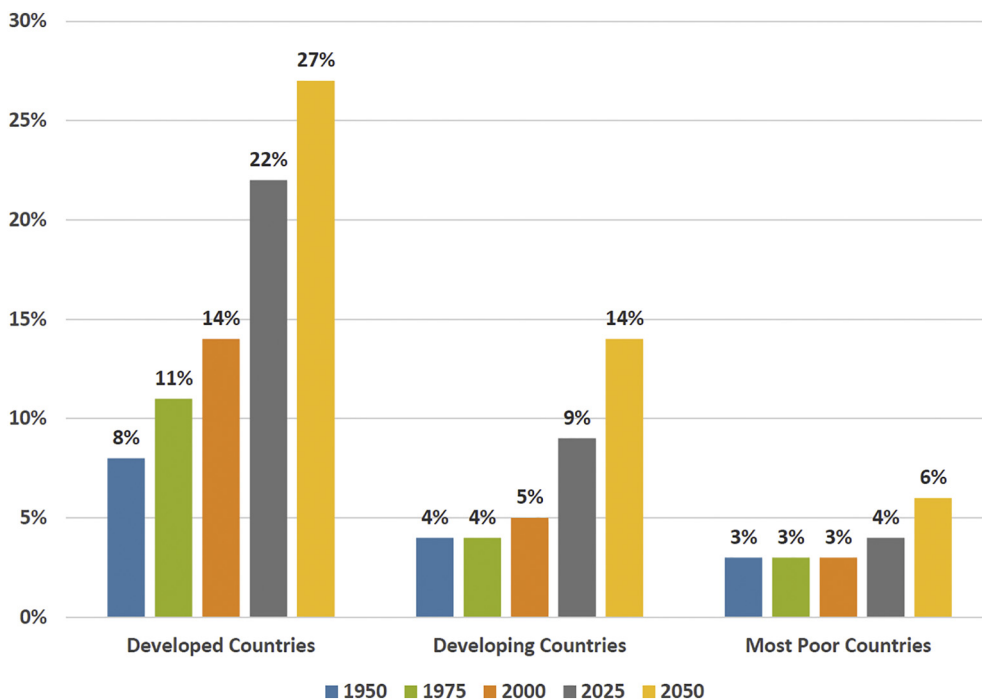
Fig. 1. Growth of the population over 65 years of age in the world between 1950 and 2050.
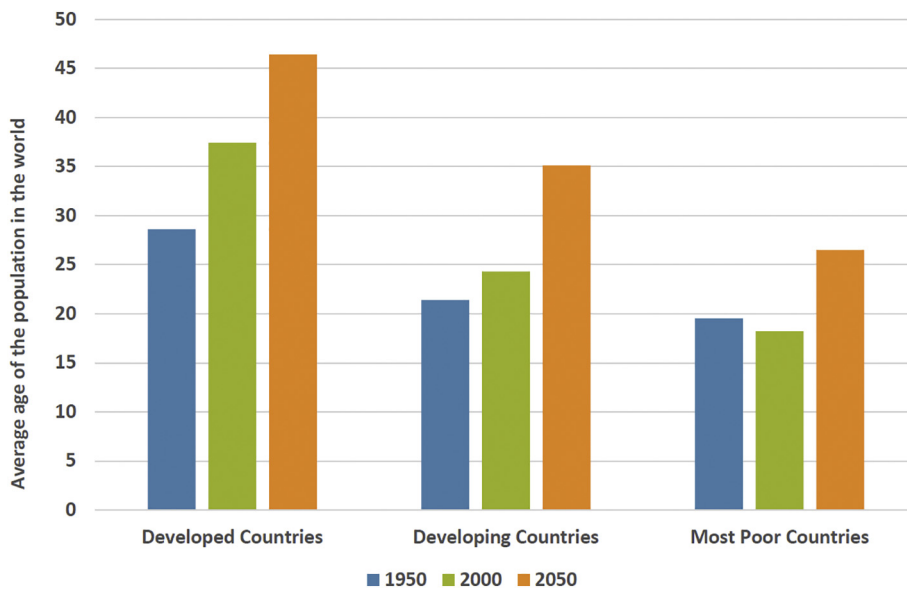

Fig. 2. Average age of the population in the world.

future life must be considered. This is especially true for people with special needs, such as those with visual or hearing disorders (Bridges and Bridges, 2019). Spaces for different phases of life have been considered by many authors. Special requirements and rules based on considerations under the various regulations - in particular, the Stockholm Declaration of the European Institute for Design and Disability (EIDD) (Stockholm EIDD Declaration, 2004) must be taken into account when considering the design of such spaces.

The demographic trends have changed the social structure in Europe, in particular changing the medium- and long-term requirements for residential development (Katunský and Lopušniak, 2006). For designers and homeowners, it is ideal to initially design with these needs in mind, in order to avoid vacancies and to create customized living spaces which will allow residents to stay independent for as long

as possible in their own home (Chen-Xiao, 2007). Therefore, it is necessary to use the rules for a barrier-free living environment (Ngowi, 2001; Pernišová, 2016) in the design proposal.

In the construction industry, it is necessary to adapt and create new building systems and construction methods (Baghchesaraei and Baghchesaraei, 2015) with consideration of the physical accessibility of the buildings (Ondra et al., 2016).

The concept of environmentally sustainable design, green architecture, low-energy design of buildings must also be observed in the design, including in the architecture of barrier-free houses (Bielek and Bielek, 2010; Bielek et al., 2013). The latest results of research into the design of barrier-free building environments have been presented by (Wang and Deng, 2018). Various case studies have been published on living and environmental costs for seniors and people with disabilities
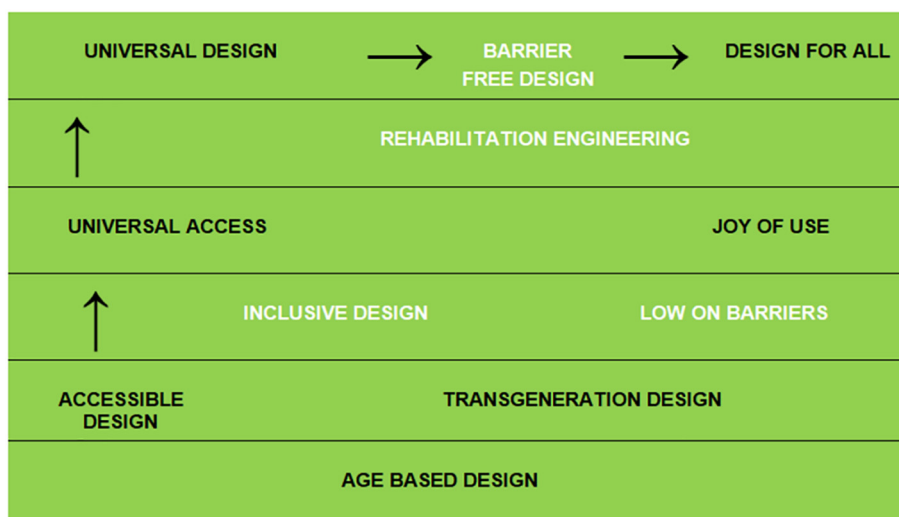
Fig. 3. Tree of definitions used (source: authors).

(Lewandowska et al., 2017). Problems with special kitchen requirements for "ambient assisted living" have been published by (Blasco and Marco, 2014). Considerations about the importance of housing, as presented in "Live well and die well" (Clark and Whitelaw, 2017), are very interesting. Some contributions have pointed to the use of e-services for the elderly and the disabled in interior spaces (Galajdova et al., 2009) or for the needs of transport in exterior spaces (Zhou et al., 2012).

