University Students' Knowledge about Welfare Technologies within Active Aging Concept: An Online Survey Interview

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Abstract

Welfare technology has made a significant impact on society, supporting people´s communication, independence, and day-to-day living. This study aims to investigate university students' knowledge of welfare technologies related to smart active aging. The research was guided by the following questions: 1: What do Slovak university students know about welfare technologies? 2: How are welfare technologies used in the households of university students and their relatives? An online interview survey with reflexive thematic analysis was conducted with 120 university students at two universities in Slovakia. Findings show four themes that were identified: (1) Different interpretations of welfare technologies. (2) Broadening students' knowledge about welfare smart technologies. (3) Attitudes towards smart and welfare technologies. (4) Gap in practical usage of welfare technologies. Welfare technology is a new topic connected to active aging. Primarily, the younger generation, as proved, has low knowledge on this theme. The novelty of the study lies in connecting the welfare technology concept with the education of the younger generation. Welfare technologies have the potential to promote positive intergenerational relationships, autonomy, and mental and physical well-being among older adults. As for improvements, smart active aging and welfare technology concepts should be incorporated more intensively into higher education. This would help curb the knowledge gap and ensure the development of skills for implementing welfare technologies in the daily lives of their elderly relatives.

1- Introduction

The increase in life expectancy has raised concerns about how societies can accommodate aging populations while promoting healthy and active lifestyles. Active and healthy aging and living in smart environments refer to creating the environments and opportunities that enable people to be and do what they value throughout their lives, making use of technology and innovation to help older adults live independently, and promoting physical and mental well-being [1]. The rising proportion of elderly people in the population is bringing new challenges connected to the introduction of new technological solutions for letting them live healthy and safe at home. Among these technological solutions belong information communication technology or welfare technology.

In recent years, the concept of smart active aging has gained interest as a potential solution to the question of accommodating an aging population [2] and how to take advantage of the increase in welfare technological use by older people. Cozza et al. [3] and Frennert [4] also described different forms of welfare technology that aim to enhance quality

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of life for older adults, facilitate their access to healthcare, and ensure their safety, thus helping them maintain their independence; these aids include personal alarm systems, GPS trackers, assistive devices, mobile applications, wearable devices, smart home systems, and telecare. There exist a wide variety of different welfare technology solutions to influence the health of the elderly living at home. Several studies show the potential of welfare technology for improving the elderlies´ health, empowering them, and reducing the workload on health care providers [5]. According to the Nordic Council of Ministers [6], welfare technology for older adults can be characterized as smart or digital technology used to maintain or increase the security, activity level, participation, or independence of people with disabilities, e.g., older people. Melting & Frantzen [7] added that in many cases, welfare technology solutions are able to prevent the need for services or admission to an institution; they can facilitate and be useful for smart active aging. Welfare technology is a growing area of research due to the increase in the aging population [8]. Welfare technology in this study is used as an umbrella term that covers different types of technologies.

The term welfare technology is used mostly in Scandinavian countries [9], and it is little known and rarely used in other countries. Welfare technology is regularly defined as "technological assistance that contributes to increased security, social participation, mobility, and physical and cultural activity and strengthens the individual's ability to manage himself in everyday life despite illness and social, psychological, or physical impairment". It is an overarching concept that includes technologies from low-tech to high-tech (e.g., technology for security, ICT, and telecare services). As stated by Rasouli et al. [10], welfare technologies are in foreign countries denoted as "assisted technologies" or often referred to as "active and assisted living technologies". They save time, cost, and personnel; they also improve independence, life quality, and health management on a day-to-day level.

Monitoring the views of the younger generation, and observing their understanding of the older generation, aging and welfare technologies, is necessary in relation to the demographic changes that are in action. Barrueco et al. [11] stressed that active and healthy aging should be presented as a new social and technical challenge for university education. They further stated that technological advances require a change in the educational paradigm; students, as future workers, need to acquire a range of transversal skills from the fields of health, communications, and information technology through collaborative and problem-based learning as well as through active and experiential learning tools. University students, especially those studying health-related courses or those who will be working with the older population in the future, should have a good knowledge and understanding of smart active aging and welfare technologies. They could play a pivotal role in the introduction of welfare technology to older adults and be conversant with the advantages and disadvantages of using welfare technology in care settings.

The current research is focused mainly on the investigation of active aging and welfare technology from the perspective of the elderly population [5], professional workers with the elderly [10, 12, 13], or students in specific study fields [14], but not the general university students' population.

