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HEALTHY AGEING AT HOME: ERGONOMIC ADAPTATIONS OF INTERIOR DESIGN AND SELF-ASSESSED QUALITY OF LIFE OF OLDER ADULTS OF THE MUNICIPALITY OF LJUBLJANA

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ABSTRACT

Population is ageing and many nations already respond by developing and promoting special strategies of healthy ageing. Living environment is one of the factors that can contribute to healthy and safe ageing at home, providing that it is well adapted to the needs of older adults. On the contrary, it can cause stress, discomfort and lead to injuries, resulting in the loss of independence and autonomy. With the use of a questionnaire, conducting a survey and an analysis regarding the adaptability of living environment to the needs of older adults, we obtained an insight into the quality of living environment of the elderly. In the Quality of Life Survey as a part of the A-Qu-A questionnaire, the participants were 198 older adults with an average age of 71.5 ± 5.2 years of age. Further on, 83 of them participated in the study of the "Adaptation of the Living Environment to the Needs of Older People," carried out in the homes of the participants, (with an average of 76 ± 1.2 years of age). The results showed that there is a significant difference between the subjective evaluation of the participants and the evaluation by the professionals regarding the estimation of appropriate lighting. The participants who estimated their quality of life as better are more likely to have sufficient or adequate lighting and more adaptations in the kitchen, which makes daily kitchen work easy and safe. Further investigation dealt with the ergonomic adaptation of the bathrooms, where we found out that less than 15 % of the participants installed

the handrails in the shower or bath tub, which can significantly contribute to safety. Additionally, physical capability as part of quality of life negatively correlates with the number of adaptations made in bathroom (r = -0.149; p = 0.039), which refers to the fact that the adaptation of accessories (handrails) were only installed when the need for them appeared. With minor changes in the living environment and taking care for maintaining psycho-physical capabilities, older adults can easily and safely perform everyday tasks, which prolongs an individual's autonomy and independence − the fact we are still not sufficiently aware of.

Keywords: *older adults, ergonomic furniture adaptation, self-assessed quality of life.*

ZDRAVO STARANJE NA DOMU: ERGONOMSKA PRILAGODITEV NOTRANJE OPREME IN SAMOZAZNANA OCENA KAKOVOSTI ŽIVLJENJA NA PRIMERU STAREJŠIH ODRASLIH V MESTNI OBČINI LJUBLJANA

IZVLEČEK

Človeštvo se stara in mnoge države so se na to dejstvo že odzvale z razvijanjem in promocijo ukrepov za zdravo staranje. Bivalno okolje je eden od dejavnikov, ki lahko prispevajo k zdravemu, predvsem pa k varnemu staranju na domu, če je le to urejeno in prilagojeno potrebam, ki jih imajo starejši odrasli. V nasprotnem primeru lahko neprilagojeno bivalno okolje povzroča stres, slabo počutje in izgubo samostojnosti, poleg tega pa je lahko tudi vzrok za poškodbe. V raziskavi o kvaliteti življenja je sodelovalo 198 starejših odraslih s povprečno starostjo 71 ± 5,2 let. Nadalje se je 83 izmed vseh udeležilo tudi raziskave "Prilagojenost bivalnega okolja potrebam starejših oseb", ki se je izvajala na domovih uporabnikov (povprečna starost 76 ± 1,2 leti). Študijo smo izvedli z uporabo dveh prilagojenih vprašalnikov ter osebnim vpogledom v bivanjski prostor udeležencev. Ugotavljamo, da glede na priporočila obstajajo pomembne razlike med oceno primerne osvetlitve po mnenju starostnikov v primerjavi s strokovno oceno izmerjeno na domu. Starostniki, ki so imeli primerno urejeno osvetljenost prostorov, so kvaliteto svojega življenja ocenjevali višje in so poročali tudi v več primerih prilagoditev v kuhinji, ki olajša dnevno delo v kuhinji. Nadalje smo raziskali stanje ergonomske prilagojenosti kopalnic udeležencev, kjer smo ugotovili, da je manj kot 15 % sodelujočih v raziskavi že uredilo ustrezne ročke za oporo v kopalnici pod tušem ali v kopalni kadi. Telesna zmogljivost teh posameznikov, kot komponenta kvalitete življenja, statistično značilno negativno korelira s številom prilagoditev v kopalnici (r = -0,149; p = 0,039). Ti svojo telesno zmogljivost kot del kvalitete življenja ocenjujejo