The basic definitions that lead to a barrier-free environment and an environment for all are given in Fig. 3. Universal design proposals for solving any barrier-free environment have been described by (Herwig, 2008). Furthermore, Kose dealt with universal design on an international scale (Kose, 1998). A summary of (Georgieff's, 2008) "ambient assisted living" is also available in the digital library (Li, et al. 2011). Suggestions for universal design in Scandinavia have been described by (Bendixen and Benktzon, 2015) in Applied Ergonomics. The benefit of such a proposal (Alonso 2002) is the re-invention of existing real estate into social housing for older people (Van Hoof and Boerenfijn, 2018). The application and creation of furniture for a barrier-free environment for the elderly have been presented by (Zhang and Cheng, 2007).

The present situation has been presented in a case study in Taiwan (Chen et al., 2016). Other literary sources have addressed the advantages, disadvantages, and "discrimination" of a universal design of a barrier-free environment (Ke, 2009). An indoor environment for people with disabilities has been presented, in an interior study for Rio Grande, by (Janner et al., 2018). The impact of a personalized active labor market program for people with disabilities has been described by (Adamecz-Völgyi et al., 2018). A variety of information has been recently distributed to help people with disabilities to improve their living situation; (Barrusio, 2018) has published studies in Sensors and Applied Sciences about these issues. Authors (Kbar et al., 2016) and (Gilart-Iglesias et al., 2015) dealt with similar problems. The advantages and feasibility of a modular home design for all phases of life have been discussed by (Brausch et al., 2018); he has also published partial results in journals (Brausch and Katunský, 2015; Brausch et al., 2019). Finally, suggestions for the local rental of housing for seniors to improve their quality of life and selected aspects of integrated environmental management have been addressed by (Kuboshima et al., 2018 and Posivakova et al., 2018). The research in this field is also by (Gou et al., 2018).

Similar problems, which consider changes in the exterior or indoor of residential houses and use questionnaire survey, are found in the literature (Qin et al., 2013; Yen et al., 2014). In recent years they are the authors (Shaikh et al., 2019); (Shinina and Mitina, 2019);

(Magdziak, 2019); (Hu et al., 2019) and others. Tao Y et al. conducted a field survey at nine homes in Hong Kong to measure the quality of interior space to meet the needs of older people. This survey - study provided recommendations for the regulation of the external and internal environment to improve the living conditions of older people in urban areas with high population density (Tao et al., 2020).

2. Aim and methods of research

The aim of this paper is to develop a comprehensive approach for the design of an interior/exterior space which is capable of serving people through all stages of life, particularly in terms of mobility (Li et al. 2011), (Katunský and Brausch, 2018), (Barriuso et al., 2018a). This means that, even if there is an unexpected situation and changes in movement abilities and physiological limitations of an individual occur - not only by natural aging, but also according to accidents or disabilities - the living space can be adapted (Alonso, 2002, Barriuso et al., 2018b), (Pošiváková et al., 2018). To this end, the results of a survey conducted in Germany and Slovakia are presented.

In the survey, respondents expressed their opinions on what they considered to be important in creating an environment which is adaptive to various life changes. The results could be of interest to the architects and designers of such environments. These results are analyzed in terms of three age groups: people aged below 35, 35–50, and over 50.

2.1. Methods of research

As a method of research in this area, a questionnaire survey was conducted in two European countries: Germany and Slovakia. The questionnaires were distributed by all authors; in most cases, in university environments where the age demographic consisted of students and young scientists up to 35 years of age. Another group ranged between the ages of 35 and 50, and the last group consisted of individuals aged over 50 years. For this purpose, particular questions were also selected, where the respondent chose whether the subject matter was important to them, less important, and so on. Alternatively, one of the possible response variants could be chosen.

Given the fact that the respondents were mostly found at universities, most of the questionnaires were conducted by people under the age of 35; about half of them. The smaller group was aged 35–50, and about a third of the participants were over 50. As mentioned above, in the field research, questionnaires were distributed to people of different ages, both in Germany and Slovakia. In Slovakia, 60 questionnaires were evaluated, with 60 in Germany as well. In total, there
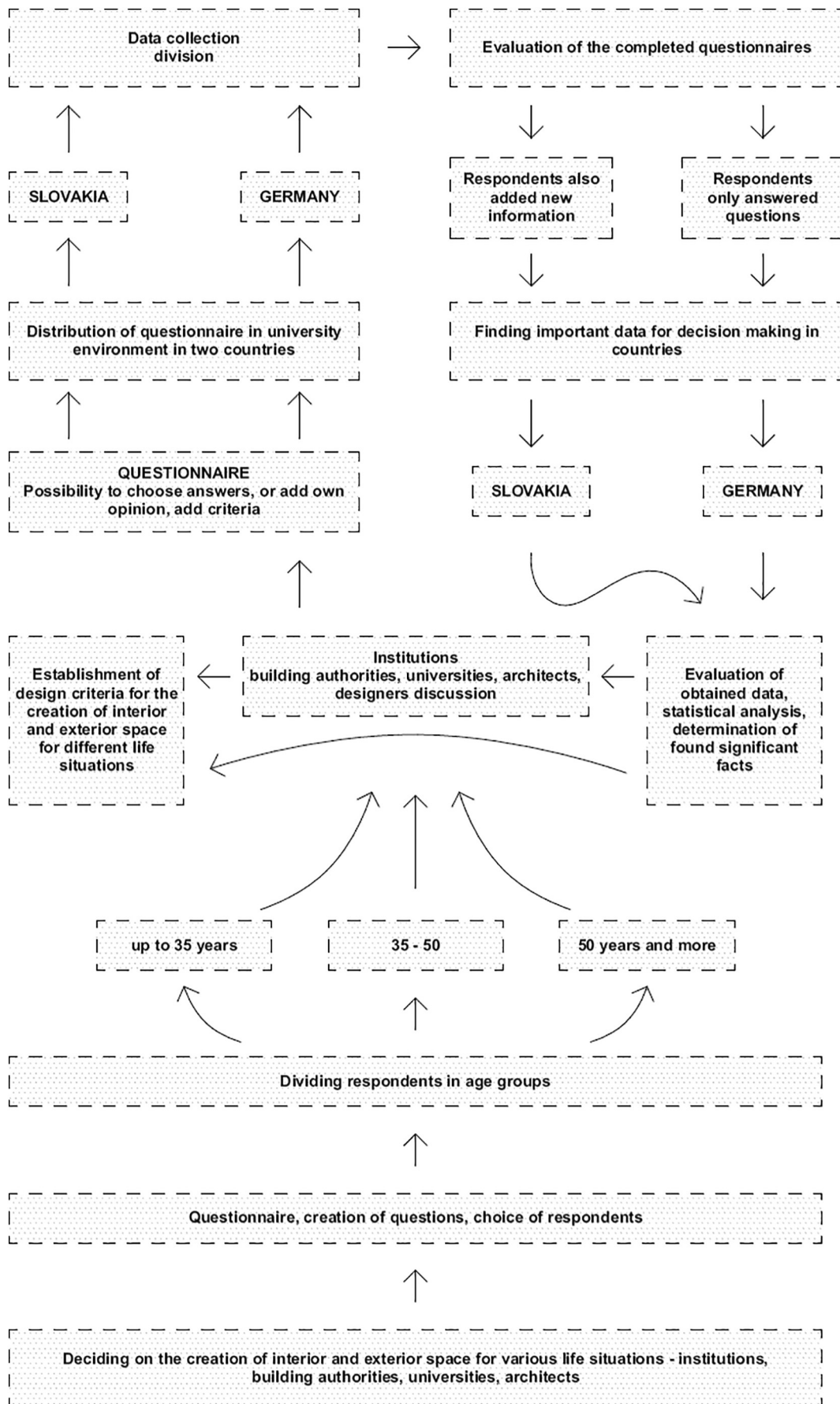
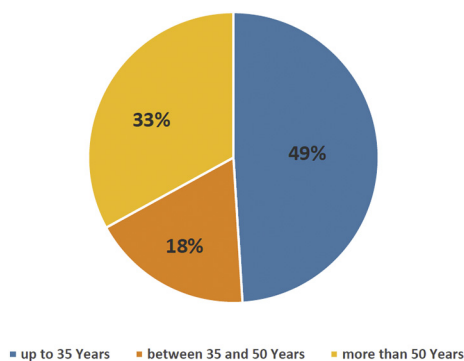**Fig. 4.** Methodology of research (source: authors).