Limited research has explored the knowledge gap on smart active aging and welfare technologies among university students. These studies reveal that university students know the usefulness and potential benefits of welfare technologies and devices, but they also have concerns and lack the necessary knowledge and skills to implement these technologies effectively [15, 16]. While some studies show that, overall, students have a positive attitude towards technology, they are shown to have a limited knowledge of how to use it in healthcare settings. Other studies [17, 18] highlight the critical role of technological literacy in the successful implementation of welfare technologies.

The aim of the study is to investigate the university students' knowledge of welfare technologies and their usage in the students' households and families. Based on the study of literature as well as the discussions with university students, we characterize the concept of welfare technology and explore the views and knowledge of students and the practical usage of welfare technologies among them. In the conclusions, we intend to present proposals for the implementation of welfare technology concepts related to active aging in higher education and point out the themes that deserve further investigation and solutions.

1-1- The Conceptual Framework

Andersson [19] defines welfare technology (also called assistive or healthcare technology) as technological assistance that improves safety, security, social participation, mobility, and physical and cultural activity and enhances people's ability to cope with illness and social, mental, or physical disability in everyday life. Welfare technology can also improve the availability, resource utilization, and quality of services and provide technological support to family members. Examples of welfare technology include e-walkers, power wheelchairs, hearing aids, visual aids, internet services, video communication, and technological support for reminders and structure in daily life, all of which promote greater activity and participation in society. For greater independence, mobility aids and cognitive aids (such as medication reminders) can be helpful, as can products for the remote control of televisions, lighting, and automatic doors. The report describes information and communication technology (ICT) services and products that make it easier to shop, bank, and deal with authorities, and highlights mobile applications developed to support people's daily lives, such as hearing or visual aids. Andersson also notes that apps with pictograms can help people with cognitive impairments to communicate [19].

Thus, this study aims to investigate university students' knowledge of welfare technologies related to smart active aging. The research study was guided by these questions:

RQ 1: What do Slovak university students know about welfare technologies?

RQ 2: How are welfare technologies used in the households of university students and their relatives?

2- Material and Methods

2-1- Study Design

Online survey interviews (also called electronic interviews, survey interviewing, and e-interviews) were conducted and analyzed using reflexive thematic analysis [20–23]. A semi-structured online survey interview guide was created to investigate university students' views on older adults and their knowledge of welfare technologies related to smart active aging. Online qualitative survey interviews are open and flexible, allowing for a comprehensive exploration of research questions and a deeper understanding of social issues that may be sensitive for those interviewed [20]. In Slovakia, some participants are reluctant to be part of qualitative face-to-face interviews with researchers because of fears that the recordings of the interviews might be misused later. In addition, the expression of personal opinions is not common in Slovak culture, especially in the teacher-student or doctor-patient relationship. The researchers, therefore, chose online survey interviews to ensure the participants did not feel uneasy or compromised. Online qualitative surveys are affordable and readily available for large, geographically distributed groups; participant numbers for student projects can range from a lower end of 20–49 to an upper end of well over one hundred [24]. Curriculum innovation in health professions education, as well as in the social sciences and humanities, would benefit by being informed by students' feedback.

Participants fulfilled an online survey interview and were guided by open-ended questions, such as: *What is your understanding of the term 'welfare technologies'? Which technologies aiding independent living are applied in your home? What is your general opinion on welfare technologies and how they can be used to make everyday life easier?*

2-2- Context of Study

This study was conducted at two public universities in Slovakia, one located in the west and the other in the center of the country. Both universities collaborated on the project 'University Enhancing Smart Active Aging'. A total of 200 online survey interviews were conducted from October 2023 to December 2023, with two reminder emails sent. The response rate was 60% (n=120).

2-3- Research Design and Instrument

The research instrument used for this online survey interview consists of several parts. Section A provides demographic details such as age, gender, education, and study program; Section B focuses on the participants' perception and understanding of welfare technologies; and Section C examines the use of welfare technologies by the interviewees and their families.

