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ORIGINAL ARTICLE

ACCESSIBILITY CHANGES AND THEIR PERCEPTION BY THE ELDERLY AFTER THE COVID-19 PANDEMIC

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Summary

Introduction

Objective of this study is to describe impact of gender, age, social status, and geographic location on mobility changes during the COVID-19 pandemic within the Czechia, Hradec Kralove region, and Ostrava region.

Methods

A cross-sectional study was carried out in two regions in the Czechia: the Hradec Kralove region and the Ostrava region.

Results

The age group of seniors 85 and older was more vulnerable to these alterations than other age groups. Age had a statistically significant impact on both the frequency of trips and the mode of transportation used. Seniors' shifts in mobility were more frequently impacted by urbanization, whereas the region's impact was seen in as many as five components. Transport, Route, and Time all showed the impact of urbanization. However, the region had the largest impact.

Conclusion

There has been little evidence of the influence of age, gender, or social class on perceptions of changes during COVID-19. Research found conflicting evidence about older adults' physical activity throughout the epidemic.

Key words: Elderly; Mobility; Transportation; COVID-19; Social isolation; Survey; Society; Czech Republic

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Introduction

Seniors can benefit greatly from staying active and being able to move about freely, which extends their lives and makes them happier. Mobility in older adults closely correlates with a more active lifestyle and the capacity for regular exercise. According to statistics (1), 45.9% of women and 41.9% of men between the ages of 65 and 74 are obese. Weight gain and mobility appear to be strongly correlated, with each factor influencing the other, according to research (1). The mobility positively influences also seniors' social well-being. Seniors with mobility issues tend to stay at home more and are at risk of social isolation. On the other side, folks who maintain an active lifestyle and follow a regular exercise routine go out and engage in numerous activities and social interactions.

During the COVID-19 pandemic, all of the aforementioned have been impacted. It is necessary to understand elderly' mobility during this period of restriction because of the essential role that mobility plays in healthy aging and the impact COVID-19 has on the entire society. Furthermore, it is crucial to comprehend how continuing public health initiatives have impacted mobility.

The following factors affecting the elderly during COVID convalescence were looked into in Czechia. Shemetev *et al*.'s study (2) examines whether an increase in pandemics is associated with appreciable changes in mobility (supported by public orders to stay at home and willing decreases in movements) in the Czech various economic sectors, including parks, supermarkets, workplaces, pharmacies, transportation hubs, retail, and homes. The second question is whether or not this pattern is linked to a sharp drop in wages and jobs. Janovský *et al*. (3) determined whether there was a drop in physical activity in Czechia during the COVID-19 epidemic and, if there was, what reasons were most important. Frantal *et al*. (4) looked at mobility-related but COVID-unrelated questions. He responded to the following queries. If there are differences in the types and frequency of daily activities among different age groups, issues relating to older people's most significant time-space constraints, how age-related sociospatial isolation feels to older people, and how routine activities and sociodemographic traits relate to people's experiences of social isolation. For the initial COVID-19 wave in the Czechia, Berec *et al*. (5) created an age-structured pandemic model parameterized with epidemiological and social data. It is important to know about the effects of the COVID-19 pandemic, but it is also important to know about other things that can affect the mobility of older people in Czechia.

Objective of this study is to describe impact of gender, age, social status, and geographic location on mobility changes during COVID-19 pandemic within Czechia, namely Hradec Kralove region and Ostrava Region.

Theoretical background

The mobility of seniors is influenced by individual as well as external, environmental factors. In the study we focus on individual factors.

Individual traits, such as gender, age, health status, quality of life, monthly income, and educational attainment, have a substantial impact on older people's everyday movement. According to a study (6), mobility in older individuals' daily lives was inversely correlated with age. More particular, as persons aged, they made more walking trips but used less public transportation (7). However, despite the popularity of the car, the usage of public transport increasing as individual's pass 75 years of age (8, 9). They also revealed that compared to women, men made more journeys for business and leisure, whereas women made more excursions for shopping. In a similar vein, Legendre *et al*. (6) demonstrated that older women who were retired used public transportation more frequently than men, primarily for commuting to and from work. The number of trips taken and the distance traveled by older individuals are positively correlated with monthly income and educational attainment (10, 11). The mobility of older individuals is strongly correlated with income level, and older persons who are poor tend to participate less in activities outside the home, especially leisure activities (11). In a similar vein, folks with higher education levels are more likely than those with lower education levels to take part in social and community activities. Additionally, a number of research have looked at the connection between everyday mobility and mental health. Mental impairment was demonstrated by Dirik *et al*. (12) to be negatively correlated with mobility and activities of daily life in older persons. According to Chiatti *et al*. (13), older individuals with greater levels of mental health status walked more than 500 meters at least once each week and took the bus more regularly. Anxiety, melancholy or low mood, and stress were mentioned as having a negative impact on participants' everyday mobility in a study by Posner *et al*. (14). The relationship