Fig. 5. Classification of age groups of the participants of the questionnaire, given in percentage.

were 120 respondents to the questionnaire. The results of the questionnaires were processed by the ANOVA statistical method. The basic methodology can be illustrated in the diagram shown in Fig. 4. Here you can see how the questionnaire was compiled. It was attended by employees of building authorities, universities, architects, designers and ordinary users of flats or houses. The results were statistically evaluated. Classification of age groups of the participants of the questionare, given in percentage is presented (See Fig. 5.)

2.2. Statistical data processing

The *t*-test tells us whether the variation between two groups is "significant". ANOVA ("ANalysis Of VAriance") collects all the data into one number (F) and gives us one value (p) for the null hypothesis; this means it is an analysis of variance between more groups. Thus, we suppose, if the method ANOVA is used, the null hypothesis is that there was not a "real" difference, in terms of answers, between the groups (i.e., sorted by age) of respondents. If our hypothesis about differences between answers mentioned above is wrong, we must reject the null hypothesis. This means that we must consider the alternative hypothesis: that there was a "real" difference between the answers given by the different groups of respondents. Then, the standard deviation of the estimated means is given as

$$d = \frac{\sigma}{N^{\frac{1}{2}}}, \tag{1}$$

where.*d* is the deviation,σ is the standard deviation of the answers of all respondents, and.*N* is the number of respondents in a group.

Thus, if we treat the collection of the three group means as data and find that the standard deviation of those means is "significantly" larger than the above, we have evidence that the null hypothesis is not correct. This indicates that the average answer of some (or several) group (s) was "unusually" different.

The comparison between the actual variation of the group averages and that expected from the above formula is expressed in terms of the *F* ratio:

$$F = \frac{\text{(found variation of the group averages)}}{\text{(expected } variation \text{ of the group averages)}}. \tag{2}$$

Thus, if the null hypothesis is correct, we expect the *F* value to be about 1, whereas a "large" *F* value indicates a difference, where the *p-value* reports the significance level (e.g., 0,05), which shows how big should F be before we reject the null hypothesis.

It is not possible to precisely specify the statistical analysis, nor is it within the scope of this research. The questions were so specified that not all options were pre-established and many responses were based on subjective feelings and opinions. There were several dozen situations possible in one answer.

The survey provided an overview of the information and needs of

Table 1
Basic questions of questionnaire.

1 Which age group do you belong to?
2 From your current perspective, would the possibility of a modifiable floor plan represent added value?
3 How important is it for you to be able to stay in your current living quarters in spite of changing living situations?
4 Which changes in living circumstances can you think of that require an adaptation of your individual living space?
5 Which changing living circumstances could you foresee in the future requiring an adaptation of your living quarters?
6 Do your current living quarters allow a variable reconfiguration of the rooms?
7 In how far are you willing to pay a higher rent for an adaptable/barrier-free living space? How many percentage points can the costs be above the current market value of a not adaptable/barrier-free living space?
8 Which criteria are important for you in a good living area?
9 Which importance do you attach to which furnishings when choosing your individual living quarters?
10 How important are potential service offers to you?
11 Which technical supports are of special importance to you?
12a Which of the below-mentioned points are of special importance for you?
12b Which prioritization would you give to these points?
13 Is there anything else you would like to mention as important for the longest possible stay in your own living quarters?

people of different ages in terms of housing and living space in two different countries (Germany and Slovakia). Based on responses to 13 questions, opinions could be defined on the options, needs, and means of housing. Analysis of the results can provide explanations of the needs and commercial viability of a modular and flexible living space design for all phases of life. The questionnaire was carried out without a specific introduction to the topic of demographic change and its implications in the design of living spaces. The main questions in the questionnaire are given in Table 1.

3. Results of the questionnaire survey

In the following sections, we present the answers to the questions in the questionnaire. The results of individual questions were also processed by statistical analysis, using the ANOVA method, the results of which are given in tables with explanation. In order to reconcile the situation and the possibility to compare the responses of the case study group, only the percentages of the total number of responses are listed. No absolute figures are given, as the results would not be conclusive. The following statements can be made for the individual questions and the results were evaluated as follows:

3.1. Question 1: which age group do you belong to?

In particular, it was expected that there were differences between the age groups in response to the subsequent questions; for example, in terms of expected technical aids.

Three age groups were provided:

- up to 35 years;
- 35 to 50 years; and.
- more than 50 years.

3.2. Question 2: from your current perspective, would the possibility of a modifiable floor plan represent added value?

In the second question, the participants were asked if the possibility of a modifiable floor plan would represent additional value, from their current perspective.

There were no statistically significant differences in the responses of individual age categories in either country; although, in the case of Slovakia, this statement was close to the threshold (see Table 2). (See Table 3.)

Table 2
Results of the ANOVA Test for Question 2.

SK - 3 age groups		G - 3 age groups		SK + G - 3 age groups	
F-ratio	p-value	F-ratio	p-value	F-ratio	p-value
2.87 Sk	0.059	0.85	0.419	3.29	0.039

Table 3
Results of the ANOVA Test for Question 3.

SK - 3 age groups		G - 3 age groups		SK + G - 3 age groups	
F-ratio	p-value	F-ratio	p-value	F-ratio	p-value
6.22	0.003	0.57	0.557	4.26	0.015

3.3. Question 3: how important is it for you to be able to stay in your current living quarters in spite of changing living situations?

The responses to this question clearly show (as in question 2) that most participants desired to remain in their living space for as long as possible. For a real estate agent, this means that if he or she can offer a flexible, adaptable building suitable for all phases of life, sustainable marketing and long-term residence of users are likely.

These results are schematically illustrated in Fig. 6.

There were no statistically significant differences in the responses of individual age categories in Germany but, in the case of Slovakia, this difference was quite significant.

3.4. Question 4: which changing living circumstances can you think of that require an adaptation of your individual living space?

In the responses to this question, several circumstances were mentioned by the various age groups, depending on the phase of life. Those below 35 years of age often mentioned planning for a family or changes in employment situation. Those between 35 and 50 considered that their children would leave home soon. Those above 50 no longer required office rooms and considered the upcoming need to take care of sick or disabled relatives. All of these criteria have a direct effect on the space requirements. It is very interesting that all age categories characterized accidents as a factor which had the ability to change their lifestyle; they all paid great attention to accidents. People aged 35 to 50 considered diseases, while respondents aged over 50 described specific existing diseases, limitations, and actual barriers in terms of visual impairment, hearing impairment, walking difficulties, and so on.
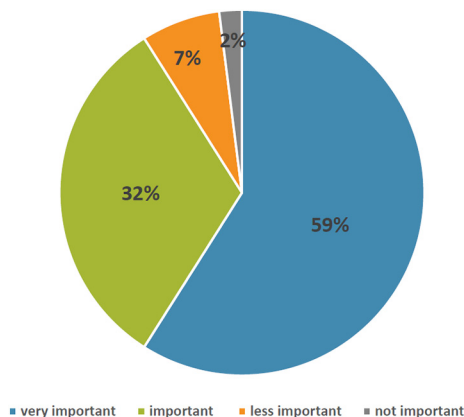

Fig. 6. Responses to importance of ability to stay in current living quarters.