Each of these sections was made up of 15 open or combined questions. Face validity of the online survey interview was achieved by a review of its format and content by university researchers, along with a pilot test comprised of 11 students who were not included in the main study. Figure 1 shows the flowchart of the research methodology through which the objectives of this study were achieved.
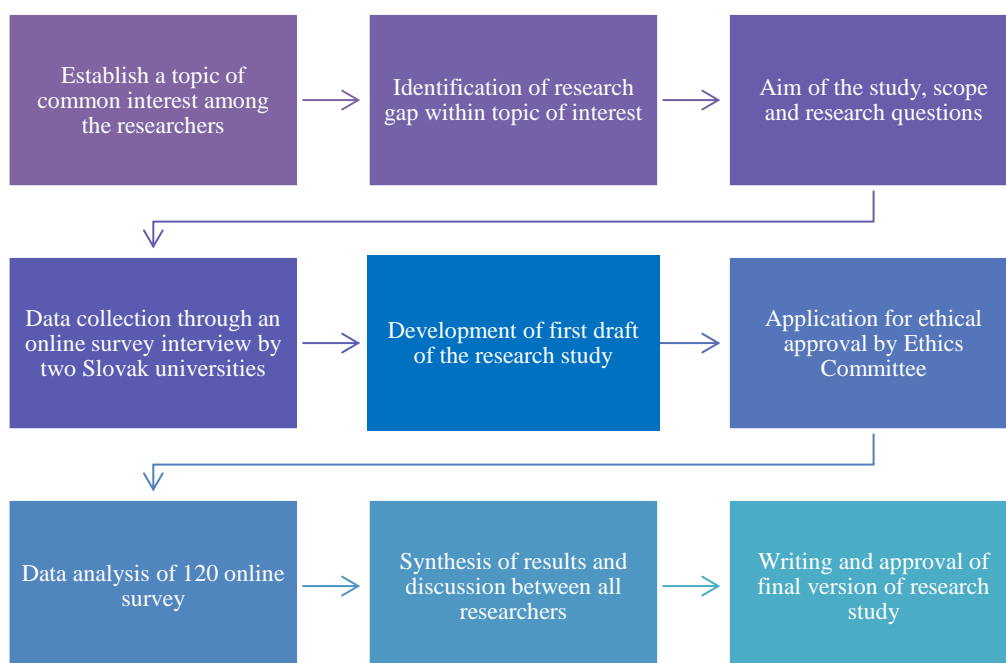

Figure 1. The flowchart of the research methodology

2-4- Participants and Procedure

The sample was recruited from undergraduates at two public universities in Slovakia, Europe; participants were recruited through email and snowball sampling by two of the researchers (T.S.Z., J.S.). A new email address was created for completed online surveys, to which a third researcher from a different university (L.J.) had exclusive access. The online survey interview was sent by email to 200 students between October and November 2023; 120 university students (84.16% women and 15.84% men) voluntarily and anonymously completed this survey. After nine weeks of point analysis and after receiving two kindly-written reminders where necessary, the total response rate was 60%. The online survey interviews were reviewed, coded, and organized by field and provided to a fourth independent researcher. To ensure validity, credibility, reliability, and objectivity, the four researchers (T.S.Z., J.S., L.J., and M.T.) are from four different universities; all these researchers participated in the analysis, and the results were discussed in three online meetings during January and February 2024.

2-5- Data Analysis

The online survey was analyzed using reflexive thematic analysis [25]. Thematic analysis is an approach to analyzing qualitative data that leads to developing themes that reflect the data and is performed as follows: (1) Become familiar with the data. (2) Generate codes. (3) Construct themes. (4) Examine potential themes. (5) Define and name the final themes. (6) Write a report [26]. The online interviews were originally written in Slovak, then translated into English and discussed by all researchers to ensure validity and reduce translation bias (Table 1).

Table 1. Example from coding through potential themes to final themes

Coding	Potential themes	Final themes
Smartphones, computers, tablets, smart technology, ICT	ICT tools	Misinterpretation and diversity of interpretation of welfare technology
Communication, digitalization of public institutions, online announcements	Support of communication	
Compensatory aids, robots, smart technology, internet, online shopping, to be informed, brain training, education, pension, financial support	Support of aging by modern technology and compensatory aids	
Automated devices, smart technology, internet, social networks, online banking, payments, shopping, smart watches, smart phones, traffic aids	Welfare technology seen as various automated and smart solutions	
Work/life help, household appliances, robotic vacuum cleaner, robotic lawnmower	Saving time	
Health care, technology in hospitals, improving health, medicine, home care	Increasing health safety	

2-6- Ethical Issues

The study obtained ethical clearance and a research permit from the project promoter, the University of Ss. Cyril and Methodius in Trnava, Slovakia, with the reference number FF-EK-2-2023. The online interview survey included a cover letter informing the students about the research study and guaranteeing the anonymity and confidentiality of the participants and their data; it also provided contact details for those who needed further information before deciding to participate, or who wished to be kept informed of the results of the study. Students had the option of returning the online survey interview and could withdraw from the study at any time without affecting their relationship with the university; however, returning the online survey interview implied consent to participate.

3- Results

3-1- Characteristics of Participants

In total, there were 120 (100%) participants, of which 101 were female and 19 were male. Table 2 shows the distribution of age, the level of study, and the study programs of participants.

