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Self-Assessment of Digital Literacy of Doctors in Chişinău, Moldova

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Abstract
Background: As healthcare increasingly integrates digital technologies, it is crucial to ensure that medical professionals possess robust digital competencies to maximize the benefits of these technologies. Mastering fundamental digital skills is essential before engaging with more complex digital health technologies. This study aimed to assess the general digital competencies of doctors in Chișinău, Moldova, and to identify specific areas needing improvement, thereby providing a foundation for tailored educational programs. *Materials and Methods:* In April 2024, data were collected using the My DigiSkills tool, a self-assessment online questionnaire developed under the European Commission's DigCompSAT project by ALL DIGITAL. This cross-sectional study involved resident doctors and specialists and from various medical institutions in Chișinău, who self-assessed their digital competence levels across five areas: Information and Data Literacy, Communication and Collaboration, Digital Content Creation, Safety, and Problem Solving. Upon completing the questionnaire, participants received their results via email and subsequently forwarded the results to the researchers. *Results:* The study revealed that over 50% of doctors in Chișinău demonstrated advanced skills in information and data literacy and communication. However, significant deficiencies were found in digital safety, with only 19% showing advanced skills in this area. Younger doctors generally exhibited higher digital competence levels. The results highlight the urgent need for customized training initiatives to address these gaps and enhance digital competencies among medical professionals. *Conclusions*: The study underscores the necessity for tailored educational programs to improve digital competencies, particularly in digital safety, because data privacy and security are paramount in the medical context.

Keywords*:* Digital Literacy; Medical Education, Healthcare Technology; Competency Assessment, Health Informatics

Introduction

The integration of digital technologies in healthcare is increasingly recognized as a crucial element in improving healthcare delivery and patient outcomes. The COVID-19 pandemic has significantly accelerated the adoption of digital health solutions, underscoring the importance of digital literacy among healthcare professionals [1-2]. Digital literacy, defined as the ability to effectively and critically navigate, evaluate, and create information using a range of digital technologies, is now seen as a fundamental determinant of health. It is essential for the effective use of digital tools in medical practice. Improved digital literacy can lead to better patient outcomes, more efficient workflows, and enhanced patient engagement through accurate data management and effective use of telemedicine and telemonitoring [3-5].

Despite the recognized importance of digital health literacy, significant gaps remain, particularly among healthcare professionals. A WHO report from 2023 reveals that only about half of the countries in the WHO

European Region (27 out of 52 states), including France, Germany, Italy, Spain, the United Kingdom, Finland, Estonia, and others, have implemented policies for digital health literacy, indicating a substantial need for targeted educational interventions [6]. These gaps, which reflect the challenges faced by medical staff, include insufficient training programs, resistance to adopting new technologies, and disparities in access to digital tools [7-9].

Addressing these gaps requires a multifaceted approach. Initiatives like the "Improving Digital Empowerment for Active Healthy Living (IDEAHL)" project funded by the Horizon Europe Framework Programme aim to develop comprehensive digital health literacy strategies to empower individuals and healthcare professionals alike. The IDEAHL project focuses on creating educational resources, promoting digital health practices, and ensuring equitable access to digital tools across Europe [10]. Moreover, reports highlight the need for bridging the digital skills gap in the healthcare sector, emphasizing the importance of continuous professional development and targeted training programs which will include workshops on digital tools usage, online courses on cybersecurity, seminars on telemedicine practices, and hands-on training for electronic health records (EHRs) management [11,12].

Before advancing to more complex digital technologies, such as artificial intelligence, blockchain technology, and big data analytics, it is essential to ensure that doctors possess a foundational level of digital competencies, which refers to the basic set of skills and knowledge required to effectively and safely use digital technologies in everyday tasks and professional activities [13-16].

Recent Eurostat data indicates that, on average, a little over one in two adults (people aged 16–74) across the EU27 show basic or above basic proficiency across five components of digital skills. In 2021, the share of people aged 16 to 74 who had at least basic overall digital skills was highest in the Netherlands and Finland (both 79%), followed by Ireland (70%). On the other hand, the lowest share was recorded in Romania (28%), followed by Bulgaria (31%) and Poland (43%) [17].

