

LITHUANIAN SPORTS UNIVERSITY

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**THE EFFECT OF TECHNOLOGICAL
LITERACY EDUCATION ON OLDER
WOMEN'S ACCEPTANCE OF SPORTS
APPS**

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Social sciences, education (S 007)

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INTRODUCTION

Research relevance. The growing proportion of older adults is one of the most significant demographic changes of the twenty-first century, highlighting the importance of promoting successful ageing. Regular physical activity is considered one of the key factors supporting successful ageing (Izquierdo et al., 2021; Wong et al., 2023; Zhao et al., 2024), as it helps maintain functional and cognitive abilities in later life (Thornton et al., 2025; Wong et al., 2023; Xu et al., 2023; Zhao et al., 2024). Higher levels of physical activity in older age are also associated with better psychological well-being, greater life satisfaction, and happiness (An et al., 2020; Huang et al., 2021).

Despite the well-established benefits of physical activity, many older adults face health, motivational, environmental, and socioeconomic barriers to being physically active (Billot et al., 2020; Koh et al., 2022; Patel et al., 2024; Ribeiro et al., 2025). In this context, sports apps are recognized as an effective tool helping users overcome these barriers by enabling them to monitor and manage their activity, thereby encouraging a more active lifestyle and supporting their overall health (Aslam et al., 2020; Billot et al., 2020; Soto-Bagaria et al., 2023; Wegener & Kayser, 2023; Yau & Hsiao, 2022). Nevertheless, their use among older adults remains limited and depends not only on psychological and technological factors but also on technological literacy, which is generally lower among older adults compared to younger individuals (Charness & Boot, 2022; Wang et al., 2019). Since technological literacy can be developed, the literature emphasizes the need to implement educational interventions (Soto-Bagaria et al., 2023), whose effectiveness can be enhanced by focusing on the practical use of technology and applying adult learning principles (El-Amin, 2020; Knowles, 1984).

Research background. One of the most widely used models of technology acceptance is the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2; Venkatesh et al., 2012), which proposes that behavioral intentions to use technology are influenced by performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, habit, and price value. Subsequent studies have extended the model by incorporating additional factors, including innovativeness (Farooq et al., 2017), self-efficacy (Chiu et al., 2025; Dai et al., 2024; Zhao et al., 2025), and health consciousness (Dai et al., 2024),

suggesting that technology acceptance is shaped not only by the core UTAUT2 constructs but also by additional individual characteristics. Studies focusing on older populations have consistently confirmed the importance of the core UTAUT2 constructs in explaining technology acceptance (Ma et al., 2023; Min et al., 2024; Ukaegbu & Fan, 2025; Wu & Lim, 2024; Zhao et al., 2025). However, they also indicate that technology acceptance is influenced by a range of individual factors, including age, psychological attitudes, prior experience with technology, and technological literacy (Charness & Boot, 2022; Wang et al., 2019; Yazdani-Darki et al., 2020). Among these, technological literacy has emerged as a particularly important determinant of the acceptance and use of health technologies (Kim et al., 2024; Noeryosan et al., 2025; Ukaegbu & Fan, 2025; Zhao et al., 2025). It encompasses not only the ability to use but also an understanding of technological development, the ideological dimensions of technology, and its impact on individuals and society (Gagel, 1997). In the health context, technological literacy is closely associated with eHealth literacy, defined as the ability to seek, understand, and apply health-related information obtained through electronic resources (Norman & Skinner, 2006a). Studies indicate that eHealth literacy is associated with technology use both directly and indirectly through technology acceptance factors (Kim et al., 2024; Ukaegbu & Fan, 2025; Zhao et al., 2025).

Older adults often have limited prior experience with smart technologies and insufficient technological literacy (Charness & Boot, 2022; Wang et al., 2019; Yazdani-Darki et al., 2020). Studies indicate that technological literacy declines substantially from the age of 55 onwards (European Commission, 2023; Kantar, 2019; LNMMB, 2020) and is associated with limited knowledge, reduced access to technological resources, and lower technology acceptance (Khan et al., 2026; Kim et al., 2023). It has also been linked to lower self-confidence, greater technology-related anxiety, and more negative attitudes towards technology (García-García et al., 2022; Shiu et al., 2023). These challenges are particularly pronounced among women, who display lower acceptance of health technologies (Jung et al., 2026), are more likely than men to perceive these technologies as difficult to use (Hoque, 2014) and have more limited access to technological resources (Aslam et al., 2024; Long et al., 2023; Tripathi, 2025). Their intention to use technology is also more strongly influenced by self-efficacy, trust in technology, and digital skills (Luo & Mou, 2022), which are often lower than those

observed among men (Fung et al., 2023; Jung et al., 2026). Based on these findings, older women appear to be among the groups at greatest risk of digital exclusion and may particularly benefit from technological literacy interventions, as stronger intervention effects have been observed among individuals with lower initial levels of such literacy (Barbati et al., 2025). In this context, such interventions represent not only an educational strategy but also a public health approach with the potential to reduce the digital divide, improve access to health information, and promote more effective use of digital health resources.