Table 2. Participants' demographic and study characteristics

Variable	Participants
Age groups	*N/%*
18-20	30 (25.00)
21-23	35 (29.17)
24-26	8 (6.67)
27-30	8 (6.67)
>31	39 (32.50)
Level of the study	
BA.	101 (84.16)
MA.	18 (12.5)
PhD.	1 (0.83)

Major	
Psychology	46 (38.33)
Education/Pedagogy	16 (13.33)
Social work	24 (20.00)
Foreign languages	15 (12.5)
Humanities / not further specified	19 (15.83)

3-2- Diversity of Interpretations of Welfare Technologies

Participants provided various answers to questions aimed at their definitions of welfare technology. Answers were put into the following nine categories: (1) Technology and technological solutions that are helping people in general. (2) Smart technologies and the usage of ICT in general. (3) Informatization and electronic communication with public bodies. (4) Devices facilitating work/life. (5) Technology facilitating medical and health care. (6) Internet and social media, communication means, and technology. (7) Technological solutions help older adults. (8) Banking, payments, and shopping. (9) Respondents were unable to explain the concept of welfare technology.

Most participants understand welfare technologies as described in category one, followed by category two. There were also several responses appertaining to category eight. However, only two answers were connected to category seven. Selected quotes are shown in Table 3.

Table 3. Diversity of interpretations of welfare technology by university students

Potential themes	Quotes from participants
Helping people in general	P1: ...technologies that benefit everyone. P23: ...all technological means that are conducive to the well-being of people... P34: Technologies available to the public, free of charge and serve to improve people's lives. P35: ...technologies that will help humanity move into the future. P77: Technologies (devices, instruments, applications, etc.) that serve not only a specific individual but also society at large. For example, traffic lights as signalling devices to ensure traffic flow - they serve both drivers and pedestrians.
Smart technologies and information communication technologies	P46: The use of telephones, smartphones, computers, communication through technological devices, facilitating life in today's technological age. P50: ...automated technological devices e.g., ATMs, water dispensers... P108: ...welfare and smart technologies are the same...
Informatisation and electronic communication with public bodies	P66: Apps like timetables or something like community radio where information is posted about where to go when a natural disaster happens. P68: ...making life easier, communicating with public administration...
Facilitating work life	P100: ...modern technologies that can make work easier...
Facilitating medical and health care	P82: This is a health-useful technology. P90: Technologies that are useful to the public - used in homes and hospitals. P118: ...services and healthcare...
Internet and social media, communication means and technology	P36: ...free Wi-Fi in towns/villages - but must have sufficient speed. Free calls to necessary institutions (emergency services, 112, etc.) P42: ...internet, social networks, email etc... P102: ...computers, mobile phones, internet...
Helping older adults	P50: ...helping older adults to educate themselves. P105: ...those that help older adults in the present...
Banking, payments, shopping	P110: Technologies that make life easier for most people, e.g. smart watches/phones that can be used to pay for purchases. P111: ...banking, payments, online shopping...
Do not know	P1: ...until I read the other questions, I had no idea... P18: ...probably nothing in particular... P107: I have no idea what welfare technology might be.

Misinterpretations, such as confusing the terms 'smart' and 'welfare technology', occurred when interpreting the understanding of welfare technology. The terms 'smart technology', 'smart welfare', and 'welfare technology' may give the impression that they are synonymous. However, a deep understanding of the meaning, content, and usage of individual terms in the digital world is necessary to avoid misunderstandings and improve education in society. Young university students, like older adults, require further education, particularly with the increasing importance of digital competencies and technological advancements.

It is evident that university students associate welfare technology with various forms of assistance throughout life. While they demonstrated creativity in their interpretation of this concept, their views were often not thought through in any depth. P1's claim that *"...technologies benefit everyone"*, or P100 stating that *"...modern technologies make work easier…"*, are not entirely accurate statements as they do not consider individuals on the margins of society - those with functional limitations, low digital literacy, or from social and economic poor backgrounds. It is important to note that the digital revolution has significantly impacted traditional life, affecting both older adults and university students. As a result, some individuals may not have a clear understanding of welfare technology, its purpose, and its benefits. This result needs to be further solved through the proper education.