Table 4
Responses to questions 4 and 5, separated by age group.

Age up to 35	Age 35 to 50	Age more than 50
Marriage	Becoming elderly	Visually impaired
Children	Increase of disability	Hearing impaired
Economic improvement	Sudden illness	Walking difficulties
Illness	Caring for relatives in need	Physical disability
Accident	Accident	Loss of partner
Job change	Issue of child	Dementia
		Personal nursing
		Room no longer needed
		Accident

3.5. Question 5: which changes in living circumstances could you foresee in the future requiring an adaptation of your living quarters?

The responses to questions 4 and 5 were analyzed together. There were many situations which required making decisions about a change of life and the need to change living space. Representative responses were selected. It is useful, here, to separate the answers by age group; which are shown in Table 4.

From Questions 4 and 5, we selected a total of 19 different factors which affected respondent's living conditions, in relation to the question of the need to change their living space. The statistical evaluation of responses in different age categories for Slovakia and Germany was different, for up to 11 cases, with a statistically significant difference in responses for Slovakia (11 factors) versus Germany (5 factors) - (see Table 5).

3.6. Question 6: do your current living quarters allow a variable reconfiguration of the rooms?

Of the all participants, 54% answered "Yes" and 46% answered "No", when considering whether their current living space was flexible. However, it must be borne in mind that the interpretation of flexible varied considerably. Very different situations were observed between Slovakia and Germany (see Fig. 7).

Table 5
Evaluation of Questions 4 and 5 by ANOVA.

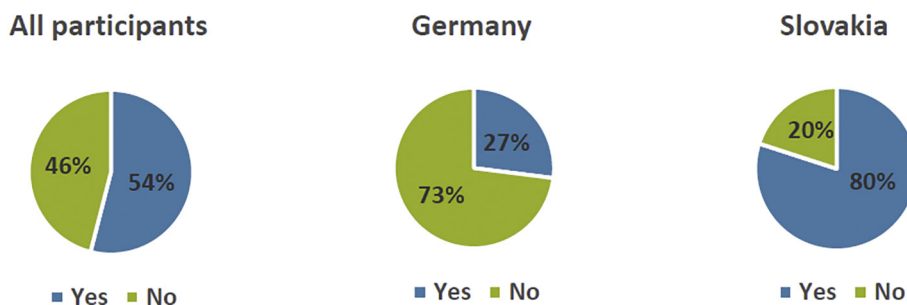| | SK - 3 age groups | | G - 3 age groups | | SK + G - 3 age groups | |
|---|---|---|---|---|---|
| | F-ratio | p-value | F-ratio | p-value | F-ratio | p-value |
| Marriage | 4.67 | 0.011 | 8.14 | 0.01 | 7.50 | 0.001 |
| Children | 3.54 | 0.032 | 6.03 | 0.003 | 0.25 | 0.773 |
| Family | 2.64 | 0.073 | 4.87 | 0.010 | 0.58 | 0.554 |
| Change in family | 2.87 | 0.059 | 5.30 | 0.007 | 4.38 | 0.014 |
| Loss of partner | 4.39 | 0.015 | 0.15 | 0.853 | 2.28 | 0.103 |
| Good job | 4.33 | 0.015 | 0.15 | 0.853 | 1.56 | 0.209 |
| Economic improvement – better Lifestyle | 4.03 | 0.02 | 1.04 | 0.349 | 1.64 | 0.192 |
| Illness | 11.40 | 0.000 | 0.07 | 0.929 | 4.33 | 0.014 |
| Accident | 11.07 | 0.000 | 0.26 | 0.765 | 5.58 | 0.004 |
| Dementia | 0.00 | 0.996 | 2.11 | 0.121 | 2.05 | 0.128 |
| Personal nursing | 3.30 | 0.039 | 3.70 | 0.027 | 6.58 | 0.002 |
| Room no longer needed | 2.11 | 0.121 | 1.00 | 0.362 | 3.16 | 0.044 |
| Becoming elderly | 3.97 | 0.021 | 1.19 | 0.300 | 4.74 | 0.010 |
| Visual or hearing Impairment | 3.35 | 0.038 | 0.26 | 0.768 | 2.47 | 0.086 |
| More desktop | 1.90 | 0.149 | 0.00 | 0.996 | 1.82 | 0.162 |
| Money | 5.33 | 0.006 | 1.04 | 0.349 | 4.71 | 0.010 |
| Cheap housing | 0.15 | 0.853 | 0.00 | 0.996 | 0.15 | 0.860 |
| Study | 2.15 | 0.117 | 0.00 | 0.996 | 1.99 | 0.137 |
| Issue of child | 3.35 | 0.038 | 1.90 | 0.149 | 4.98 | 0.008 |

Is Your Apartment Flexible, Adaptable?

Fig. 7. Answers to Question 6: "Is your apartment flexible/adaptable?"

Table 6
Results of the ANOVA Test for Question 6.

SK - 3 age groups		D - 3 age groups		SK + D - 3 age groups	
F-ratio	p-value	F-ratio	p-value	F-ratio	p-value
11.8	0.000	0.52	0.586	2.26	0.105

Table 7
Results of the ANOVA Test for Question 7.

SK - 3 age groups		G - 3 age groups		SK + G - 3 age groups	
F-ratio	p-value	F-ratio	p-value	F-ratio	p-value
1.29	0.271	0.23	0.793	1.13	0.321

It is worth noting that, in analyzing the data for this question, the reactions highly varied between the Slovak and German participants.

In Question 6, there were no statistically significant differences in the responses of individual age categories in Germany, but in the case of Slovakia the difference was quite significant (see Table 6).

3.7. Question 7: in how far are you willing to pay a higher rent for an adaptable/barrier-free living space? How many percentage points can the costs be above the current market value of a not adaptable/barrier-free living space?

This question was asked to determine how important the participants considered a flexible and barrier-free living space, through their willingness to pay a higher rent.

This analysis can be seen in Fig. 8. Surely, this outcome mirrored their knowledge that the increased construction efforts come with increased costs: calculated for the overall time of building inhabitation, the higher initial costs are certainly less than the sum of the necessary rebuilding (if possible, at all).

There were no statistically significant differences in the responses of individual age categories in Slovakia or Germany for Question 7 (see Table 7).

3.8. Question 8: which criteria are important for you in a good living area?

In this question, seven parameters defining the location of the living space were provided and multiple answers were possible. In addition, a free-text answer was possible (under "other").

In the following questions, the participants from the higher age group also requested a cross-generational living space and a mixture of inhabitants of all age groups. As additional parameters, a pool, cafe/restaurant, and playground were mentioned. This analysis can be seen in Fig. 9.

A detailed analysis, according to the age groups, confirmed the results obtained so far. All respondents below 35 and above 50 considered green areas - gardens, parks, forests - to be very important in choice of location for their homes. All four criteria (doctors, shop for daily needs, green area, forest, public transport) shown were considered to be very important.