Research problem. In response to the challenges of digital exclusion, increasing attention has been devoted to promoting technological literacy among older adults (Soto-Bagaria et al., 2023). Studies have shown that such interventions can reduce technology-related anxiety (Chiu et al., 2016; Lee & Kim, 2019) and increase confidence in using technology (Chang et al., 2021; De Main et al., 2022). Nevertheless, several important gaps remain in the existing literature. First, most technological literacy education interventions focus on strengthening general digital skills (Quialheiro et al., 2023; Yoo, 2021), rather than on developing eHealth literacy competencies required for the use of health technologies and sports apps. Given the learning barriers experienced by older adults (Schirmer et al., 2023), there is a need for targeted interventions tailored to their specific needs (Perim et al., 2025; Yoo, 2021). Second, the effectiveness of eHealth literacy interventions is most commonly evaluated in terms of informational, motivational, and behavioral outcomes (Yang et al., 2024), whereas technology acceptance has been explained primarily using earlier models, such as the Technology Acceptance Model (TAM) (Chiu et al., 2016), which does not encompass as broad a range of determinants of technology acceptance as the UTAUT2. Third, there is a lack of experimental evidence on the effects of technological literacy education on acceptance of sports apps. Although some studies have used UTAUT-based models to investigate the effects of digital skills development on technology acceptance (Yang et al., 2024), they have been limited to general smartphone use. Furthermore, it remains unclear whether increased technology acceptance translates into health-related behavioral intentions. These gaps highlight the need for experimental studies based on the UTAUT2 theoretical framework to evaluate the effects of targeted technological literacy education on the factors influencing older women's acceptance of sports apps and their health-related behavioral intentions. Based on the

identified research gap, the **following research questions were formulated:**

1. What effect does technological literacy education focused on the use of sports apps have on the factors shaping older women's acceptance of sports apps?

2. What effect does this educational intervention have on older women's intentions to engage in physical activity?

Research object – the effect of technological literacy education on older women's acceptance of sports apps.

Research aim – to evaluate the effect of technological literacy education on the factors shaping older women's acceptance of sports apps and on their intentions to engage in physical activity.

Research objectives:

1. To analyze the concept of technological literacy and the factors shaping the acceptance of sports apps among older adults.

2. To develop a technological literacy education program for the use of sports apps among older adults and to establish and justify a research model for evaluating its effects.

3. To evaluate the factors shaping older adults' acceptance of sports apps and their intentions to engage in physical activity and to determine the relationships among them.

4. To evaluate the effect of technological literacy education on the factors shaping older women's acceptance of sports apps and on their intentions to engage in physical activity.

Research hypotheses:

H1. eHealth literacy has positive direct and indirect effects on behavioral intentions to use sports apps through health consciousness and sports app acceptance factors.

H2. Participation in a technological literacy education intervention focused on the use of sports apps has a positive effect on the factors shaping older women's acceptance of sports apps and their behavioral intentions to engage in physical activity.

Scientific novelty. The scientific novelty of this dissertation is reflected in several aspects: (1) it is among the first studies employing an educational experiment to evaluate the effects of technological literacy education focused on the use of sports apps on older women's eHealth literacy, health consciousness, UTAUT2-based sports app acceptance factors, and health-related behavioral intentions; (2) it extends current knowledge on technological literacy education and the factors influencing

acceptance of sports apps among older women; (3) it introduces a technological literacy education program based on the principles of andragogy, experiential learning theory, and eHealth literacy competencies, focused on the use of sports apps and tailored to the needs of older adults by taking into account learning facilitators and barriers; and (4) it validated a questionnaire for assessing older adults' eHealth literacy, health consciousness, sports app acceptance factors, and behavioral intentions.

Practical significance. The findings of this study may be applied in the development and implementation of technological literacy education programs for older adults aimed at promoting physical activity through the use of sports apps. The technological literacy education model developed in this dissertation may be used by professionals working in health promotion, public health, and adult education. The factors influencing the acceptance of sports apps and behavioral intentions identified in this study may contribute to a better understanding of technology use among older adults and support the design of targeted interventions. The findings may also inform strategies to promote physical activity and reduce the digital divide among older adults, particularly women, thereby contributing to improved health and quality of life.