between mental health and daily mobility is complex: individuals' mental health concerns can influence their capacity to travel and personal experience. The most often stated issues were avoiding travel, lack of concentration, and unsafe or hindered travel behavior (15).

Therefore, this study examines how the pandemic has affected older individuals' everyday mobility and how these changes are related to seniors' gender, age, social status, hobbies and geographic location.

Methods

Design of the Study

Quantitative research was chosen for the investigation. The cross-sectional study was based on a questionnaire survey that was carried out in the spring of 2022. The questionnaire contained both closed questions with answers on a scale and open questions with the option of own text answers. The respondents were seniors aged 65 and over (65+) from two regions of the Czechia, namely the Hradec Kralove (HK) and Ostrava (OV) regions. The study focused on both urban and rural seniors. The data was collected by the research agency STEMMARK in two ways, face-to-face interviews (PAPI) and a web-based interface (CAWI). Respondents were addressed based on quota sample selection: 230 respondents for the HK region (150 from the city and 80 from nearby municipalities) and 260 for the OV region (180 from the city and 80 from nearby rural municipalities). The research sample finally included 536 respondents (242 from the HK region, and 294 from the OV region).

Hypotheses

As a part of the study, the following eight hypotheses regarding the influence of selected determinants on changes in the mobility of seniors during the COVID pandemic was verified:

H1a: Senior men and women perceive changes in their mobility during the COVID pandemic differently.
H1b: The age of seniors affects the changes in their mobility during the COVID pandemic.
H2a: The social status of seniors affects changes in their mobility during the COVID pandemic.
H2b: Changes in seniors' mobility at the time of COVID depended on their walking lifestyle.
H2c: Changes in seniors' mobility at the time of COVID depended on their dog-walking lifestyle.
H2d: Changes in seniors' mobility at the time of COVID depended on their gardening lifestyle.
H3a: The level of urbanization affects changes in seniors' mobility during the COVID pandemic.
H3b: The specificity of the region affects changes in seniors' mobility during the COVID pandemic.

The established hypotheses can be divided into three main groups, see Figure 1. The first group of hypotheses (H1a, H1b) concerns the influence of demographic determinants, namely gender (H1a) and age (H1b). The second group of hypotheses (H2a, H2b, H2c, H2d) focuses on the influence of lifestyle, including social status (H2a), walking (H2b), dog walking (H2c), and gardening (H2d). The last third group of hypotheses (H3a, H3b) refers to the influence of geographic (location) determinants – level of urbanization (H3a) and region (H3b). In addition, the diagram in Figure 1 suggests that the dependence of the change in the mobility of seniors during the COVID pandemic on the selected eight determinants was investigated simultaneously.

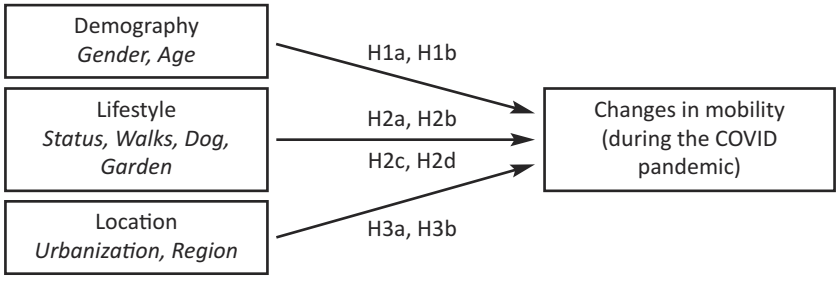

Figure 1. Scheme of Hypotheses divided to three main groups (demographic, Lifestyle, Geographic).