3-3- Broadening Students' Knowledge about Welfare Smart Technologies

Results connected to welfare technologies showed a low level of knowledge about the existence of online platforms for older adults. From the overall number of participants, only 11 answered that they were aware of such platforms, and some of these students could not specifically name the internet platforms or web pages. Their answers were very general, such as: …*"websites, browsers"* (P2); …*"internet, apps, smart technologies"* (P64); …*"applications, computer"* (P90);...*"Facebook"* (P92);…*"English language learning via smartphone"* (P95);…*"call for help"* (P99);...*"internet, mobile trolleys, medicine dispenser, TV remote controller"* (P88);...*"rescue bracelets"* (P101);…*"internet dating"* (P1);... *"University of the Third Age"* (P115); and, incorrectly,…*"training, libraries"* (P110). Formal education about smart technology is limited, and most of the information available to students comes from personal research or news and media coverage. However, there is a significant knowledge gap in this regard.

Interest in greater awareness of technologies for the safety of older adults was presented by 17% of participants; smart devices for home life, assistive technologies, and devices were expressed by 16% of participants; 16.5% have an interest in the field of rehabilitation and disease management; robots and automation as an aid in personal life was presented by 11.5% of participants; 11% expressed interest in digital solutions and smart homes; 10% are interested in knowing more about digital online (or mobile) platforms for older adults; 17% are interested in technologies to increase activity and opportunities to engage in social life; and only one student (less than one percent) has no interest in any of the above-listed areas. These results demonstrate the lack of knowledge about welfare smart technologies among university students, but also their interest in learning new information in certain areas.

3-4- Attitudes towards Smart and Welfare Technologies

The attitudes of university students toward smart technologies, and how they can be used to make everyday life easier, varied from positive through neutral to negative. Among the positive attitudes P2 stated: *"…it is certainly important that we try to use today's digital age for good and to help us in our daily lives…it will be closer and more natural to the next generation."* Several participants concluded that it would be probably not possible to live without smart technology in this day and age. P5 answered *"I use them, and I support their usage."* P54 stated that *"I perceive smart technologies very positively; they can certainly serve a person well."* Other positive statements: P3: *"I don't know many of them, I personally use mainly mobile phone, remote controls, but I think all the products listed in this survey are also important and can be really helpful."* P11: *"Nowadays, it's probably not even possible to live without smart technology."* P55: *"I see them positively; it's our future, and even they are necessary for a modern society."*

Negative attitudes were expressed as for example: P69 emphasized that *"We've got lazy, and we're too spoiled. Technology does everything for us. Our brains are not forced to remember information and are not stimulated as they should be. I'm not happy with that."* P83 holds negative views of smart technology: *"It's a step sideways, and I'd like the world to slow down rather than speed up. I see [technological solutions] more negatively because they bring a glut of information, which leads to a lot more time being wasted sorting out the right information from the wrong, the trustworthy from the untrustworthy, etc."* Also, P97 added, *"I rather think that they harm us physically and psychologically more than they make our lives easier."* Neutral opinions expressed by the participants included the following examples of statements: P22: *"Both technologies make life easier and enslave."* P39 stated *"Everything must be taken in moderation."* P46 noted that *"on the one hand, it is useful, making life easier; on the other hand it spoils people's cognition, intelligence, and social skills."* P47 pointed out that *"Technology is a good servant but a bad master."* P10 emphasized that *"Sometimes they are useful and sometimes not."* P15 answered, *"I have no opinion; I am not interested in technology."*

3-5- Gap in Practical Usage of Welfare Technologies in Slovak Students´ Households

Regarding the application of welfare technologies to enhance security in participants' home environments, the solution with the strongest representation was found to be mobile phones (64%). Entry video systems/monitoring webcams - and, in a separate category, a security alarm - each accounted for only fourteen percent. Only eight percent of participants' families are reaching out to other solutions to enhance their security; many of the interviewees indicated there were no security technologies used in the participants' households, nor other technologies (such as a CO2 detector) in the house. One cited answer was: *"I've got a dog, a tall gate, and an intimidating daddy"* (P13).

The most popular technologies for facilitating independent living that are used in the participants' homes include remote controllers for devices such as televisions, lighting, blinds, air conditioning, automatic doors, etc. (47%), followed by ICT services that enable online shopping, e-banking and contact with the public institutions and authorities (37%), mobility aids (7%), and cognitive aids such as medication reminders (6%). Three percent of the responses stated that no technological solutions were in use.

The highest proportion of technologies used by participants' families were ICT services that support communication with their relatives or social care staff (42.5%), followed by compensatory aids for different types of disabilities (23%), motion detectors (9%), and lifting devices (2.5%). Answers in the category "Other" are represented at 23% and included four answers: tablet computers, retirement home, mobile phone, and internet; the rest of the answers indicated no techno-solutions usage.