1. SUMMARY OF THE LITERATURE REVIEW

1.1. The concept of technological literacy

An analysis of the scientific literature revealed several concepts describing the competencies required for the use of sports apps, namely technological literacy, digital literacy, and eHealth literacy. **Technological literacy** is the broadest of these concepts, encompassing not only the ability to use technology but also an understanding of technology, its critical evaluation, and awareness of its impact on individuals and society (Dyrenfurth & Kozak, 1991; Gagel, 1997). These competencies are particularly important not only for developing the technical skills needed to use sports apps but also for fostering awareness of their purpose, benefits, and potential to support health-promoting behavior. **Digital literacy** represents a narrower dimension of technological literacy, focusing on activities in digital environments (Eshet, 2012; UNESCO, 2026) and encompassing the competencies required to use digital technologies effectively, safely, and critically, as well as to manage digital information (UNESCO, 2026; Yeşilyurt & Vezne, 2023). **eHealth literacy** can be understood as a health-specific form of digital literacy, encompassing the competencies required to seek, understand, evaluate, and apply health information obtained from electronic sources (Norman & Skinner, 2006a). As sports apps are examined in this dissertation within the context of physical activity and health promotion, technological literacy was adopted as the conceptual basis for the educational intervention because it captures both the technical competencies required for their use and an understanding of their purpose, benefits, and potential to promote health-enhancing behavior. In contrast, eHealth literacy was selected as a specific component of technological literacy for empirical assessment because it more accurately reflects the contextual competencies required to access, understand, evaluate, and apply health information.

1.2. Factors shaping older adults' sports apps acceptance

According to the Theory of Reasoned Action, behavioral intentions are among the most important predictors of human behavior (Fishbein & Ajzen, 1975). Therefore, behavioral intentions were used as the primary indicator of sports app acceptance in the present study.

The analysis of studies involving older adults showed that eHealth literacy may be associated with behavioral intentions to use sports apps

both directly (Kabakus et al., 2025; Kim et al., 2024; Noeryosan et al., 2025; Ukaegbu & Fan, 2025; Zhao et al., 2025) and indirectly through health consciousness (Dai et al., 2024) and sports app acceptance factors, including performance expectancy, effort expectancy (Chang et al., 2021; Kabakus et al., 2025; Min et al., 2024; Ukaegbu & Fan, 2025), facilitating conditions (Ma et al., 2023; Min et al., 2024), social influence (Kim et al., 2024; Min et al., 2024; Zhao et al., 2025), habit, hedonic motivation (Min et al., 2024), and self-efficacy (Chiu et al., 2025; Dai et al., 2024; Wu et al., 2022; Zhao et al., 2025).

The analysis also indicates that health consciousness may influence behavioral intentions both directly (Cho et al., 2014; Zhang et al., 2022) and indirectly through the sports app acceptance factors (Barua & Barua, 2021; Cao et al., 2024; To et al., 2019).

The literature further indicates that behavioral intentions to use health technologies are directly associated with performance expectancy, effort expectancy (Aranha et al., 2024; Hanqing et al., 2025; Wu & Lim, 2024), facilitating conditions (Candra et al., 2025; Wu & Lim, 2024; Xiang et al., 2024), hedonic motivation (Palas et al., 2022; Vietzke et al., 2023; Wu & Lim, 2024), social influence (Candra et al., 2025; Palas et al., 2022; Suh & Li, 2022; Vietzke et al., 2023; Wu & Lim, 2024), habit (Lan et al., 2020; Liu et al., 2023; Palas et al., 2022; Schroeder et al., 2023), innovativeness (Dash & Mohanty, 2023; Van Elburg et al., 2022), and self-efficacy (Schroeder et al., 2024; Wilson et al., 2021; Yang, 2024).

Taken together, these findings suggest that behavioral intentions to use sports apps among older adults are shaped by a complex interplay of individual, technological, and contextual factors.

1.3. Development of a technological literacy education program

Based on the analysis of the scientific literature, a theoretical model of technological literacy education was developed to integrate the key principles, competencies, and educational strategies (Figure 1). Based on this theoretical model, a technological literacy education program focused on the use of sports apps was subsequently developed and tailored to older adults.

The program is grounded in the principles of andragogy, which emphasize the relevance of learning content, the value of learners' prior experience, the active role of the learner, and the practical application of knowledge in real-life situations (El-Amin, 2020; Ferreira & Maclean, 2018; Knowles, 1984). To tailor the program to the context of sports app

use, its content is based on the analytical and contextual competencies identified in the eHealth literacy model (Norman & Skinner, 2006b), while also emphasizing the benefits of technology, its potential applications, and its role in supporting a physically active lifestyle.

The selection of educational methods and the organization of the educational process are based on experiential learning theory, according to which new knowledge and competencies are developed through concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, 1984; Kolb & Kolb, 2009). Accordingly, educational methods such as explanation, demonstration, practical training, gamification, independent learning, collaboration, discussion, feedback, and consultations were incorporated into the education program.

The program was designed to address the learning barriers among older adults identified in the scientific literature, including low self-confidence and limited trust in technology, fear of using technology or making mistakes, physical limitations, age-related and other stereotypes, information overload, insufficient consideration of individual needs, and a lack of flexibility (Charness & Boot, 2022; Schirmer et al., 2023; Wang et al., 2019; Yazdani-Darki et al., 2020). Accordingly, the educational program was designed to address these barriers by providing access to support, peer learning, and consultations, while tailoring its content and delivery to the needs of older adults through engaging and practically relevant educational content, flexible learning, and access to technology (Flauzino et al., 2020; Perim et al., 2025; Xu et al., 2025; Yoo, 2021).