No information about the level of digital skills in Moldova was identified in the scientific literature at the time of research, neither among healthcare workers nor the general population. Understanding the level of digital literacy in Moldova is crucial for addressing existing gaps and developing effective training programs to elevate the standard of care. Our study contributes to the broader effort to enhance digital literacy among healthcare professionals in Moldova, ultimately improving the quality and efficiency of healthcare delivery. The present study aimed to assess the digital competencies of doctors in Chișinău, Moldova, to identify areas with deficiencies, analyze differences based on demographic variables, and lay the foundation for tailored educational programs.

Materials and Methods

Selection and Description of Participants

This cross-sectional study was conducted in April 2024 and involved resident doctors and specialists from various medical institutions in Chișinău, Moldova. The participants were selected based on their willingness to participate in the study. Invitations were sent via social media platforms (Facebook, Instagram) through private messages to doctors who are members of a group of State University of Medicine and Pharmacy "Nicolae Testemițanu" graduates. Those who agreed to participate provided their email addresses, to which the survey link was subsequently sent. Inclusion criteria were: being a resident doctor or a specialist in Chișinău, having access to digital devices (such as smartphones, tablets, laptops, and desktop computers), and providing informed consent. There were no specific exclusion criteria beyond not meeting the inclusion criteria. The source population consisted of resident doctors and specialist doctors from different specialties, all of them working in urban areas.

Data Collection

The study employed the My DigiSkills self-assessment questionnaire to evaluate the digital competencies of the participants. This tool was developed under the European Commission's DigCompSAT project by ALL DIGITAL and is designed to assess digital competences for private individuals into five main dimensions, each encompassing specific individual competences (Figure 1) [18].