Characteristics of Respondents

536 respondents (seniors) completed the questionnaire. 11 respondents lived in residential facilities where there were significantly stricter restrictions during COVID. Therefore, they were excluded from the study. Furthermore, 4 questionnaires contained missing values for questions characterizing the respondent. Finally, a total of 522 (225 men, 297 women) respondents from the original 536 were included in the study. The age of respondents was determined using five age categories: 65 to 69 years (155 respondents), 70 to 74 years (141 respondents), 75 to 79 years (129 respondents), 80 to 84 years (73 respondents), and 85 and over (24 respondents). 230 (44.1%) of 522 respondents were from the Hradec Kralove (HK) region and 292 (55.9%) from the Ostrava (OV) region. 374 (71.6%) respondents lived in the city, while 148 (28.4%) lived in the village. A more precise division of the respondent's place of residence to the level of urbanization can be found in Table 1. Moreover, Table 1 provides a distribution of the respondents concerning their lifestyle. This is characterized by their social status, and relationship to walks, dog walking, and gardening.

Table 1. Characteristics of the sample of respondents (n =522).

Variable	Number	%	Variable	Number	%
Gender			*Status*		
Male	225	43.1	Alone	212	40.6
Female	297	56.9	With someone	310	59.4
Age			*Walks*		
65-69	155	29.7	I do not go	54	10.3
70-74	141	27.0	Close to the house	59	11.3
75-79	129	24.7	Nearby	257	49.2
80-84	73	14.0	Longer Distance	152	29.1
85+	24	4.6	*Dog*		
Urbanization			I do not have	383	73.4
City	374	71.6	It runs around the garden	52	10.0
Prosperous village	42	8.0	I am walking the dog	87	16.7
Typical village	37	7.1	*Garden*		
Mountain village	24	4.6	No	256	49.0
Disappearing village	45	8.6	Next to the house	159	30.5
Region			Elsewhere	107	20.5
HK	230	44.1			
OV	292	55.9			

Changes in Mobility Items

The changes in the mobility of seniors due to the COVID pandemic were assessed through six items with a four-point ordinal scale (1 - strongly disagree, 2 - rather disagree, 3 - rather agree, 4 - strongly agree). With a greater degree of agreement, respondents felt a greater degree of change in mobility. The items are introduced in Table 2 together with the obtained sample means and standard deviations (SD). According to them, there were no fundamental changes. The highest value 2.05, which was obtained for frequency of trips and non-functioning of used services, is at the level of the answer "rather disagree". The smallest change was then in the choice of route (M = 1.48).

Table 2. Overview of mobility change items.

Shortcut	Description of the mobility changes	Mean	(SD)	n
Destination	Travel destinations	1.77	(0.88)	521
Transportation	Way of transportation	1.55	(0.78)	521
Route	Route	1.48	(0.64)	521
Frequency	Frequency of trips	2.05	(1.00)	520
Time	Daytime for visits	1.80	(0.87)	521
Services	Non-functioning of the services used	2.05	(1.03)	514

Ordinal Regression

Ordinal regression was chosen considering the ordinal scale for the items of changes in mobility. In particular, the effect of gender, age, social status, lifestyle variables (walking, dog walking, gardening), urbanization, and region on mobility changes (six ordinal variables) was assessed using multiple ordinal regression with cumulative logits and proportional odds.

Answers to open questions

In order to clarify the situation during the COVID pandemic, the open answers of the respondents specifying the facts related to the change in behavior were also collected. Some selected answers are part of the results section. However, content analysis was used to analyze all text responses.

Results

Changes in mobility due to COVID – scale responses

Table 3 shows basic descriptive statistics in the form of the sample mean values in mobility changes on a scale ranging from 1 to 4 according to the eight examined categorical variables.

Table 3. Mean changes in mobility due to COVID by selected categorical variables.