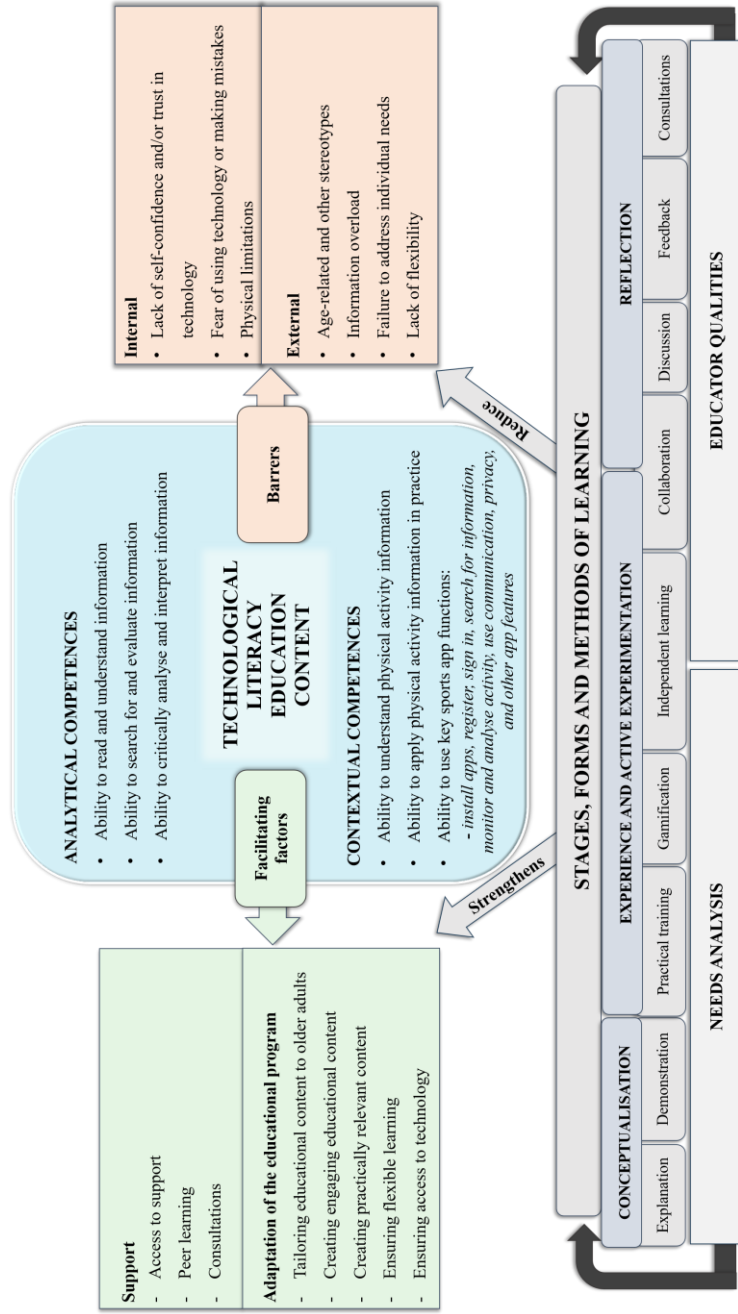


Figure 1. Theoretical model of the technological literacy education program (developed by the author based on a review of the scientific literature)

1.4. The effects of technological literacy education on sports apps acceptance

The analysis of the scientific literature indicates that technological literacy and eHealth literacy education for older adults can reduce technology-related anxiety and the digital divide (Bevilacqua et al., 2021; Chang et al., 2021; De Main et al., 2022; Lee & Kim, 2019; Spindler et al., 2022).

Research has shown that technological literacy education can improve eHealth literacy (Bevilacqua et al., 2021; Chang et al., 2021; De Main et al., 2022; Spindler et al., 2022), strengthen self-efficacy (Lee & Kim, 2019; Nahm et al., 2019), increase motivation to use technology (Lee & Kim, 2019; Lee et al., 2022; Nahm et al., 2019; Spindler et al., 2022) and foster more positive attitudes towards technology (Chang et al., 2021; De Main et al., 2022). As higher eHealth literacy has been associated with sports app acceptance factors, its improvement through technological literacy education may contribute to more favorable evaluations of these factors.

Improved eHealth literacy is also associated with the ability to make informed decisions, greater independence (García-García et al., 2022; Shiu et al., 2023), higher self-efficacy (Chiu et al., 2025; Lee & Kim, 2019; Nahm et al., 2019), and greater digital and social inclusion (Lee et al., 2022; Park & Chung, 2024). Conversely, lower eHealth literacy increases the risk of limited access to healthcare services (Ghahfarokhi, 2025), often leads to greater dependence on others (De Santis et al., 2023), and is associated with loneliness and poorer well-being (Ivan et al., 2025). Therefore, improvements resulting from technological literacy education may contribute to more favorable perceptions of sports apps, greater acceptance of these technologies, and more active use among older adults.

Based on these findings, a theoretical model of the effects of technological literacy education was developed (Figure 2). The model assumes that a targeted educational intervention may contribute to positive changes across all included constructs.