This clearly shows the desire to live in a functioning infrastructure with an efficient public transport system, across all ages and life phases. Of all the possible criteria, the respondents considered four criteria (shops, transport, green areas, and doctors) to be most important, the analysis of which by age groups can be explained as follows: Results of statistical significance testing ($p < 0.05$) recorded statistically significant differences between the groups of respondents, in terms of their age categories (Chi-square = 29.19; df = 6; $P < .0001$). This shows that the different age groups had different priorities in the evaluated
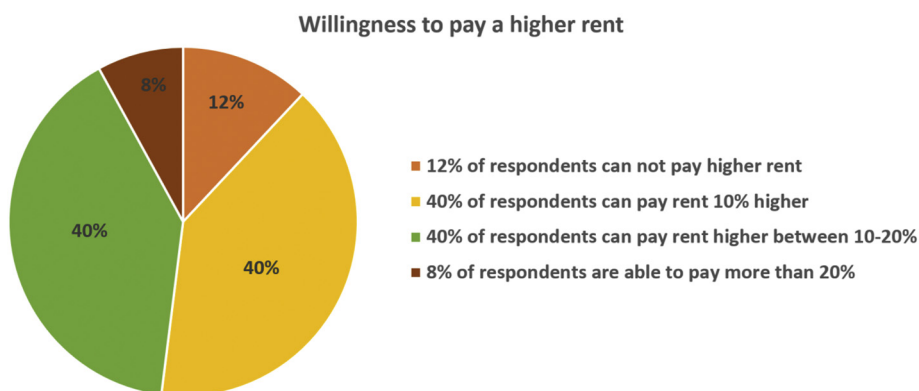

Fig. 8. Willingness to pay a higher rent for an adaptable living space.
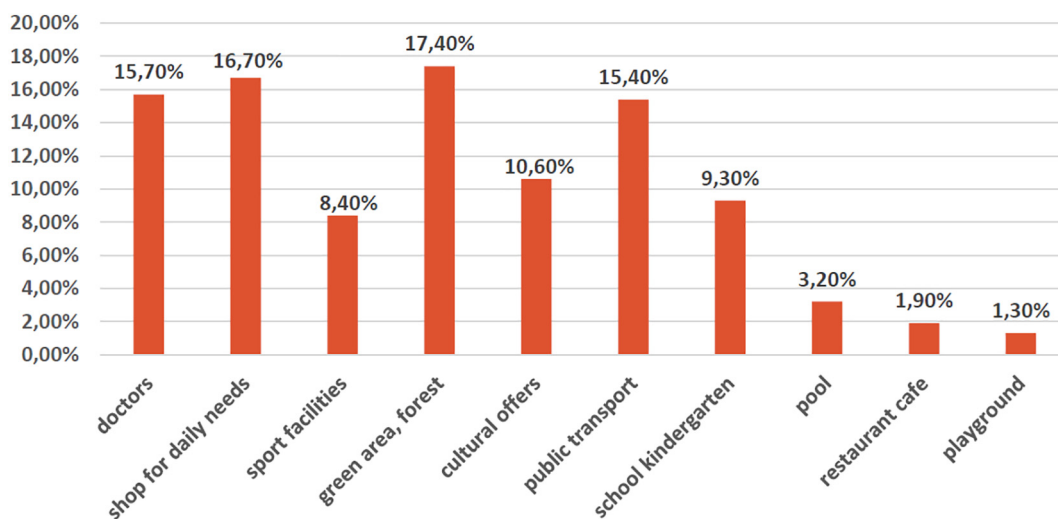
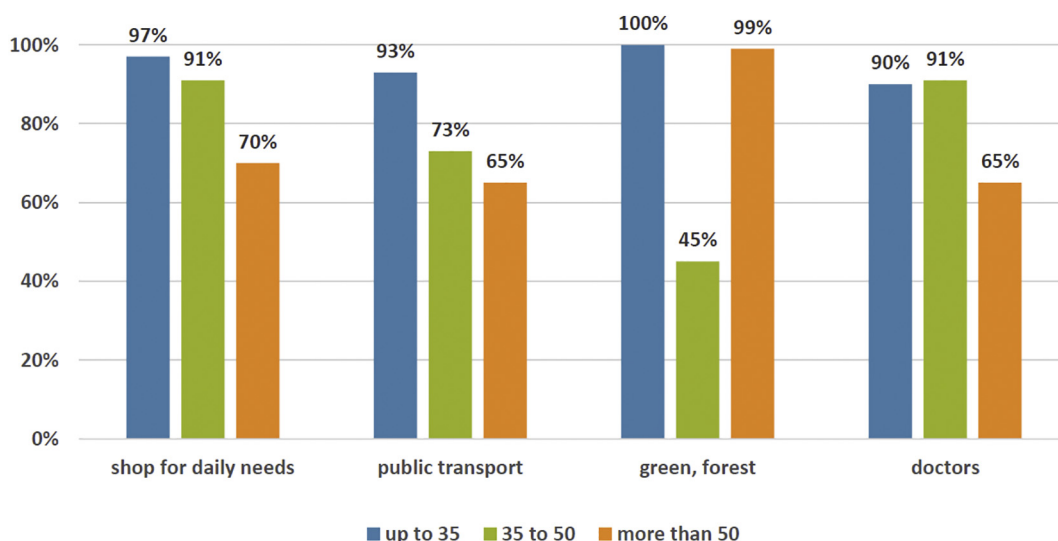**Fig. 9.** Criteria for a good living area.

Fig. 10. Criteria for a good living area by age groups.

parameters, which can be seen in Fig. 10.

From Question 8, nine different criteria for a good living space were determined. Statistical evaluation of the responses in the different age categories for Slovakia and Germany was almost the same; the only difference was in the consideration of sports facilities and proximity of a kindergarten or school as a criterion for good housing. We note that, for most of the criteria, there were no statistically significant differences in the responses of individual age categories in Slovakia and Germany (see Table 8).

3.9. Question 9: which importance do you attach to which furnishings when choosing your individual living quarters?

This was a multiple-choice question. The responses showed which fittings were of special value to the participants. That which was seen to be of high value was the presence of a bathroom with a ground-level shower stall, which is an excellent example of a demand that is independent of the age range and provides an advantage for all. Likewise, the availability of a balcony or an outdoor sitting area was in high demand. If necessary, it was of important for the users to have an alarm system at their disposal, which shows the demand for a secure living space.

An analysis can be seen in Fig. 11.

Table 8
Results of the ANOVA Test for Question 8.

	SK - 3 age groups		G - 3 age groups		SK + G - 3 age groups	
	F-ratio	p-value	F-ratio	p-value	F-ratio	p-value
Doctor	0.82	0.433	2.36	0.095	2.78	0.063
Shops for daily needs	2.38	0.094	0.26	0.768	1.96	0.141
Sports facilities	5.70	0.005	1.36	0.254	4.41	0.013
Green area forest	0.26	0.768	1.44	0.233	0.68	0.505
Cultural offers	1.84	0.158	2.28	0.103	0.13	0.872
Public transport	0.46	0.621	2.01	0.134	0.49	0.607
School/kindergarten	27.23	0.000	13.30	0.000	38.18	0.000
Restaurant, cafe	0.00	0.996	1.90	0.149	1.82	0.162
Living big house	1.00	0.362	2.15	0.117	2.17	0.115

The results of statistical testing at the level of significance ($p < .05$) recorded statistically significant differences between the groups of respondents in terms of their age categories (Chi-square = 58.60; df = 6; $P < .0001$), indicating that the different age categories of respondents had different priorities in the evaluated parameters.