nižje. To vodi do ugotovitve, da prilagoditve bivalnega prostora starostniki uredijo šele, ko jih potrebujejo. Z manjšimi prilagoditvami v bivalnem okolju ter z ohranjanjem psiho-fizične zmogljivosti bi starejši odrasli lahko vsakdanja opravila izvajali lažje, z manj napora in bolj varno. To bi pomenilo daljše samostojno in neodvisno bivanje starejših odraslih v domačem okolju - dejstvo, ki se ga ne zavedamo dovolj.

Ključne besede: *starejši odrasli, ergonomija, prilagoditev pohištva in opreme, samoocena kakovosti življenja.*

INTRODUCTION

Being aware of the fact that population is ageing, the main focus and challenge for nations are how to increase or at least maintain the quality and years of healthy life (Drewnowski et al., 2003; WHO, 2002). Many nations have already responded by developing and implementing the policies to promote healthy ageing. According to the last data from 2011, in Slovenia the older adults (65 +) represented 16.6 % of population (women 19.8 %, men 13.3 %). EROPOP2010 Eurostat projection expects that lifespan will be prolonged, so older adults (65 +) will represent 27.5 % of population in 2040, yet in the year 2050, 30.6 % of population and in the year 2060 every third Slovenian will be older than 65 years of age (Statistic Office RS, 2012).

A lot of older citizens live in homes that are not properly adapted to the needs of older adults (Colombo, Vitali, Molla, Gioia, & Milani, 1998), which can cause stress, discomfort and loss of independence. In the last decade, there has been a trend in developed countries to provide independent living conditions for older people, in a familiar home environment and for as long as possible (Grdiša, 2010). In Slovenia, only 7.85 % of people aged 65 and over live in the old people's homes, therefore, it is very important that housing and equipment for older adults and disabled persons is facilitated and adapted to the safety and comfort of their use (Hvalič Touzery, 2009). The research performed by the School of Architecture, University of Sheffield, UK (2004), regarding the impact of architecture on the quality of life, with the emphasis on environmental suitability of housing for the elderly, found out that the design of buildings have both positive and negative effects on the quality of residents' life. That is particularly important since older people spend most of their time in the building in which they reside. Due to the increased susceptibility of older adults to infections and diseases, they found that the compliance with hygiene standards is of extreme importance, particularly in the parts of buildings where food preparation and dining take place (Torrington, Barnes, McKee, Morgan, & Tregenza, 2004). In the research by Colombo et al. (1998), the most frequent problems faced by older adults were identified. Among other things, older adults reported a safety problem in the kitchen (as many as 33 % of the dwellers) and of inadequate lighting (25 % of the dwellers). Very few older adults can afford a thorough home adaptation because of financial reasons. It was found that 60 % of older

people live in homes that have not been renovated or ergonomically adopted or newly equipped more than 20 years, which affects lower comfort and safety of the residents. More than 14 % of older people in England live in inadequate housing condition at home that urgently needs adaptation (Boyo, 2001).

In addition, only 10 % of older adults decide to modify the existing equipment and adjust them to new needs (Gilderbloom & Markham, 1996). The studies mainly focused on furniture design for seniors, which is extremely important as most products include the elements designed for young people, so that older adults often have difficulties in using them (Fabisiak & Jankowska, 2016; Klos, Fabisiak, & Kaczmarek, 2014). It should be emphasized that the designers and furniture manufacturers who wish to create products tailored to the needs of elderly people should first identify and focus on the needs arising from the old-age-related changes occurring in the human body (Fabisiak & Klos, 2016). However, there is also evidence that older adults have poor knowledge of the possible psycho-physical changes in the old age and about positive effect on performance of daily routines and, thereby, the possibilities to prolong the period of independence in home environment (Batič et al., 2016).

Beside the adaptation of living environment to age-related changes in functionality of older adults, we were focused also on the potentially dangerous places in the apartment. Evidence showed that most accidents in the home environment happened in the kitchen and bathroom (Stevens, 2005), so we need to pay more attention to the ergonomics of the furniture to maintain the performance of daily habits easy and, most of all, safe.