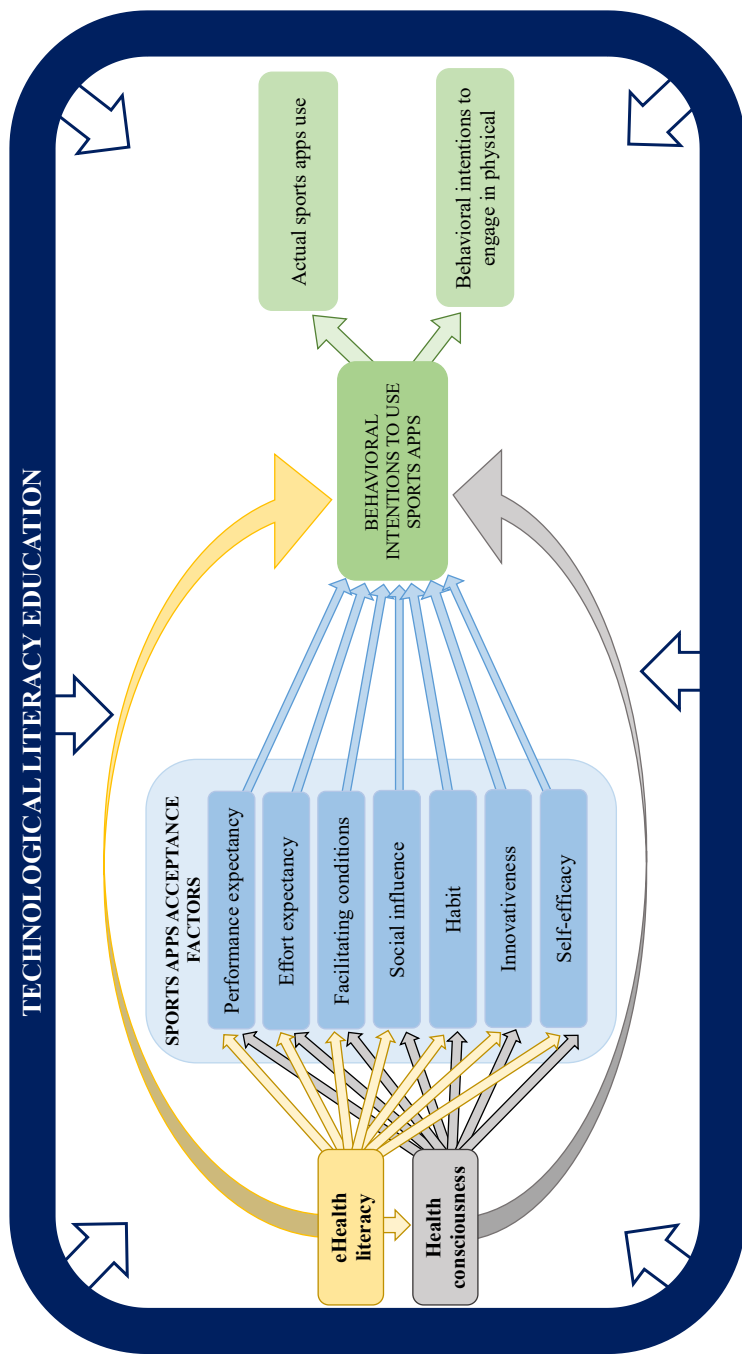


Figure 2. Theoretical model of the effect of technological literacy education on the acceptance of sport apps (developed by the author based on a review of the scientific literature)

2. RESEARCH METHODOLOGY

2.1. Methodological assumptions of the study

The research strategy and methods were selected to address the aim and objectives of the study. The literature indicates that quantitative research involving pre- and post-intervention assessments is the most commonly used approach for evaluating the effects of technological literacy education programs for older adults (Carrasco-Dajer et al., 2024; De Main et al., 2022; Lee et al., 2022; Moore & Hancock, 2022). Furthermore, quantitative methodology predominates in studies examining technological literacy and its associations with technology acceptance (Yang et al., 2020). According to Creswell and Creswell (2017), quantitative research is most appropriate when the aim is to identify factors associated with the phenomenon under investigation or to evaluate the effectiveness of an intervention. Accordingly, this dissertation adopted a quantitative research methodology comprising two stages: an initial cross-sectional study and an educational experiment.

The initial cross-sectional study established the baseline situation by assessing the extent of the research problem among older adults in Lithuania, thereby providing the rationale for the subsequent educational experiment (Siedlecki, 2020; Wall & Horak, 2007). Furthermore, the larger sample obtained in the cross-sectional study enabled empirical testing of the theoretical model developed in the literature review, examination of the relationships among its constructs, and evaluation of the suitability of the research instruments for the target population (Ssekamatte & Okello, 2016; Wall & Horak, 2007).

The educational experiment was conducted to determine the extent to which changes in the participants' outcomes were attributable to the educational intervention rather than to external factors (Adu & Miles, 2023; Creswell & Creswell, 2017).