Variable	Category	Destin.	Transp.	Route	Freq.	Time	Serv.
Gender	Male	1.72	1.53	1.49	2.04	1.79	2.11
	Female	1.81	1.57	1.46	2.06	1.81	2.00
Age	65-69	1.70	1.41	1.45	2.08	1.77	2.08
	70-74	1.79	1.63	1.51	1.96	1.77	2.06
	75-79	1.75	1.59	1.45	2.01	1.80	2.03
	80-84	1.78	1.47	1.48	2.10	1.85	2.06
	85+	2.17	2.00	1.62	2.57	2.04	1.86
Status	Alone	1.77	1.51	1.49	2.12	1.85	2.00
	With someone	1.77	1.57	1.47	2.01	1.77	2.08
Walks	I do not walk	1.63	1.57	1.30	1.98	1.65	1.86
	Close to the house	1.78	1.78	1.59	2.05	1.71	1.76
	Nearby	1.85	1.53	1.50	2.13	1.88	2.06
	Longer Distance	1.68	1.49	1.46	1.95	1.76	2.21
Dog	No	1.76	1.58	1.47	2.07	1.79	1.99
	It runs around the garden	2.02	1.56	1.58	2.08	1.83	2.18
	I am walking the dog	1.67	1.43	1.45	1.98	1.83	2.22
Garden	No	1.71	1.54	1.47	2.06	1.84	2.04
	Next to the house	1.82	1.48	1.45	1.96	1.73	1.98
	Elsewhere	1.84	1.67	1.54	2.19	1.82	2.16
Urbanization	City	1.76	1.58	1.50	2.12	1.85	2.12
	Prosperous village	1.74	1.57	1.45	1.83	1.60	1.66
	Typical village	1.78	1.84	1.73	2.03	2.08	2.08
	Mountain village	1.83	1.17	1.17	1.88	1.54	1.88
	Disappearing village	1.82	1.27	1.29	1.82	1.49	1.89
Region	HK	1.61	1.41	1.31	1.93	1.63	1.97
	OV	1.90	1.66	1.60	2.15	1.94	2.11

Table 4 summarizes the basic results of the six ordinal regression models (one model per column) when the dependent ordinal variables were mobility change items (Destination, Transportation, Route, Frequency, Time, and Services; see Table 2). Eight categorical explanatory variables (Gender, Age, Status, Walks, Dog, Garden, Urbanization, and Region) entered the model using related dummy (0-1) variables, where the reference categories are always the first categories listed for the categorical variables in Table 3. Specifically, Table 4 represents odds ratio (OR) estimates and their statistical significance.

Table 4. Multiple ordinal regression results for evaluating the influence of gender, age, social status, walking lifestyle, dog-walking lifestyle, gardening lifestyle, urbanization, and region on the mobility changes: Odds ratios (OR) estimates.

Variables	Destin.	Transp.	Route	Freq.	Time	Serv.
Gender: Female	1.24	1.21	0.87	1.01	1.00	0.88
Age: 70-74	1.18	1.73**	1.34	0.77	0.94	1.00
Age: 75-79	1.19	1.82**	1.22	0.92	1.12	1.07
Age: 80-84	1.23	1.26	1.40	1.01	1.17	1.12
Age: 85+	3.49***	5.72***	3.28***	3.08***	2.59**	1.33
Status: With someone	1.00	1.28	0.87	0.83	0.85	1.02
Walks: Close to the house	1.03	1.25	2.38**	1.02	0.93	0.84
Walks: Nearby	1.63	1.05	2.82***	1.46	1.83**	1.65
Walks: Long distance	1.43	1.11	3.14***	1.09	1.66	2.20**
Dog: In garden	1.79*	1.17	1.62	1.63	1.53	2.20**
Dog: Walking with it	0.81	0.76	0.88	0.87	1.09	1.47*
Garden: Next to house	1.02	0.83	0.81	0.97	0.84	0.87
Garden: Elsewhere	1.34	1.21	1.13	1.37	1.01	1.07
Urbaniz.: Prosperous Village	1.06	1.21	1.29	0.58*	0.77	0.59
Urbaniz.: Typical Village	1.00	1.51	2.17**	0.85	1.68	1.07
Urbaniz.: Mounting Village	0.98	0.26**	0.25**	0.59	0.39**	0.49
Urbaniz.: Disappearing Village	0.89	0.35**	0.47*	0.44**	0.39**	0.52*
Region: OV	2.14***	2.39***	2.88***	1.55**	2.09***	1.39*

Note: The number of stars indicates a statistically significant result at the significance level *** 1%, ** 5%, * 10%.

Table 5 gives p-values for the significance of individual investigated categorical variables (as a whole, together for all corresponding dummy variables) within the six considered ordinal regression models (one model per row). We can see that the perceived change in mobility does not depend statistically significantly on gender, social status, and gardening. Thus, the data do not support hypotheses H1a, H2a, and H2d.

Table 5. Multiple ordinal regression results for evaluating the influence of gender, age, social status, walking lifestyle, dog walking lifestyle, gardening lifestyle, urbanization, and region on the mobility changes: p-values of the likelihood-ratio tests.