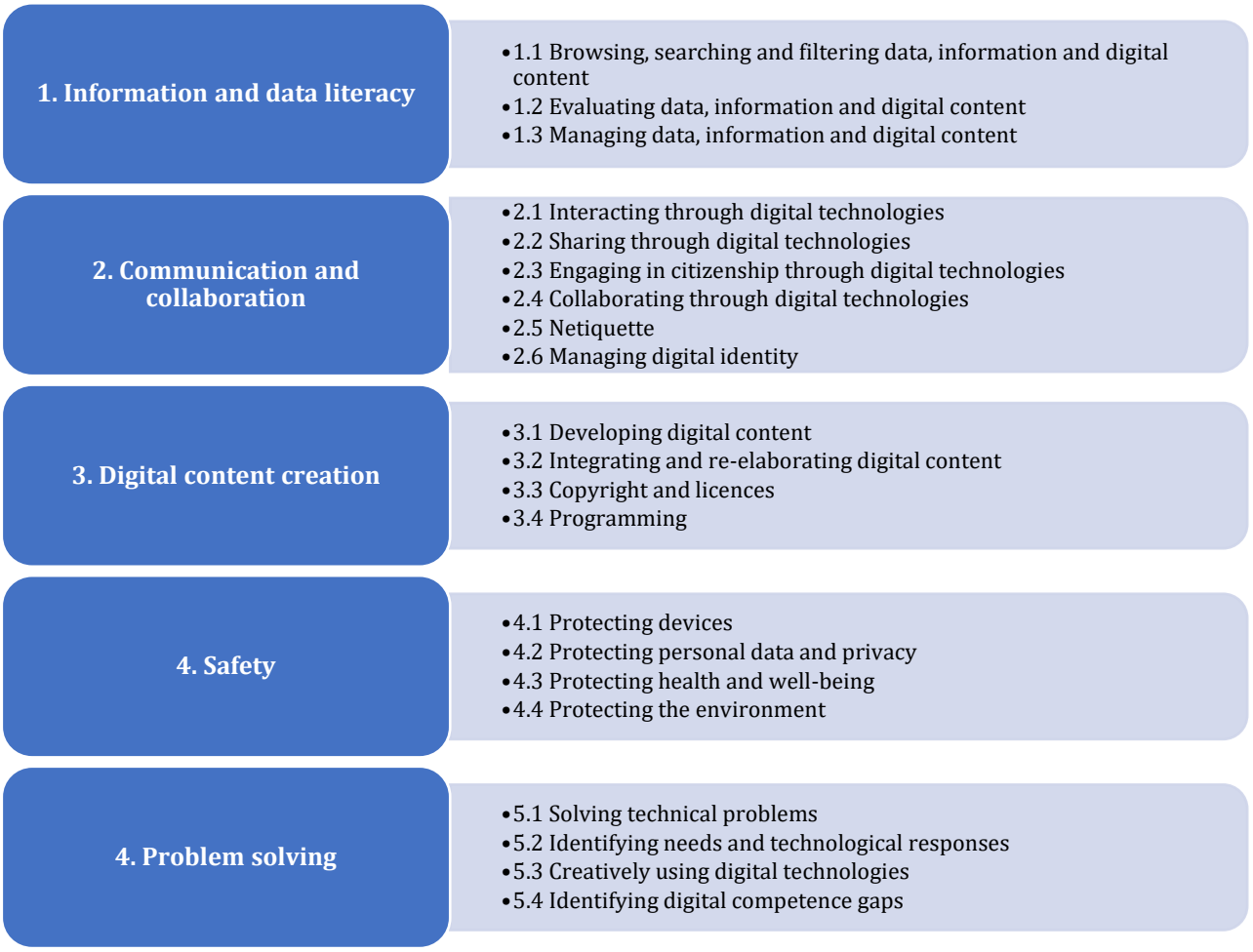

Figure 1. Areas of the european digital competence framework

My DigiSkills is a validated tool, translated into 11 languages, including Romanian. The respondents completed the survey in Romanian. The tool's reliability and validity have been documented in prior research [19].

The data collection process involved the following steps:

- *Invitation:* An email invitation with the survey link was sent to potential participants.
- *Completion*: Participants completed the 82-question survey online, which took approximately 20-30 minutes.

Submission: After completing the survey, participants received their results via email based on their responses. They then forwarded these results to the study authors. Importantly, the study authors only received the final results forwarded by the participants and did not have access to the individual answers.

Statistics

Data were compiled using Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) for initial aggregation. All data handling procedures adhered to ethical guidelines to ensure participant confidentiality and data security.

Descriptive statistics were calculated using Microsoft Excel. Percentages were computed to summarize the distribution of digital competencies among the doctors in Chişinău, Moldova.

Cross-tabulation was employed to examine the association between categorical variables. The analysis was structured around five key areas of the European Digital Competence Framework: Information and Data Literacy, Communication and Collaboration, Digital Content Creation, Safety, and Problem Solving.

Results and Discussions

Participation Rate and Demographics

A total of 352 invitations were sent to potential participants. Of these, 107 individuals accepted the invitation to participate in the study. However, 16 participants were excluded because they did not meet the inclusion criteria (3 were students, and 13 were working in cities other than Chișinău). This resulted in a final evaluated cohort of 91 doctors, representing a participation rate of approximately 25.9%.

The evaluated data were collected from 91 doctors aged between 26 and 55 years. The participants were divided into two age groups: Millennials (26-43 years) and Generation X (44-55 years). The cohort consisted of 53.85% women (49 women) and 46.15% men (42 men). All participants were working in different medical institutions in Chișinău, including clinical hospitals, state or private laboratories, and polyclinics.

The participants were categorized into 3 groups based on their medical specialties: Medical Specialties (Anesthesiology and Intensive Care, Dermatovenerology, Gastroenterology, Family Medicine, Occupational Medicine, Nephrology, Neonatology), Surgical Specialties (Surgery, Otorhinolaryngology, Stomatology, Urology), and Paraclinical Specialties (Epidemiology, Imaging and Radiology, Laboratory Medicine, Labor Medicine, Public Health).

Main Findings

The data emphasize areas where doctors have advanced skills and those where improvements are needed. Associations were made between the level of competences for each area and demographic variables. Figure 2 shows the association between gender and level of digital competence, while Figure 3 illustrates the association between age and level of digital competence.