2.2. Research instruments

As the study adopted a quantitative research strategy, data for both the cross-sectional study and the pre- and post-intervention assessments of the educational experiment were collected using a questionnaire.

The questionnaire consisted of the following sections:

1) ***Sociodemographic assessment*** (gender, age, marital status, and employment status);

2) **Physical activity assessment** (frequency, types, and duration of physical activity);

3) **Sports app use assessment** (current use, previous experience, frequency and duration of use);

4) **eHealth literacy assessment**. eHealth literacy was assessed using the eHealth Literacy Scale (eHEALS) developed by Norman and Skinner (2006a). The scale consists of eight items measuring individuals' perceived ability to find, understand, evaluate, and apply health-related information obtained through digital technologies. All items were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The overall eHealth literacy score was calculated by summing the responses to all eight items, with higher scores indicating higher levels of eHealth literacy (Norman & Skinner, 2006a). The scale demonstrated high internal consistency ($\alpha = 0.869$; $\omega = 0.891$).

5) **Sports app acceptance assessment**. Sports app acceptance was assessed using the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2; Venkatesh et al., 2012), including the constructs of performance expectancy, effort expectancy, facilitating conditions, hedonic motivation, habit, social influence, and behavioral intention. The price value construct was excluded because the sports apps included in the study were available free of charge, making this construct irrelevant in the present context. The model was further extended by incorporating the constructs of personal innovativeness (Farooq et al., 2017), self-efficacy (Dhiman et al., 2020), and health consciousness (Damber et al., 2021). Participants rated all items measuring the factors influencing sports app acceptance on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Mean scores were calculated for each construct, with higher scores indicating more favorable evaluations of the respective construct. All subscales demonstrated very good internal consistency ($\alpha = 0.832$ – 0.928 ; $\omega = 0.865$ – 0.939).

Exploratory factor analysis (EFA) demonstrated the suitability of the data for factor analysis, with KMO values exceeding 0.60, statistically significant Bartlett's tests ($p < 0.001$), high explained variance ($> 57\%$), and strong factor loadings (0.622 – 0.991). A single-factor structure was identified for all constructs, whereas the eHealth Literacy Scale demonstrated a two-factor structure comprising the ability to find and understand health information and the ability to evaluate and apply health information.

Confirmatory factor analysis (CFA) demonstrated good model fit ($\chi^2(1364) = 3215$, $p < 0.001$; $\chi^2/df = 2.36$; RMSEA = 0.078; CFI = 0.953; TLI = 0.950; SRMR = 0.062).

2.3. Participants and organization of the cross-sectional study

Participants were selected according to the following **inclusion criteria**:

- 1) Age (55 years or older);
- 2) Experience using sports apps (current or former users);
- 3) Engagement in at least a minimal level of planned physical activity (at least 30 minutes per session, twice a week).

As the cross-sectional study aimed to assess the overall situation among the older adult population in Lithuania, both men and women were included.

Based on these criteria, purposive sampling was employed.

The required sample size was calculated using Cochran's (1977) formula for large or unknown populations. The minimum required sample size was estimated to be 385 participants.

The final sample comprised 414 participants, of whom 89.4% were women and 10.6% were men. The mean age of the participants was 64.6 ± 5.1 years (range: 55–78 years).

Prior to data collection, ethical approval was obtained from the Research Ethics Committee for Social Research of the Lithuanian Sports University (Approval No. SMTEK-271, 29 June 2024).

The cross-sectional study was conducted from 3 September to 20 December 2024.

2.4. Participants and organization of the educational experiment

Participants were selected based on the following **inclusion criteria**:

- 1) Sex (female);
- 2) Age (55 years or older);
- 3) Experience using sports apps (current or former users);
- 4) Smartphone use (owning and being able to use a smartphone);
- 5) Engaging in at least a minimal level of planned physical activity (at least 30 minutes per session, twice a week).

Given these inclusion criteria and the nature of the educational experiment, which required participants to attend consistently throughout

the 9-week intervention, participants were recruited using purposive and snowball sampling.

The required sample size was calculated for a paired-measures design using the formula proposed by Ledolter and Kardon (2020). The minimum required sample size was estimated to be 31 participants per group.

Participants were allocated to the experimental and control groups using stratified block randomization (Efird, 2011). Randomization was performed using the online randomization tool “Sealed Envelope” (www.sealedenvelope.com) with a 1:1 allocation ratio and a block size of four. Stratification was based on age (57–67 years and 68–77 years) and sports app use status (current users and former users), as both age and previous experience with sports apps were considered factors that could influence the assessment of the study constructs.

Complete pre- and post-intervention data were obtained from 63 women (experimental group, $n = 32$; control group, $n = 31$), who were included in the final analysis. At baseline, the mean age of the participants was 67.0 ± 4.6 years. All participants reported being physically active and either currently using sports apps or having used them previously.