Technologies supporting daily life in the participants' homes are represented by mobile apps developed to support people with hearing impairments (25%), followed by mobile apps developed to support people with visual impairments (14.5%) and apps containing pictograms that can assist people with cognitive impairments to communicate (14.5%). Forty-six percent of the university students gave answers in the category "Other" (58 participants). Among these answers, 41 participants indicated no techno-solutions usage in their homes, four participants did not know how to answer, and other solutions being used in participants´ homes (13 answers) were listed as follows: remote controls for electrical appliances; reminders in mobile phones; ICT services; smart home appliances; an insulin pump; and a personal safety alarm for older adults. Some of the answers connected to the use of welfare technology to support everyday life were, for example, as follows: P10 appointed to *"Remote controls and security video cameras.* P11 answered, *"We use reminders on mobile phones."* P13 *"We use only heating and air conditioning."* P24 stated, *"We use smart blinds, washing machines, and robotic vacuum cleaners."* P71 answered *"temperature adjustment on the gas boiler."* Among the personal safety alarms, P73 stated, *"First aid button - Samaritan."*

To sum up the results connected to the practical usage of welfare technologies, the results show that 34% of the participants do not use any techno-solutions supporting daily life in their homes. Technologies used by the students are mainly phones and ICT, which support communication with others. Students in general associate technologies enhancing security in participants' home environments with mobile phones, and the most common technologies for facilitating independent living used in the participants' homes include remote controllers for various devices. Other specific welfare technologies are used at a smaller rate.

4- Discussion

This study explores the issue of smart active aging with welfare technologies through the prism of the knowledge, perceptions, and attitudes of Slovak university students towards welfare technology. University students tend to have limited exposure to smart active aging concepts and often lack essential information on how to use and implement welfare technologies effectively. Some of the factors that may affect their knowledge gap include a lack of exposure to technology, inadequate training, and limited research in this area. Except for one respondent, all the students indicated an interest in developing their knowledge in some of the areas of welfare technologies. This can be explained by the presumption that the students are not fully familiar with the concept, which is supported by our results, which indirectly prove the low level of students' knowledge.

The results of our study are relevant to the National Programme for Active Aging for the years 2021–2030 [27] (hereinafter referred to as 'NPA') and its target group (older adults) and investigate themes that are pertinent to the stated NPA goals. Area 1 of the NPA—Support for active aging from a family perspective—included the goal (number three) of 'creating conditions for the retention of older adults in the home environment through the development of community social services. Area 2—support for human resources in the life cycle—included the goal (number two) of the 'implementation of digital skills development programs for older people within the digital coalition and through IT'. The future professionals of various fields of study involved in our investigation—today's students—thus correspond to Area 2 and goal four, namely: the need for qualified human resources working with the target group of older people in the field of silver digitalization.

As a foundation for investigation into the actions taken by students at Slovak universities, we referenced the established strategies by Nordic Ambient Assisted Living—Welfare Technologies for Active and Independent Living at Home in Norway. These strategies were put into effect in 2019 by the Nordic Council of Ministers, focusing on diverse aspects of smart active aging by using welfare technology. Nordic Welfare Solutions seeks to showcase Nordic health and welfare technologies and strengths concerning the future of health and care services [6].

In the future, preserving the current standard of care will pose a challenge, and welfare technology could potentially offer a solution to alleviate the projected care crisis. The public healthcare system is being shaped by new public management principles, such as prioritizing "what can we afford?" over "what are the patients' needs?" with less emphasis on questions regarding patients' rights and healthcare providers' ethical responsibilities.

Different interpretations of welfare technologies by Slovak university students were identified. The majority of the answers included perceptions of welfare technology as various technological solutions and smart technologies in general, but there were also respondents unable to explain the concept of welfare technology. Only a few students understand welfare technology more specifically, as defined by Pajalic et al. [5] as "solutions to influence the health of the elderly living at home". One of the study's results demonstrated that participants grasp the concept of welfare technologies in a broader context, aligning with commonly used descriptions in relevant literature [6, 19, 28], yet some university students lack prior knowledge of the concept. In light of this discovery, welfare technology promotes innovative solutions that enhance the quality of life for individuals requiring care and support, regardless of their age or specific impairments. Innovation in welfare technology is increasingly crucial as the European welfare system grapples with challenges and mounting pressures. The rising life expectancy coupled with declining birth rates are just a couple of reasons illustrating why our future welfare will rely on innovative technological advancements. The primary goal of welfare technology as a focal point is to foster innovation that aids individuals of all ages with impairments, irrespective of the nature of the impairment, in becoming more self-reliant and independent in their daily lives [28]. As indicated by the participants in accordance with Sánchez et al. [29], welfare technology is viewed by older adults as a valuable enhancement for future households.