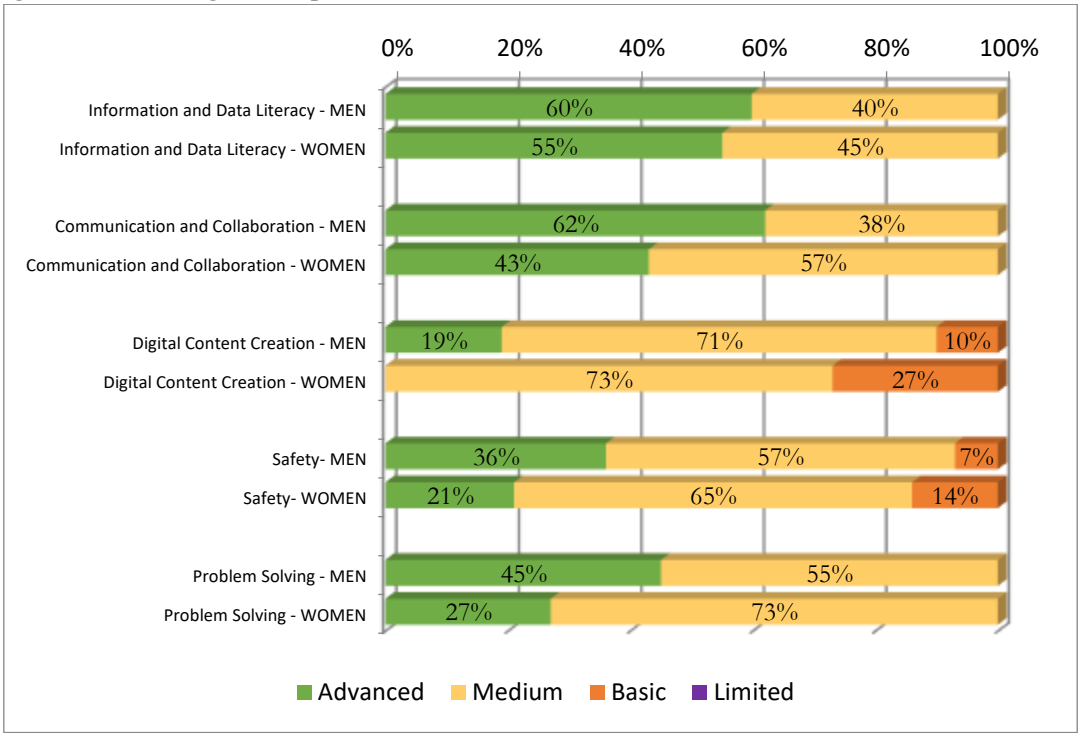

Figure 2. The association between sex and level of digital competence

In the areas of *Information and Data Literacy* and *Communication and Collaboration*, over half of the participants demonstrated advanced proficiency. This indicates a strong ability to locate, evaluate, and use information effectively, as well as to communicate and collaborate digitally. Millennials showed higher proficiency (77% for Information and Data Literacy, 63% for Communication and Collaboration) compared to Generation X, where

the majority have a medium level of digital skills in these areas. These results align with findings from Romania and the EU, where digital proficiency decreases significantly with age [20].