In addition, the lighting proves to be a common problem with the kitchen equipment. The kitchen is a workspace where we use sharp knives, home appliance and hot dishes, so it is necessary that the entire kitchen, especially the working area has proper lighting. A particular attention should be paid to the main working surface, sink and cooker hob area. When installing the lighting and choosing a single lamp, we must pay attention to disturbing shadows, glare and adequate power. For lighting which is directed towards the workplace, it is necessary to be installed from the front or from the left side and not from behind. This prevents the appearance of throwing shadows on the worktop.

Another potentially dangerous place in the living environment is the bathroom (Carter, Campbell, Sanson-Fisher, & Redman, 1997). The handrails intended for greater security should be placed at the appropriate level and at appropriate places. Our next analyses were directed to the research of handrails and other accessories (shelves, anti-slip mats) and their connection with the self-assessed quality of life, as well as the falls that occurred in a one year period.

Within the definition of healthy ageing (Pell, McClure, & Bartlett, 2005) as *"a lifelong process optimizing opportunities for improving and preserving health and physical, social and mental wellness; independence; quality of life and enhancing successful life-course transitions"* we were focused on the situation of living old people's environment. Having in mind the self-assessed quality of life according to the status of ergonomics adapted in living environment and furniture, we wanted to

examine the effect on independence and diminishing the potential injuries. That is why we examined the current status of adapted living environment when prolonging autonomy and ensuring the independence of older adults, their safety and comfort when living at home.

According to the presented facts, the research questions we considered in this part of the project were the following: i.) what is the present state of ergonomic interior design of old people's home environment in the studied sample of older population in the Municipality of Ljubljana and ii.) does the self-assessed quality of life of older adults correlate with the level of adapted living environment (considering the number of adaptations).

METHODS

The study was a part of the project titled A-Qu-A: Active and Quality Ageing, (Project no. 4300-472/2014), supported by Norway Grants. The leading partner of the project was the Ljubljana Home Care Institution, Department of Home Care Ljubljana (Slovenia), while the research partners of the project were the Institute for Kinesiology Research, Science and Research Centre, University of Primorska and the Faculty of Design that collected all the data of the mass measurements and carried out the intervention. Through a complex questionnaire and with an interview we tried to determine the status of interior adaptations to the needs of older adults living in dwellings within the Municipality of Ljubljana. The research protocol was conducted according to the *Declaration of Helsinki*, all the participants also signed a written consent to participate in the measurements.

Participants

In the Quality of Life Survey, there were 198 older adult participants (151 female, 70.35 ± 5.8 years of age and 47 male, 71.54 ± 5.3 years of age). 83 of them (58 female and 25 male), with their average age of 76 ±1.2 years, have additionally decided to participate also in the second Survey – "Adaptation of the Living Space to the Needs of the Elderly." All the participants of the study are the residents of the Municipality of Ljubljana.

Measurements

In the Quality of Life Survey, 198 older adults filled out a complex A-Qu-A questionnaire regarding the demographic and socio-economic data, healthy lifestyle, nutrition habits and ergonomic adaptation of interior design and furniture. They were all initially tested for physical characteristics, functional capabilities and general health status.

AQuA questionnaire was a combination of different parts of standardized questionnaires (GPAQ, QOL), where part of QOL was used also in the survey of Quality of Life of National Institute for public health. It consisted of 78 questions and was sent to each participant who agreed with a signed consent to participate in the mass measurement. The participant brought their own questionnaire, filled out on the first day of measurement. After the measurement, the researchers checked the understanding and the missing answers together with the participants, to obtain more relevant data. In the second survey titled "Adapt the Living Space to the Needs of the Elderly," the questionnaire was filled out by a group of interior design experts during their visit at the participant's home. The questionnaire was divided into 7 groups according to individual residential premises and comprised a total of 121 questions. Most of the questions were related to individual elements that affect the increased security and functionality processes in homes for the elderly. The adequacy of light exposure was measured using the LUX--meter (CEM, model DT-1301).