The study was conducted between 7 January and 28 March 2025 and followed a randomized controlled trial design with a **three-stage pre-post experimental structure**:

- 1) Baseline assessment (7–8 January 2025);
- 2) Educational intervention (28 January – 25 March 2025);
- 3) Post-intervention assessment (28 March 2025).

The intervention was delivered only to participants in the experimental group.

The educational experiment lasted nine weeks. Following the baseline assessment, participants were allocated to the experimental and control groups, and the educational intervention began on 28 January 2025. Sessions were held once a week at the same time at the Lithuanian Sports University. A total of nine sessions were conducted. Each session lasted 1 hour. Attendance ranged from 85% to 100%. All educational sessions were delivered by the researcher.

The educational program included nine topics designed to develop technological and eHealth literacy in the context of sports app use. The topics covered types of sports apps and their benefits, data protection and privacy, app search, download, and use physical activity monitoring, data analysis, and social features.

Each session included a review of the previous assignments, an introduction to a new topic, practical training, and independent tasks to be completed before the next session. Between sessions, participants completed independent learning tasks designed to reinforce the knowledge acquired and encourage its application in everyday life.

Before the educational program began, participants were provided with personalized user guides for sports apps based on the operating system of their smartphones. The practical component of the program was based on three sports apps (Health, Walk15, and Google Fit), selected because of their availability in Lithuanian and wide range of features.

2.5. Statistical analysis

Statistical data analysis was performed using IBM SPSS Statistics (version 29.0.1.0) and Jamovi (version 2.6.44) programs.

Data distribution was assessed using skewness and kurtosis values. According to Hair et al. (2022), data may be considered normally distributed when skewness and kurtosis values fall within the range of -1 to 1 . However, values ranging from -2 to 2 may also be considered acceptable (Gravetter et al., 2021; Hair et al., 2022).

Descriptive statistics, including percentage distributions, means (M), standard deviations (SD), and minimum and maximum values, were calculated.

The internal consistency of the questionnaire scales was assessed using Cronbach's alpha (α) and McDonald's omega (ω) coefficients. Reliability coefficients were interpreted as follows: >0.90 , excellent; >0.80 , good; >0.70 , acceptable; >0.60 , questionable; >0.50 , poor; and <0.50 , unacceptable (George & Mallery, 2003).

The fit of the structural model, as well as the strength and statistical significance of the relationships between the constructs, were evaluated using structural equation modelling (SEM).

As the data met the assumption of normality, parametric statistical analyses were performed. A paired-samples t-test was used to compare two measurements within the same group of participants in order to assess changes over time. An independent-samples t-test was used to compare the means of two independent groups. Analysis of variance (ANOVA) was used to compare differences among more than two groups or conditions, whereas multivariate analysis of variance (MANOVA) was used to examine differences across multiple dependent variables simultaneously.

3. RESULTS

3.1. Results of the cross-sectional study

The initial cross-sectional study aimed to evaluate the baseline level of eHealth literacy among older adults before developing the educational intervention. The mean eHealth literacy score was 25.49 ± 7.58 for the total sample and 23.62 ± 7.02 for women, who constituted the target population of the intervention study, indicating the need for a targeted educational intervention.

A further aim of the initial cross-sectional study was to examine the relationships among the variables included in the proposed theoretical model of older adults' sports app acceptance. The results are presented in Figure 3.

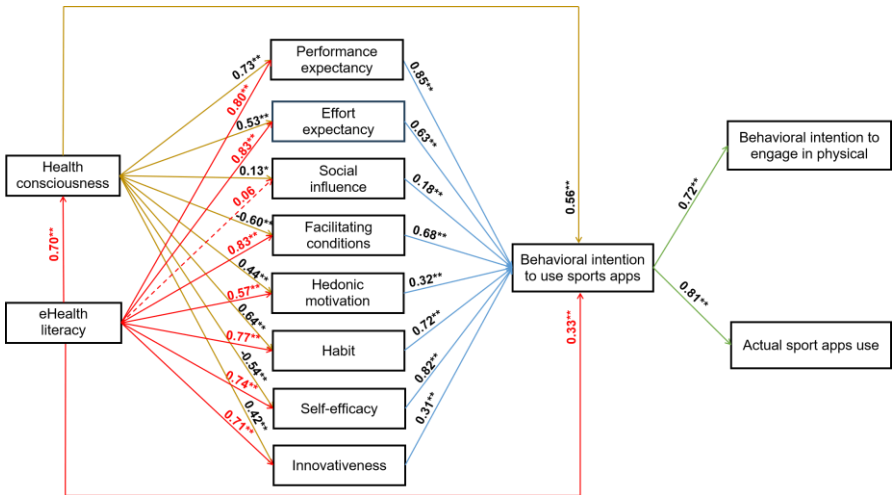


Figure 3. Structural model of the relationships among factors shaping the acceptance of sport apps ($n = 414$)

Note. $p \leq 0.05$; $p \leq 0.01$; dashed arrow – $p > 0.05$.