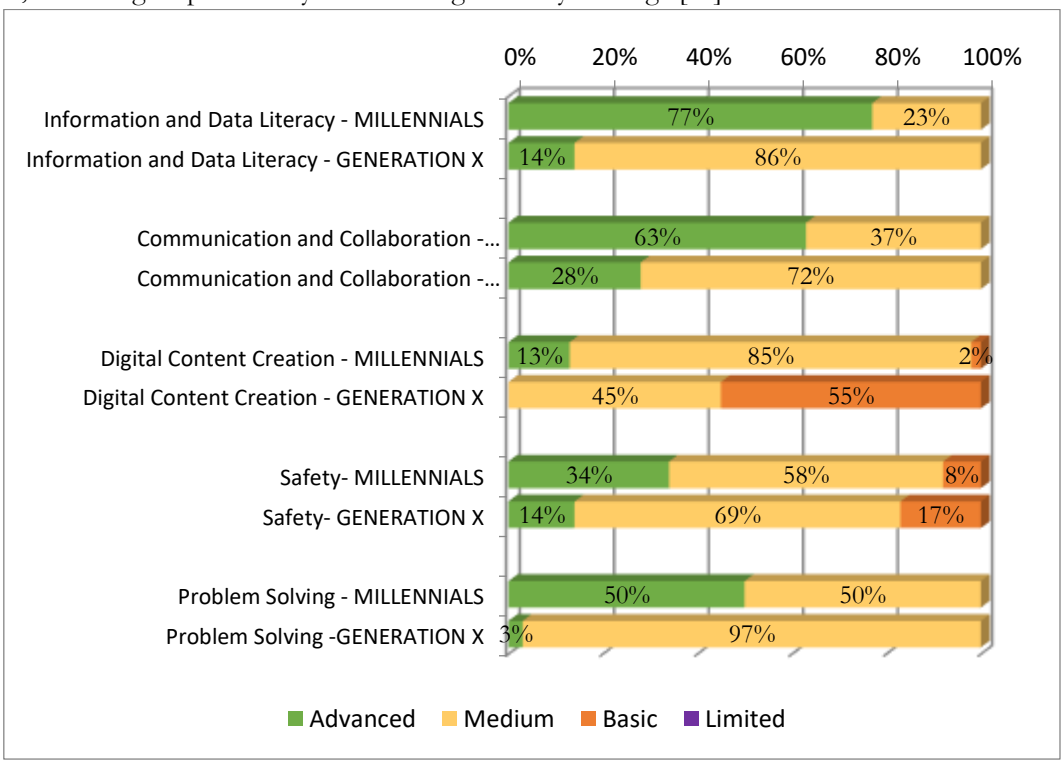

Figure 3. The association between age and level of digital competence

In the area of *Digital Content Creation*, deficiencies were noted. This area displayed the largest gaps among the evaluated areas. Specifically, 27% of women showed only a basic level of competence. Additionally, more than half (55%) of doctors from Generation X demonstrated only basic proficiency, with no individuals showing advanced proficiency. This critical gap indicates a need for targeted training to enhance the ability to create and manage digital content effectively, especially for the older generation, because young people, as shown in other studies, have a better level of proficiency in all the evaluated areas.[21,22]

Safety emerged as a concern, with only 27% of participants having advanced skills in protecting devices and personal data. There were no significant differences between men and women, but Millennials had higher proficiency compared to Generation X. Notably, 17% of doctors aged 44-55, and 8% of younger doctors, had only a basic level of competence in digital safety. This area is particularly important because inadequate digital safety practices can lead to data breaches, compromising patient confidentiality and potentially causing harm. When compared to Romania and the EU, the results indicate a concerning disparity: only 48% of Romanian citizens have basic or above basic safety skills, compared to 68% in the EU [20]. This highlights that doctors in Chișinău have even lower proficiency in digital safety than the general population in Romania and the EU, underscoring the urgent need for targeted interventions.

In *problem-solving*, half of the participants from the Millennials group demonstrated advanced skills, while the other half showed medium proficiency. In contrast, the majority (97%) of Generation X participants exhibited only medium proficiency. This indicates a clear generational gap in the ability to identify and solve technical issues effectively.

The participants were further categorized into three groups based on their medical specialties (Figure 4).

No differences in overall digital competence between the groups of specialties class were observed. However, despite being expected to digitalize first and requiring digital devices in their daily work [23], paraclinical specialties showed greater deficiencies compared to clinical and surgical specialties. One possible explanation for this could be the specialized nature of the digital tools used in paraclinical fields, which may require higher levels of digital proficiency and more specialized training. The rapid evolution of these tools and the lack of adequate training could contribute to the observed gaps in digital competence.