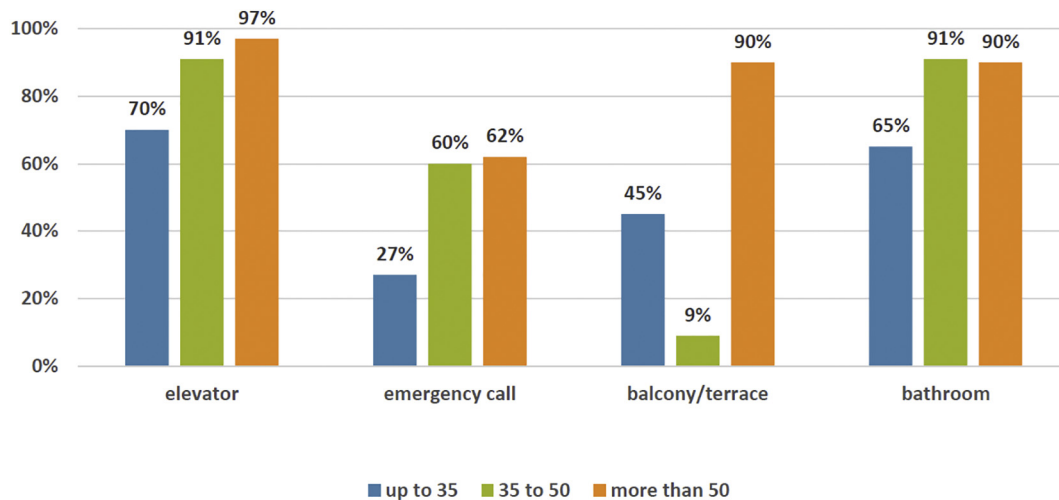From Question 9, seven different supplementary facilities for the

Fig. 11. Importance for choosing the individual living quarters by age group.

respondent's residential area were determined. Statistical evaluation of the responses in the individual age categories for Slovakia and Germany was almost the same; there were only 4 differences, in the cases of need of door threshold and emergency alarm, **the space for pushchair, bike.**

We note that, for most of the criteria, there were no statistically significant differences in the responses of individual age categories, in both Slovakia and Germany (see Table 9).

3.10. Question 10: how important are potential service offers to you?

When assigning the relative importance of the potential service offers, multiple answers were possible The analysis can be seen in Fig. 12.

From Question 10, eight potential service offers were selected. In up to seven cases, the statistical evaluation of the responses in different age categories for Slovakia and Germany was different. This implies a completely different view of the issue in the case of different age categories in Slovakia, compared to Germany (see Table 10).

The results of statistical testing at the level of significance (p < .05) did not show statistically significant differences between the groups of respondents, in terms of their age categories (Chi-square = 8.984; df = 6; P = .1745).

Based on a more detailed analysis, some local differences between the groups of respondents were noted, but differences were not statistically significant. Consequently, the individual age categories of respondents did not have significantly different priorities in the evaluated parameters. Finally, it must to be mentioned that these services need not be provided by the landlord but can be significant criteria in the choice of the location for a dwelling and can provide a competitive advantage.

3.11. Question 11: which technical supports are of special importance to you?

This question did not provide answers to choose from, instead providing an opportunity for participants to voice their personal needs by indicating the technical aids of special importance to them.

The following technical aids were mentioned (see Table 11a).

From Question 11, a total of 14 technical supports were selected for a good living space. The statistical evaluation of the responses in individual age categories for Slovakia and Germany was based on the fact that there were 4 differences, in the case of the Internet and PC, TV, shower, and bathtub. We note that there were no statistically significant differences for most of the criteria in the responses of the individual age categories in Slovakia and also in Germany (see Table 11b)).

3.11.1. Question 12a: which of the below-mentioned points are of special importance for you?

All suggested items were considered important by the participants, where the most frequently mentioned items were clear door width and emergency call systems. A well-illuminated entrance area was also mentioned; an important note that should not be forgotten.

The percentage representation of their importance, as indicated by the participants, is shown in Fig. 13.

3.11.2. Question 12b: which prioritization would you give to these points?

In Question 12, there were an additional 6 priorities for a good living space. Statistical evaluation of the responses in different age categories for Slovakia and Germany was almost the same, the only difference being in the width of the car park and the alarm (as was the case in question 9). We note that, for most criteria, there were no statistically significant differences in the responses (see Table 12).

Table 9
Results of the ANOVA Test for Question 9.

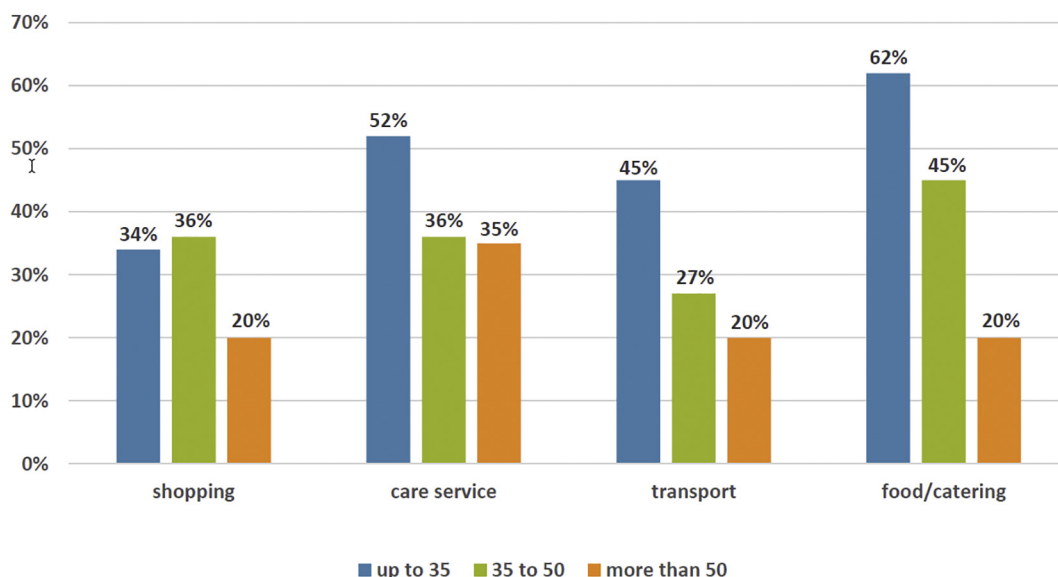|	SK - 3 age groups		G - 3 age groups		SK + G - 3 age groups	
	F-ratio	p-value	F-ratio	p-value	F-ratio	p-value
Door - no threshold	16.49	0.000	1.63	0.193	9.48	0.000
Balcony/Terrace	0.75	0.467	2.23	0.108	0.55	0.575
Shower bath	2.59	0.077	0.73	0.474	0.72	0.482
Elevator in Building	1.35	0.254	0.45	0.631	1.03	0.355
Sufficient movement possibilities	0.87	0.413	0.69	0.494	0.27	0.758
Emergency call system, Alarm	7.31	0.001	1.67	0.187	3.73	0.025
Space for pushchair, bike	11.13	0.000	6.00	0.004	13.57	0.000

Fig. 12. The demand for potential service offers by age groups.

Table 10
Results of the ANOVA Test for Question 10.

	SK - 3 age groups		G - 3 age groups		SK + G - 3 age groups	
	F-ratio	p-value	F-ratio	p-value	F-ratio	p-value
Board	12.08	0.000	0.50	0.597	2.85	0.059
Transport	0.41	0.654	4.57	0.012	2.02	0.132
Nursing	3.02	0.051	5.53	0.005	3.61	0.028
Help with shopping	0.08	0.921	7.91	0.001	4.02	0.019
Swimming pool	5.30	0.007	1.00	0.362	4.66	0.010
Post office, bank	3.23	0.042	0.00	0.996	3.06	0.048
Cleaning and laundry services	7.02	0.002	1.45	0.232	2.43	0.089
Care services	1.19	0.300	1.00	0.362	0.51	0.596

Table 11a
Technical support responses, separated by age group.