Item	Gender	Age	Status	Walks	Dog	Garden	Urbaniz.	Region
Destination	0.221	0.087	0.983	0.238	0.103	0.410	0.996	<0.001
Transportation	0.306	0.001	0.202	0.938	0.458	0.480	0.003	<0.001
Route	0.466	0.137	0.491	0.015	0.330	0.585	0.001	<0.001
Frequency	0.973	0.033	0.277	0.293	0.202	0.309	0.125	0.012
Time	0.987	0.193	0.375	0.050	0.440	0.750	0.006	<0.001
Services	0.448	0.960	0.909	0.008	0.023	0.728	0.127	0.063

The results of the analysis demonstrate that age had a statistically significant effect on the choice of modes of transport ($p = 0.001$) and the frequency of trips ($p = 0.033$). Seniors aged 85+ were more susceptible to these changes than other age groups. Hypothesis H1b was therefore only marginally supported.

The influence of the walking lifestyle was manifested in changes in routes ($p = 0.015$), the time of day of visits ($p = 0.050$), and the possibility of services used ($p = 0.008$). The assessment of changes in the last item also depended on the respondent's lifestyle regarding dog walking ($p = 0.023$). Those who took long walks or had a dog were "more critical" of closing the services they used. Hypothesis H2b was partially verified and Hypothesis H2c was only marginally supported.

Considering Hypotheses H3a and H3b, urbanization and especially region had a more frequent impact on changes in the mobility of seniors. The effect of urbanization was detected in three items (Transportation, Route, Time), while the effect of the region in even five items (excluding Services). Odds ratio estimates (Table 4) suggest that greater changes occurred in region OV versus HK. Of all the hypotheses, Hypothesis H3b was most supported by the data.

Changes in mobility due to COVID – open responses

As part of the research survey, respondents had the opportunity to express themselves with free answers about what changes occurred during the COVID pandemic and whether they considered them significant. 316 respondents answered this question, with 84 (26.6%) of them saying there was no significant change. 232 respondents indicated from one to four different types of changes. 313 partial answers (changes) were thus found. After excluding obvious pandemic changes, 193 partial responses were finally analyzed. Based on the content analysis, three basic areas of changes were identified (Table 6), namely physical (72.5%), psychological (25.9%) and technological (3.1%).

Table 6. Distribution of identified types of changes during the COVID pandemic.

Area	Number	Percentage (Total)	Percentage (Area)
1 – Physical	140	72.5	100.0
Services	76	39.4	54.3
Mobility	42	21.8	30.0
Regime	22	11.4	15.7
2 – Psychological	50	25.9	100.0
Social contact	44	22.8	88.0
Others	6	3.1	12.0
3 – Technological	3	1.6	100.0

Among the most frequent answers were: limiting visits; fewer trips to shops for the purpose of shopping; reduced attendance at restaurants; more use of one's own vehicle; and a reduction of public transport. Restrictions also occurred in the case of services, when respondents commented on lower attendance at hairdressers, theater and culture in general, sports venues, and doctors. There was a focus on greater contact with family, trips to the cottage, and spending time in nature. The respondents expressed themselves in the following way:

"I missed the library's closing."
"I go to the theater less for visits."
"I go out less often and for shorter periods of time."
"We stopped going to big stores where there are a lot of people; some groceries are brought to us by children."
"I couldn't go to the hairdresser; some of the shopping was done for me by the children."
"I couldn't visit a closed restaurant; I missed hanging out with friends."

It can be said that people felt uncertainty and fear; the time of the pandemic changed the frequency of shopping; previously, people went for smaller purchases more often, and now they prefer one big purchase a week. People reduced their overall use of services and focused, if possible, on family support, cottage visits, and nature walks.

Discussion

Objective of this study was to describe impact of gender, age, social status, and geographic location on mobility changes during COVID-19 pandemic within the Czechia and to the chosen regions. The results of the analysis show that age had a statistically significant impact on both the frequency of trips and the mode of transportation used. The age group of seniors 85 and older was more vulnerable to these alterations than other age groups. The walking way of life had an impact on the routes people took, the times of day they visited, and the services they would use. The respondent's lifestyle with reference to dog walking was also taken into consideration while evaluating the improvements in the last item. People who enjoyed lengthy walks or had dogs were "particularly critical" of the services being discontinued.