Statistical Analysis

All data were organized in Microsoft Excel and analyzed in IBM SPSS Statistical Package, Version 20.0. Descriptive statistics, independent samples of T-test for gender difference, the number of adaptations and Spearman test for correlation between the number of living environment adaptations and quality of life (general health, physical capability, psychical condition and general quality of life) were used. P values $< .05$ were considered significant.

RESULTS

During the visit at the participant's home, we found out that only 22 % of the total of 83 respondents have appropriate task lighting. The measurements for determining the suitability was performed using the LUX meter. There is a high level of those who assessed their kitchen lighting inadequate (Figure 1).

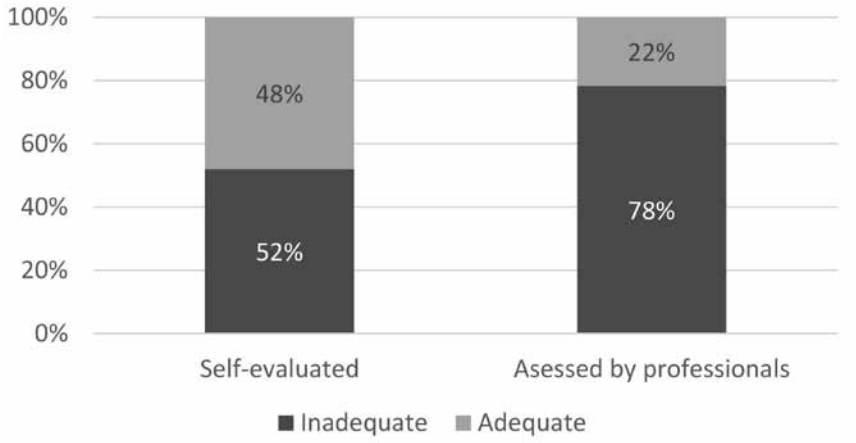

Figure 1: Comparison of adequate or inadequate lighting of working area by professional assessment criteria and self-assessed criteria.

Additionally, we have analyzed the bathroom's equipment for safety when entering into a bath tub (a step) and the shower equipment (a chair) and additional accessories such as handrails, shelves for shampoo and anti-slip mats. The results showed that 59 % of the participants have a shower and only 33 % participants reported a bath with at least one of the listed accessories (Figure 2 and Figure 3 respectively). The other 8 % did not report any ergonomic accessories. The results from the questionnaire showed that only less than 15 % of the respondents installed the handrails in the shower or either in the bath tub, which significantly increases safety when using the bathroom. From the interviews, it was evident that persons who have handrails installed were already receiving benefits by physiotherapists or occupational therapists who advised them to set up such holders. Similar results were found also with the presence of a seat / a chair in the shower.

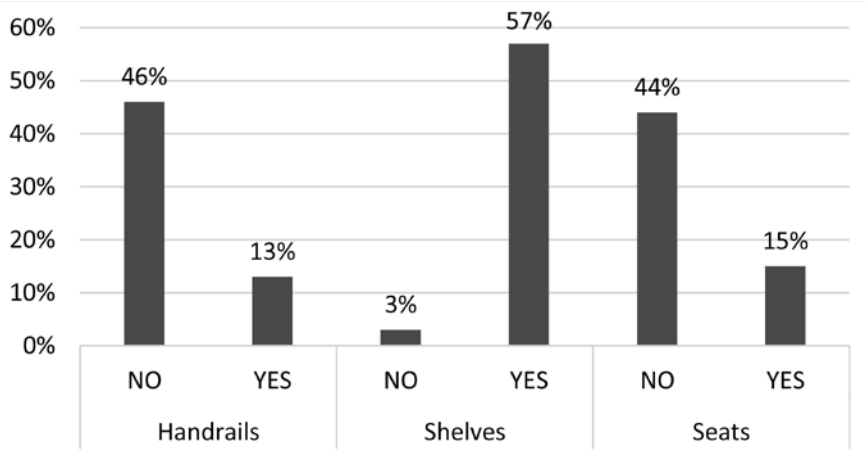

Figure 2: Number of the participants who have equipment in the shower (n = 117).