Our investigation shows that there are gaps in knowledge about welfare technologies, there exist even negative opinions and attitudes on them, and a reluctance to implement them in some households in Slovakia. These findings were also reported in other countries by other researchers [30–32], and further, other barriers to welfare technology implementation are reported: high costs, lack of competence, lack of knowledge about available solutions, differences between sectors, technical problems, legal complications, resistance to change among personnel, limited research, and weak analyses of needs [32].

The three groups of participants´ attitudes towards welfare technology were identified. Students have mostly positive attitudes and opinions, which is in accordance with the results of Rasouli et al. [10]. His research showed that students are mainly positive towards welfare technology and believe it could improve the quality of services and the everyday lives of people with impairments. However, the students in our research show interest in gaining more information about specific areas of welfare technologies, and this interest of the younger generation was also proved by other authors. For example, according to Rasouli et al. [10], students have a positive attitude towards using welfare technology, but they require more skill training and ethical knowledge before entering clinical practice.

Besides the positive attitudes, the research also identified the negative and neutral participants´ attitudes. Regardless of the huge potential of technology-based interventions, the possible negative effects of ICT cannot be ignored. The risks of digitalization can be associated with the discrimination, exclusion, and inequality problem, especially for those people who are without internet access and without digital skills [33]. The negative attitudes and skepticism were discovered among the students not only in this research, but it was proved by other studies [5, 33]. As stated by Pajalic et al. [5], an overly complex user interface can lead to stress or feelings of overload, which can hinder its inclusion and acceptance. Users can feel that welfare technology threatens their independence or disrupts their relationships, they will not use it. Loss of privacy is a serious issue, and there are concerns about how such interventions might contribute to stigmatization and loss of autonomy [5].

Among the neutral attitudes and opinions of participants belong the views of awareness of both positive and negative aspects and those participants who are not familiar with the concept, similarly as in other studies [5, 10].

University students have, however, shown an interest in learning more about the relevant welfare technologies, and three areas were mentioned by roughly equal numbers of participants in regard to broadening their knowledge base: (1) Smart devices for home life, assistive technologies, and devices; (2) Technologies to increase activity and opportunities to engage in social life. (3) Rehabilitation and disease management. These three areas are probably less known among the younger generation in Slovakia. Lower numbers of university students indicated interest in three other areas: (1) Robots and automation as an aid in personal life. (2) Digital solutions and smart homes; (3) Digital online (or mobile) platforms for older adults. It is possible that university students' lack of knowledge of welfare technologies could be caused by the difference in their age when compared to the age of the target group. This is supported by Offerman et al. [34], who stated that the kinds of technologies that are preferred to support active and healthy aging and the reasons for using certain technologies differ by generation. However, the lower financial investments in social and health care and slower rate of digitalization in Slovakia in comparison to other countries (e.g., Scandinavian countries) could be a factor. Slovak university students' opinions toward the use of technologies varied from positive to negative, and the results showed that the use of welfare technologies by their older relatives is not the standard, contrary to the results obtained from Norway. The majority of the participants in Norway confidently use various technologies in their homes and daily lives [29]. Among the mostly used technological solutions identified in Slovak students´ homes belong mobile phones and various ICT tools for communication. In comparison to other studies published in English, Norwegian, and Swedish

in the period between 2015 and 2020, the technologies applied were mostly commercial solutions in the form of telephones, smartphones, computers, telemonitoring, and robots [5]. Other research shows that students reported "Compensation and wellness" technology as the top category to promote the quality of services for people with disabilities. However, people with disabilities mostly use technologies for "Social contact" [10].

Our participants indicated that mobile phones and the internet are the most commonly used welfare technologies in their households and those of close relatives. Other specific technologies are used at a smaller rate. In comparison to the findings of Offerman [34], participants in Sweden prefer using household devices, home entertainment, exercise devices, and assistive devices, but there are differences according to their age. This study found that the younger generation (of three), aged between 30-39 years, showed less interest in using household devices, home entertainment, motorized vehicles, and social media to support active and healthy aging compared to the older generation (70-79 year-olds). The middle-aged generation (50–59-year-olds) showed significantly more interest in using assistive devices, personal emergency response systems, and social media to support active and healthy aging when compared to the oldest generation. It is obvious that age and the specific type of disability or need are the criteria for particular welfare technology usage. But the lower practical usage of technology in Slovak households may also be caused by lower financial capacity or a lower level of digital literacy and skills in comparison to other countries. Digital literacy and knowledge development through targeted education could be one of the solutions for welfare technology practical usage improvement.