Seniors' shifts in mobility were more frequently impacted by urbanization, and particularly by region. Transport, Route, and Time all showed the impact of urbanization, whereas the region's impact was seen in as many as five components. Seniors in OV region perceived more modifications than HK region. In general, there has been little evidence of the influence of gender, age, or social class on perceptions of changes during COVID. Only between cities and municipalities, and mostly between regions, are there differences.

Overall, it can be said that the changes that occurred during COVID were mainly on the physical level, i.e. with a direct impact on mobility, health and the use of services, and on the psychological level, i.e. limiting social contact, and in the development of some psychological problems (fear of illness, fear of infection, frustration, more health concerns, health effects and fear of vaccination).

These findings contradict the research of Janovský *et al*. (3) who found that 33% of the 204 participants had increased levels of physical activity in the period following the COVID-19 pandemic outbreak in Central Europe. We found that the size of the city where the seniors lived and the social status did not affect the general level of physical activity. Zipprich *et al*. (16) and Nascimo (17) at their research showed that growing older was linked to declines in function-ality, vitality, and mobility. A few research (18–21) showed changes in daily goals and routines. Several research (15) found that people's behavior changed, including buying more food and water than normal, going out less, cutting back on social interactions, and avoiding public spaces. Older individuals' unemployment increased, but at a slower rate than it did for other age groups (22). Less sexual activity was linked to older age (23). There has been less physical activity reported in certain research (24) as well as less people attending seminars on physical exercise. However, research found conflicting evidence about older adults' physical activity throughout the epidemic. Indeed, it was found that older adults had the lowest levels of physical activity among all age groups (25). However, they also had the lowest rates of insufficient physical activity, the smallest increases in physical activity (25), and the lowest likelihood that their levels of physical activity had changed as a result of the pandemic (26). Additionally, physical activity has been linked to improved resilience, upbeat mood, and fewer depression symptoms. Additionally, it was noted that the decrease in unhealthy movement behaviors was less pronounced among older persons (27).

Conclusions

The conducted study points to the relationship between the environment, mobility and autonomy of the elderly. Identified changes in the behavior of seniors based on the pandemic experience may have a wider impact and consequences on the health and well-being of seniors. To summarize our results, seniors' opinions about mobility changes during COVID-19 pandemic in both regions are different, and more changes in destinations, transport mode, routes, frequencies, and time of day are perceived in Ostrava region. Also, the type of urbanization influences perception of changes in transport mode, routes and time. Contrary, gender, social status or gardening do not seem to modify any perception of changes. It indicates the environmental common factors (where senior live) should play more important role than individual, personal factors.

From this point of view, community planning in the regions with an emphasis on the spatial solution of service-ability is of great importance and role. This requires the cooperation of a number of state and local government bodies, transport companies and technical services. The availability of health care services, which falls under the Ministry of Health, must not be neglected either. This research could also help military health care providers

increase older adult health care access. This could involve offering telemedicine services, enhancing transportation, and helping older persons get health care. Military healthcare providers can improve patient-centered treatment by studying older individuals' health care experiences. This could involve personalizing services to older individuals' needs and preferences, enhancing health care professional communication and coordination, and including older adults in care decisions.

When making decisions about the implementation of social isolation measures, it is crucial that decision-makers and governing bodies comprehend the demands of older adults. To guarantee that senior citizens can maintain social connections, family relationships, and the capacity to offer or receive assistance during this pandemic or similar difficult situation which are connected with isolation, individual, organizational, and institutional initiatives should be implemented. To promote social contacts despite isolation and protective measures, the efficacy of various tactics, such as increasing accessibility to communication technologies, offering technology usage training, and supporting technical developments, should also be evaluated. During pandemics and other emergencies, social isolation techniques for older persons may be tested. Technological, community-based, and personalized solutions can help socially isolated older persons. Future studies could assess the efficacy of different therapies and determine which work best for older adults. Older people may have trouble getting social help due to mobility or technology challenges. This research could examine these obstacles and find solutions. Finally, engaging older folks, ensuring meaningful engagement, and removing barriers to participation has been shown to benefit decision-making. Future research should examine co-design methods for incorporating older persons, recognizing and ranking their needs, and implementing co-designed services.

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Conflict of Interest

The authors declare that they have no conflicts of interest regarding the publication of this article.

Adherence to Ethical Standards

The research was approved by the ethics committee for science of the University of Hradec Kralove on 14th November 2021 as No. 14/2021.

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