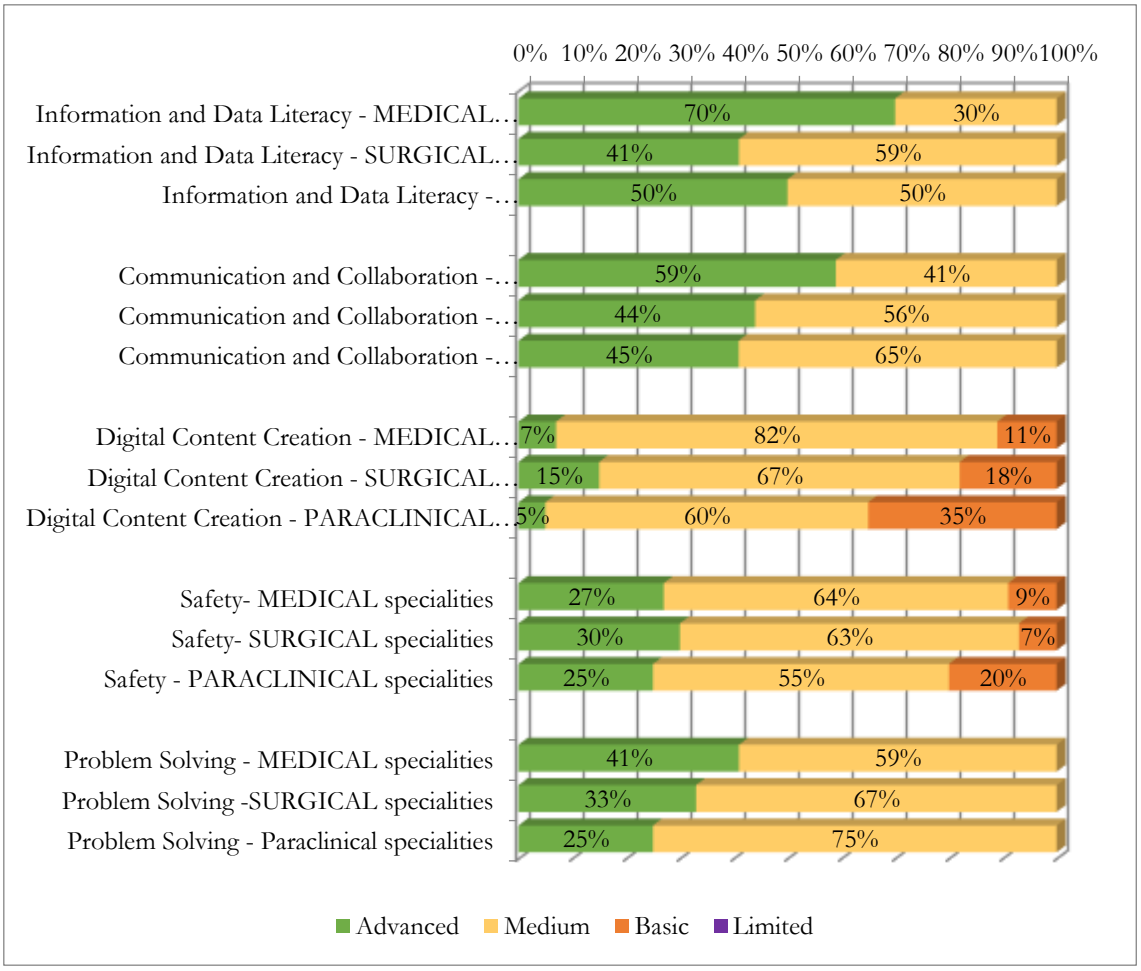

Figure 4. The association between specialty class and level of digital competence

Overall, these findings highlight both strengths and critical gaps in digital competencies among doctors in Chișinău. Addressing these gaps through tailored educational programs is essential to ensure effective and secure use of digital technologies in medical practice. Better digital literacy levels help to boost doctors confidence in providing clinical care [24].

Limitations of the Study

The study has several limitations that must be highlighted. First, self-evaluation of competencies is subjective and reflects what the respondent thinks that are her/his skill not what they really know and do. Second, the evaluated sample size is small and limited to limited to doctors in Chișinău. So, the results reflect the evaluated sample and could not be generalized neither to Moldova. Third, the respondent forwarded the results to the researchers, so maybe those not satisfied with their accomplishments did not do it. Forth, based on collection procedure we work with summary associated to the evaluated dimension and we did not have access to individual response to each question per respondent. Future studies should consider these limitations and aim to provide more robust and generalizable data.

Implications for Future Research and Practice

These findings highlight the need for tailored educational programs to address specific gaps in digital competencies among healthcare professionals. Future research should expand the sample size and include participants from different regions to obtain a more comprehensive understanding of digital competencies among healthcare professionals in Moldova.

Conclusions

The study concludes that while doctors in Chişinău have advanced skills in information and data literacy and communication, there are critical areas, particularly in digital content creation and safety, that require improvement. Developing tailored educational programs to address these gaps is essential to ensure that medical professionals can effectively utilize digital technologies in their practice.

List of Abbreviations: COVID-19: Coronavirus Disease 2019; DigComp 2.2: Digital Competence Framework for Citizens, version 2.2; EU: European Union; IDEAHL: Improving Digital Empowerment for Active Healthy Living; WHO: World Health Organization.

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Ethics Statement: This study was conducted in accordance with ethical principles. All participants provided informed consent before participation in the study. Participant confidentiality was strictly maintained, with all data anonymized and securely stored. No identifying information was collected or shared.

Data Availability Statement: Not applicable.

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Conflict of Interest: The authors declare no conflict of interest.

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