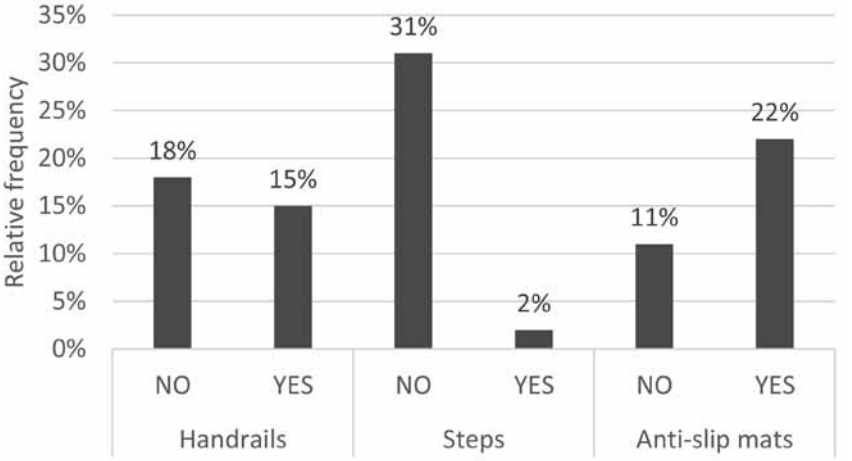

Figure 3: Number of the participants who have specially adapted equipment in the bath tub (n = 66).

Within the study, we additionally analyzed the self-assessed adequate living environment (no. of adaptations) and its correlation according to the self-assessed "Quality of Life": general health, physical capability, psychological conditions and general quality of life. The participants assessed the quality of life on the qualitative scale, in the range

from 1 − ”very bad,” 2 − “bad,” 3 − “fair,” 4 − “good,” and 5 − ”very good.” In the correlation analysis also the variables such as “education level” and “number of falls in the previous year” were included. Since bathroom is marked as a place with the highest rate of accidents, we have gathered the data of the number of participants’ adaptations of useful accessories such as handrails, shelves and seats in the shower or steps, shelves and anti-slip mats in the bath tubs, which could prevent potential falls and slips.

The number of adaptations showed us logical results in negative correlation (ρ = -.149) between the number of adaptations in the bathroom and the self-assessed physical capability, which could be argued that older adults who assessed their physical capability lower have more adaptations than those with better physical capability. Additionally, we found no correlation between the number of the adaptations with the presented variables (Table 1) and other life quality determinants. Also, there is no gender difference referring to the number of adaptations among men and women who participated in project.

Table 1: Spearman correlation of adaptations in the bathroom and Quality of Life.

Spearman's rho		**General health status**	**Physical capability**	**General Quality of Life**
No. of Adaptations in in the bathroom	Correlation Coefficient	-.036	-.149*	-.089
	Sig. (2-tailed)	.620	.039	.213
	N	197	192	198

Spearman's rho		**Psychological status**	**Level of education**	**No. of falls last year**
No. of Adaptations in in the bathroom	Correlation Coefficient	-.084	-.078	-.021
	Sig. (2-tailed)	.241	.272	.767
	N	198	198	197

Correlations were found between the characteristics of QOL, especially physical status, which were estimated better by those participants who assessed general health (ρ=.490), physical capability (ρ=.339) and general quality of life (ρ=.731), which is reasonable, and also we can confirm that those with higher education level more likely estimate psychological status (ρ=.282) and general quality of life (ρ=.246) better than those with lower. On the other hand, the variable “number of falls last year” showed us significant negative correlations regarding general health (ρ= -.260), physical capa-

bility (ρ=-.213) and education (ρ=-.148), which can be argued that older adults who are less healthy have lower physical capabilities and lower educational level are more likely to fall in the previous year.

Additionally, we can find a larger share of those with the self-assessed quality of life as "very good" and "good" and reported more adaptations in the kitchen which simplify their daily kitchen work and provide safety (automatic shutdown of the oven; lower edge of the oven at the height of the kitchen countertop and easy cleaning of the kitchen hob), which could suggest possible correlation between QOL and adaptation of furniture (Figure 4).

Figure 4: Self assessed General Quality of Life in relation to the characteristics of kitchen adaptation.