Age up to 35	Age 35 to 50	Age more than 50
High-Speed Internet Access TV	Elevator Stair Lift Bath-Tub Lift AAL	Elevator Stair Lift Bath-Tub Lift AAL Emergency call systems Raised lavatory seat Height adjustable bed

3.12. Question 13: is there anything else you would like to mention as important for the longest possible stay in your own living quarters?

This free-text question provided an opportunity for the participants to name important points that had not been specifically included. Importance for the longest residency in their own residential neighborhoods is shown in see Table 13, for all age groups. The following points were mentioned.

Here, the importance of location and surroundings was again stressed. In addition to the demand for a green environment and sufficient infrastructure, the participants placed high value on well-tended surroundings and a good neighborhood. One participant referred to this as well-being. High priority was given to privacy and the preservation

Table 11b
Results of the ANOVA Test for Question 11.

	SK - 3 age groups		G - 3 age groups		SK + G - 3 age groups	
	F-ratio	p-value	F-ratio	p-value	F-ratio	p-value
Internet, PC	0.48	0.613	6.69	0.002	4.12	0.017
TV	5.83	0.004	0.00	0.996	3.75	0.025
Technical equipment	0.00	0.996	0.50	0.599	0.50	0.603
Shower cabin	19.00	0.000	1.04	0.349	13.83	0.000
Handrails in the Bathroom	2.11	0.121	2.11	0.121	4.33	0.014
Raised toilet	0.00	0.996	1.04	0.349	1.02	0.358
Lift bath	0.00	0.996	3.35	0.038	3.16	0.044
Electric shutters	0.00	0.996	2.11	0.121	2.05	0.128
Bath-Tub Lift	2.11	0.121	1.00	0.362	3.16	0.044
Barrier-free bathroom	4.75	0.011	3.59	0.030	6.68	0.002
Wifi	0.99	0.364	1.68	0.185	0.08	0.923
Car	1.00	0.362	0.00	0.996	1.00	0.365
Phone	2.87	0.059	1.04	0.349	3.44	0.033
Stair lift	0.00	0.996	1.57	0.205	1.44	0.235

of independence.

For this additionally conceived question for the respondents, a total of 27 different incentives for quality housing were presented. Statistical evaluation of the responses in different age categories for Slovakia and Germany was not very different, except in the cases of playgrounds, workload, social contacts, multi-generation housing, and retirement meetings. We note that, for most of the criteria, there were no statistically significant differences in the responses of individual age categories in Slovakia and in Germany (see Table 14).

4. Discussion

The responses in the questionnaires clearly showed the age-specific needs and uncovered a multitude of varying expectations. The number of potential occurrences increased the likelihood of change in living situation. Health is not considered to be obvious and is considered to be very valuable. We note that, for most of the criteria, there were no statistically significant differences in the responses of individual age categories in Slovakia and in Germany (see answers to questions 2, 7, 8, 9, 11, 13). In contrast, statistically significant differences between
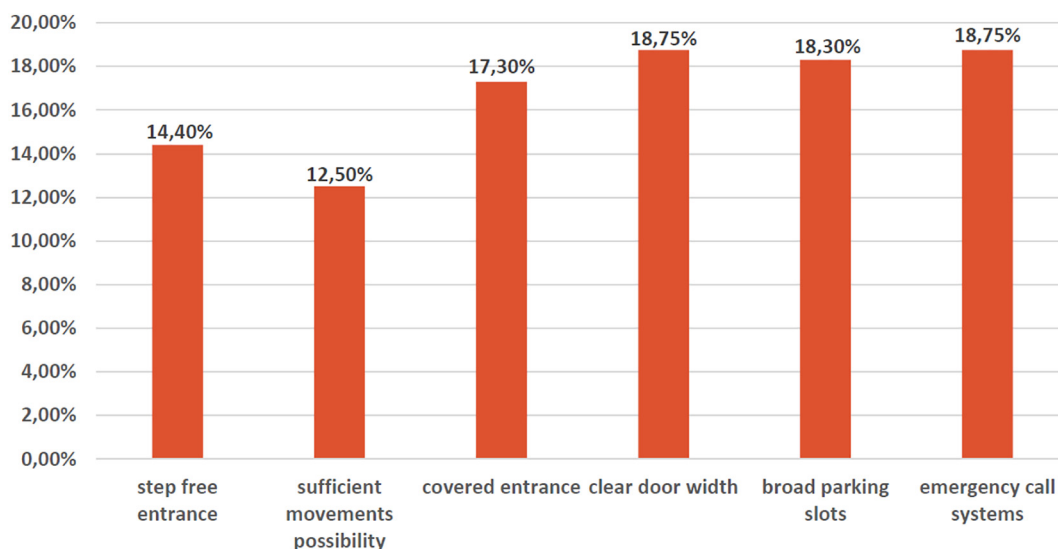
Fig. 13. Items of special importance.

Slovakia and Germany were reflected in the answers to questions 3, 4, 5, 6, 10 and 12.

Respondents argued consistently in both countries that in terms of their ability to modify the floor plan, such an apartment would add value to them. The same applies to all three groups of people who are willing to pay higher rent for an adaptable living space. Respondents from both countries also agreed to attach importance to the area without barriers (door without threshold), emergency call system, alarm and space for pushchair when choosing a personal residence. Similarly, it is with technical support, technical equipment. This is of particular importance to all. They identified as very important for the longest possible stay in their own apartment a number of criteria (11), which are listed in Table 13.

The answers to the question of how long they want to stay in the original apartment are that most participants wished to stay in their living space as long as possible. Not the same criteria are important in a good residential area for Germany and Slovakia. For German respondents important are doctor, cultural offers and living in big house. For Slovak survey participants these are shops for daily needs and sports facilities. For both groups there are school and kindergarten. There are significant differences between the German and Slovak participants in the answers to questions 4 and 5. When asked how their living space requirements could be changed, the Slovak participants identified (loss of partner, good job, economic improvement, illness, accident), so German participants consider as important (marriage, children, family, change in family, personal nursing).

The optimization results from the questionnaire evaluation show that participants had a high level of awareness of the different stages of life and the resulting changes in life situation. Different age groups expected specific changes in their life situation. Planning parenting was often a key aspect for people under 35, while people aged 35–50 often

Table 13
Importance for longest possible stay in your own living quarters—for all age groups.

Age up to 35	Age 35 to 50	Age more than 50
Good neighborhood		
Clean, well-tended surroundings		
Good location		
Family contact		
Home care		
Cross-generational living		
Preservation of independent living		
Intercom with video screen		
Room for visitors		
Potential for private retreat		
Well-being		

considered an adult child moving or relocation of a relative in need of help more likely. The respondents over 50 years of age were most concerned about possible health disorders and had knowledge of possible solutions. This group has changed in recent years; their number is rising and often in good financial condition and, so, they are an important demographic for the real estate market. No longer satisfied with small one-room flats, most above 50 years of age preferred flexibility, innovation, and independence.

The level constructions of rooms with a sufficiently large area for keeping strollers, bicycles, walking frames, wheel chairs, and so on were considered important as well, which should be considered in the planning and construction of a barrier-free living space. The presence of an elevator was another major item. If not initially available in a building, the construction should take into account the potential to retrofit an elevator. Remarkably, these features were in demand

Table 12
Results of the ANOVA Test for Questions 12a and 12b.