As proved by our investigation, it can be concluded in accordance with others [5, 10, 15, 16] that students are aware of the potential benefits of smart welfare technologies but lack the specific knowledge and skills needed to implement them.

5- Conclusions

Interest in the implementation of welfare technologies is growing and can bring many benefits to older adults in the process of smart active aging. Welfare technology helps people live more independently, safely, and healthily as they age. Welfare technology provides services to the healthcare system, enables two-way communication between citizens, patients, and healthcare professionals, and even allows users to manage a specific condition themselves. In addition, younger people, represented by university students, will have an important part to play in introducing welfare technologies into daily life. The knowledge and practical usage of welfare technology by the younger generation can bring many benefits to the elderly through transgenerational learning. Overall, this study highlights the importance of smart active aging and welfare technologies in facilitating the well-being of older adults and the critical role that education plays in ensuring the effective implementation of these technologies. The knowledge gap identified in the research can be addressed through education leading to welfare technology implementation. There is a significant need to explore university students' understanding of welfare technologies for older adults. Knowledge of welfare technology is important not only especially for the students in study fields for helping professions in social or health care services. This issue is important to promote, even among all students, so they will be able to actively age themselves. By promoting intergenerational connections through technology, university students have the potential to play a vital role in bridging the generation gap. Through education, students can understand the focus of welfare technology and its possibilities in supporting the active and healthy aging of their older relatives. Students can promote the concept of welfare technology among the older generation and help them practically use welfare technology in their everyday lives.

Adequate education and training of university students in the concept of smart active aging, as well as sufficient information about the older population, are crucial. It is essential to facilitate communication between the two groups by developing an understanding of aging issues. Furthermore, the younger generation's knowledge of welfare technologies can help them to become involved in their own active aging. Welfare technologies have the potential to promote positive intergenerational relations, autonomy, and mental and physical wellbeing among older adults. However, there are still some barriers to overcome and investigate (e.g., negative attitudes and skepticism, financial costs, digital skills, etc.) before it can be widely adopted.

5-1- Strengths and Limitations

One strength of this study is that it was conducted in Slovakia, where the issue of welfare technologies is new. The findings may be relevant for other countries as well. Another strength is the focus on university students, who can provide practical help to older adult relatives, increasing and improving intergenerational transmission. The study contributes to a better understanding of the knowledge and views of this younger group towards the issue.

The research on welfare technology implementation was limited in that it focused primarily on knowledge, views, and opinions. Another limitation is a gender prevalence due to participating participants being from the Faculty of Arts and Faculty of Education. The study programs provided at these faculties are traditionally preferred by female students. The research sample is taken exclusively from two Slovak faculties and thus cannot be taken as a representative sample of all Slovak universities. The research sample can, however, serve as the starting point for a broader investigation of the topic; future investigations should pay attention to gender perspectives, age group, region, and study field differences.

5-2- Recommendations

The findings of this study highlight the need for educational institutions to incorporate smart active aging and welfare technologies into their courses, possibly through health-related or ICT courses. This would help curb the knowledge gap and ensure that students have the necessary understanding and skills to implement these technologies effectively. To support this, educational institutions should develop a curriculum that focuses on the application of welfare technologies.

Additionally, there is a need for future research to investigate effective strategies to improve student knowledge and skills in using welfare technologies. Opinions and attitudes towards active aging with the use of welfare technologies according to the age categories of the university students should also be explored.

6- Declarations

6-1- Author Contributions

Conceptualization, T.S.Z. and M.T.; methodology, J.S. and M.T.; software, T.S.Z. and L.J.; validation, T.S.Z., J.S., L.J., and M.T.; formal analysis, T.S.Z.; investigation, J.S. and T.S.Z.; resources, M.T. and T.S.Z.; data curation, T.S.Z. and L.J.; writing—original draft preparation, M.T. and T.S.Z.; writing—review and editing, T.S.Z., J.S., L.J., and M.T.; visualization, J.S.; supervision, M.T.; project administration, T.S.Z.; funding acquisition, T.S.Z. and M.T. All authors have read and agreed to the published version of the manuscript.

6-2- Data Availability Statement

The data presented in this study are available in the article.

6-3- Funding

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6-4- Institutional Review Board Statement

The study was conducted following the Declaration of Helsinki and approved by the Institutional Ethics Committee of the University of Ss. Cyril and Methodius in Trnava (approved on the 25th of April 2023 under reference number FF-EK-2-2023) for studies involving humans.

6-5- Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

6-6- Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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