Still, a significant number of participants do not pay enough attention to the safety in the bathroom, whereas only 18 % possess the handrails, 31 % have a seat in their shower and 22 % have an anti-slip mat. For this reason, the warnings of possible accidents in the bathroom (falls, slips) should be much more highlighted. Living in unadapted apartments does not allow an independent life and could even present a danger for health.

DISCUSSION

Within the detailed analysis of ergonomic characteristics of participant's homes, we focus on two main characteristics: adequate lighting in the kitchen work area and the safety of equipment and accessories in the bathrooms. For adequate lighting, 1400 lux or more for work surface and 600 lux or more for general lighting are advised. However, a general recommendation is that the lighting of between 1400 and 2000 lux is advisable for the working surface and from 600 to 900 lux for the general lighting of kitchens for people over 65 years of age (Podlesnik, 2011). Most of the participants had too weak lighting. Our findings varied from the data in the questionnaire, where the respondents self-reported having adequate worktop lighting in their kitchen with a rather higher percentage (46 %). The results indicate that older people generally think they have sufficient lighting of their work surface, but in reality the lighting in most cases is too weak, which hinders older adults at their work and may also be a cause of accidents.

Due to the fact that older adults find it difficult to stand up for a long time, in particular while they wash their hair with their arms raised, it is recommended that a seat is placed in their shower. There are special self-supporting chairs which could even be attached to the wall. Thus, older adults can sit while showering and washing their hair without any danger to slide on the slippery floor or to fall as they might get dizzy as well. The above presented results show that only 15 % of the participants have a seat placed in their shower despite the fact that many older people have problems with balance because of poorer movement skills. To enhance the security in the shower, shelves for storing soaps and shampoos also help as deposing and bending can cause a loss of balance and lead to a fall. Here we found more promising results because almost 60 % of the participants reported having a shelf for storing cosmetics in the shower. Installing the storage shelves in the shower is simple, as they can also be fixed with the help of a vacuum; that is why a majority of the respondents have shelves in the shower, however, 43 % of showers are still without shelves. Tinetti (2003) and Tomšič & Gunčar, (2012) found out that the falls of older adults grow constantly and linearly with the increasing number of risk factors among which we also rank unadjusted living environment. That could be argued that adaptation and installing the accessories (handrails) only take place after the first fall.

Older adults are not aware enough of the potential problems encountered in their own homes, and of the existing possibilities in order to create living environment with minimal interventions that could significantly ease their living at home (Hrovatin, 2015). Older adults are often afraid of any kind of adaptation, on one hand due to the fear of high costs and on the other hand due to the fear of the organization. The fact is that even a minor adaptation, which is neither financial nor organizational problem, brings significant changes that ensure greater safety and consequently prolong an individual's independence.

With this research, we found that most of older adults from our sample do not have ergonomically adopted interior design of their home, i.e. that they live in the apartments which do not suit their actual needs. Despite the fact that there are negative correlations

between self-assessed physical capability as one characteristic of quality of life and the adaptations of equipment or accessories in the bathrooms, such as holders, shelves, steps and seats, we found that higher-assessed quality of life is more common for people with higher education. That corresponds also to higher economic status and, thus, higher standards of living conditions.

CONCLUSION

According to the research, we found that the majority of older adults in our sample live in the apartments which could prove a threat to their health and prevent successful ageing. Older adults are mostly not aware enough that they could achieve a significant level of safety and independence in their living environment with only minimal interventions or adaptations. The best time to make adjustments to achieve ergonomic interior design is immediately after the retirement, when the problems are not yet present, to avoid the fact that maladjusted interior design leads to the early loss of independence. For the safe, high-quality and independent living in particular homes, it is also very important to maintain the physical and mental fitness of older adults. The need for safe, high-quality and independent living is evident so the awareness of possible small adaptations needs to be highlighted. Being aware that inadequate living environment remains a problem among older population, we need to investigate and identify the proper strategies to ensure healthy ageing with prolonged living at home. Conscious of the potential barriers to achieve adaptation in the old people's living environment should present a further challenge in creating national strategies of health promotion for the older population. As mentioned, older adults should be aware that even minor changes in their living environment could allow them to perform everyday tasks faster, with less effort and more security, but above all, that this can prolong their autonomy and independence and contribute to the sufficient quality of life even in their »golden age.«

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