	SK—3 age groups		G—3 age groups		SK + G—3 age groups	
	F-ratio	p-value	F-ratio	p-value	F-ratio	p-value
Step-free entrance, wheelchair access	60.62	0.000	4.34	0.015	31.65	0.000
Covered entrance	1.60	0.200	0.21	0.805	1.09	0.332
Clear door width	0.46	0.624	0.28	0.748	0.57	0.560
Broad parking slots	14.40	0.000	0.96	0.376	5.44	0.005
Emergency call system - alarm	7.31	0.001	4.50	0.013	5.86	0.003
Ground floor	2.11	0.121	0.50	0.599	1.82	0.136

Table 14
Results of the ANOVA Test for Question 13.

	SK—3 age groups		G—3 age groups		SK + G—3 age groups	
	F-ratio	p-value	F-ratio	p-value	F-ratio	p-value
Quiet habitat	2.87	0.059	0.99	0.364	0.88	0.411
Green locations	1.90	0.149	0.00	0.996	1.82	0.162
Infrastructure	0.00	0.996	2.28	0.103	2.13	0.119
Good neighborhood	2.38	0.094	0.38	0.678	0.68	0.501
Independence	0.00	0.996	2.11	0.121	2.05	0.128
Playgrounds	9.43	0.000	0.00	0.996	7.36	0.001
Parks	1.46	0.230	0.00	0.996	1.09	0.335
Access to a garden	0.00	0.996	2.11	0.121	2.05	0.128
Close to the center	0.00	0.996	0.56	0.564	0.53	0.586
Room for visitors	0.00	0.996	1.68	0.185	1.58	0.205
Less work	6.33	0.003	1.00	0.362	6.88	0.001
Social contacts	3.35	0.038	1.00	0.362	1.82	0.162
Multi-generation house	3.35	0.038	0.50	0.599	2.77	0.064
Retirement meeting	8.14	0.001	2.11	0.121	9.75	0.000
Bathroom	0.00	0.996	1.00	0.362	1.00	0.365
Low crime	1.00	0.362	0.00	0.996	1.00	0.365
Have a good time	0.00	0.996	1.00	0.362	1.00	0.365
House care	0.00	0.996	1.00	0.362	1.00	0.365
Party	1.00	0.362	0.00	0.996	1.00	0.365
The arrival of close people who need care	0.00	0.996	1.00	0.362	1.00	0.365
Decline in debt	0.00	0.996	1.00	0.362	1.00	0.365
Privacy	0.00	0.996	1.00	0.362	1.00	0.365
Comfortably open rooms	0.00	0.996	1.00	0.362	1.00	0.365
Dentist	0.00	0.996	1.00	0.362	1.00	0.365
Pet	0.00	0.996	0.50	0.599	0.50	0.603
Fitness	1.00	0.362	0.00	0.996	1.00	0.365

independently of age, which shows that barrier-free equipment has advantages for all. Elevators and bathrooms seemed very important to all age groups. The lower age group (up to 35) showed preference for a shower cubicle. The age group of 35–50 did not consider the balcony area to be important, due to the fact that, most of the time; they are at work and are only at their apartment later. Even when determining the priorities of an emergency call system the age groups of 35–50 and over 50 responded similarly, while the lower age group did not consider such a system to be so important.

When assigning the relative importance of the potential service offers, multiple answers were possible. Assessment of the answers of the different age groups shows their specific priorities. Those below 35 considered food/catering, care services, and transports to be very important. Obviously, what they currently considered to be a luxury is often later considered to be a defined need. However, this age group was also sufficiently forward-looking, in considering care services to be very important. The group between 35 and 50 was less clear in considering something to be very important. Relative importance was given to catering, care, and shopping services. The group above 50 considered care services to be the most important. The other services were not seen to be as important. Participants also mentioned cleaning and laundry services, as well as support for garden/outdoor area work.

The responses showed a degree of basic knowledge about the potential technical aids available. Some technical aids for the realization of a barrier-free living space, such as the stair lift, were mentioned several times. Other demands were described by the desired function, such as environmental controls. Separated by age groups, it can be seen that those below 35 mostly put importance on high-speed Internet access and TV. Those between 35 and 50 and those above 50 mostly put importance on elevators, Raised lavatory seats, stair lifts, bath-tub lifts, emergency call systems, height adjustable beds, and AAL. Those above 50 also mentioned handles in the bathroom and height-adjustable beds.

Throughout the whole questionnaire, well-known technical aids (such as stair lifts or bath-tub lifts) were named.

By the high values placed on the all answers, the participants displayed a comprehensive awareness of barrier-free living spaces, or living spaces for all phases of life. Of all possible answers, six basic priorities emerged.

Analysis of the prioritization given shows that clear door width and emergency call systems were considered to be the most important. For the second-most important item, the answers were country-specific, with the Slovakian participants mentioning broad parking slots and the German participants mentioning clear door width. In the third place, a covered entrance, step free entrance, and sufficient movement areas were mentioned. All responses were close together, indicating that all of these points must be considered in the realization of a barrier-free design for a living space suitable for all phases of life.

5. Conclusions

The results of the questionnaire survey shown that only about one third of respondents consider, it important to stay in the same environment (same flat, house), even when unforeseen circumstances occur. This means that they want to stay where they are even when different life situations occur (e.g. health restrictions). The survey respondents said that as many as 91% of them wanted to stay in their current residence. The analysis of the responses showed that the answers "less important" and "unimportant" were seldom used. Only 7% considered the opportunity to remain less important in their own living space and 2% considered it irrelevant. Participants were also asked if the possibility of a modifiable floor plan would represent additional value, from their current perspective. A total of 95% of the participants responded "yes"; only 5% responded "no". This result shows the awareness within society and the expressive desire for a flexible, adaptable living space and the resulting demand for such.

It can be seen total of 19 different factors which affected respondent's living conditions, in relation to the question of the need to change their living space. The statistical evaluation of responses in different age categories for Slovakia and Germany was different, for up to 11 cases, with significant difference in responses for Slovakia (11 factors) versus Germany (5 factors). It follows that, in Slovakia, respondents of different ages assessed the impacts of given factors mostly only from the point of view of their generation, without broader scope and regardless of generations; whereas, in Germany, there was more empathy in the respondent's responses, due to different needs of life in the period of life of the respondents.

It is worth noting that, in analyzing the data for this question, the reactions highly varied between the Slovak and German participants. It was found that 80% of participants from Slovakia considered their current living space to be variable, but only 27% of the German participants considered their current living space to be variable. It may be speculated that Slovak participants were more willing to renew. Another possible explanation could be the skeleton buildings that have been built in Slovakia in recent decades, which have formed a basis for flexible construction (i.e., skeletons, panel houses, and apartment buildings). These buildings allow greater flexibility, compared to other types of construction. Thanks to this construction style, the structure of these buildings is predominantly operated by columns, panels, and ceiling slabs. Supporting walls that are not replaceable or replaceable only with great effort are rarely present in this building style. In Germany, predominantly atypical buildings (not blocks) have been built, which are more difficult to adapt to new needs. This may explain why the German respondents considered their living spaces to not be flexible.

Approximately 12% of the participants were unwilling to pay a higher rent or cost for a variable and barrier-free living space, compared to an inflexible one. About 40% of the participants were willing to pay up to 10 percentage points more and another 40% were willing

to pay up to 20 percentage points more. Approximately 8% were even willing to pay more than 20 percentage points more than the standard price. With their willingness to pay more for a barrier-free and variable living space, the users indicated the value of these advantages.

The results clearly show how important outside areas, such as gardens and forests, were for the users. Their need to move in nature was major. This was also confirmed in the other questions, where many participants indicated their desire for a garden, balcony, or terrace. At the same time, a central location was also of importance. The presence of medical doctors, shops for daily needs, and an efficient connection to public transport were considered to be part of a good living location. The availability of a school and kindergarten was considered necessary by the younger participants.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

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