- Relationships between eHealth literacy and the other constructs in the model
- Relationships between health consciousness and the other constructs in the model
- Relationships between the sports app acceptance factors and intentions to use apps
- Relationships between behavioral intentions to use sport apps, actual app use, and intentions to engage in physical activity

eHealth literacy had a positive effect on health consciousness and more favorable evaluations of the sports app acceptance factors, and increased behavioral intentions to use sport apps both directly and

indirectly. Additional mediation analysis demonstrated that significant indirect effects were observed through the sports app acceptance factors ($p < 0.001$) and through the sequential mediation pathway involving health consciousness and the sports app acceptance factors ($p < 0.001$). However, the indirect effect operating solely through health consciousness was not statistically significant ($p > 0.05$). The only statistically non-significant direct relationship was found between eHealth literacy and social influence. Behavioral intentions to use sport apps were significantly associated with both actual sports app use and behavioral intentions to engage in physical activity.

Overall, the SEM analysis supported almost all relationships proposed in the theoretical model of older adults' sports app acceptance, thereby largely supporting Hypothesis 1.

3.2. Results of the educational experiment

The educational experiment aimed to evaluate the effects of the technological literacy education intervention on the factors shaping sports app acceptance and behavioral intentions to engage in physical activity.

eHealth literacy. A statistically significant Group $\times$ Time interaction was observed (Wilks' $\Lambda = 0.60$, $F(3, 58) = 12.93$, $p < 0.001$, $\eta_p^2 = 0.40$). Subsequent analyses showed that, following the educational intervention, the experimental group demonstrated significant improvements in overall eHealth literacy ($p < 0.001$), the ability to find and understand health information ($p < 0.001$), and the ability to evaluate and apply health information ($p < 0.001$), whereas no statistically significant changes were observed in the control group.

Table 1. Effect of the group $\times$ time interaction on eHealth literacy and its factors

Variables	Group $\times$ Time interaction			
	<i>F</i>	<i>p</i>	η_p^2	$1 - \beta$
eHealth literacy	38.037	<0.001	0.388	1.000
Ability to find and understand information	28.017	<0.001	0.318	0.999
Ability to evaluate and apply information	24.029	<0.001	0.286	0.998

Note. η_p^2 - effect size; $1 - \beta$ - observed power.

Sports app acceptance factors. A statistically significant Group $\times$ Time interaction was observed (Wilks' $\Lambda = 0.41$, $F(7, 54) = 11.14$, $p < 0.001$, $\eta_p^2 = 0.59$). Subsequent analyses showed that, following the educational intervention, the experimental group demonstrated significant improvements in performance expectancy ($p < 0.01$), effort

expectancy ($p \leq 0.001$), facilitating conditions ($p < 0.001$), hedonic motivation ($p < 0.001$), habit ($p < 0.01$), social influence ($p < 0.05$), innovativeness ($p < 0.01$), and self-efficacy ($p < 0.001$). Changes in health consciousness were not statistically significant in the experimental group ($p > 0.05$). No statistically significant changes were observed in the control group ($p > 0.05$).

Table 2. *Effect of the group × time interaction on sports app acceptance factors*

Variables	Group × Time interaction			
	<i>F</i>	<i>p</i>	η_p^2	$1 - \beta$
Performance expectancy	7.539	0.008	0.112	0.771
Effort expectancy	11.916	0.001	0.166	0.925
Facilitating conditions	14.676	<0.001	0.197	0.965
Hedonic motivation	15.634	<0.001	0.207	0.973
Habit	8.092	0.006	0.119	0.799
Social influence	4.072	0.048	0.064	0.510
Innovativeness	7.013	0.009	0.108	0.754
Health consciousness	0.052	0.820	0.001	0.056
Self-efficacy	15.807	<0.001	0.209	0.975

Note. η_p^2 - effect size; $1 - \beta$ – observed power.

Behavioral intentions. A statistically significant Group × Time interaction was observed (Wilks’ $\Lambda = 0.44$, $F(3, 56) = 23.94$, $p < 0.001$, $\eta_p^2 = 0.56$). Subsequent analyses showed that, following the educational intervention, the experimental group demonstrated significant increases in behavioral intention to use sport apps ($p < 0.001$), behavioral intention to engage in physical activity ($p < 0.01$), and actual sports app use ($p < 0.001$). No statistically significant changes were observed in the control group ($p > 0.05$).

Table 3. *Effect of the group × time interaction on behavioral intention to use sport apps, intention to be physically active, and actual sport app use*

Variables	Group × Time interaction			
	<i>F</i>	<i>p</i>	η_p^2	$1 - \beta$
Behavioral intention to use sport apps	18.982	<0.001	0.240	0.990
Behavioral intention to engage in PA	7.155	0.010	0.110	0.749
Actual sport app use	25.806	<0.001	0.301	0.999

Note. PA – physical activity; η_p^2 - effect size; $1 - \beta$ – observed power.

Overall, the findings partially support Hypothesis 2, indicating that the technological literacy education improved the factors shaping sports app acceptance and behavioral intentions to engage in physical activity, but had no significant effect on health consciousness.

4. DISCUSSION

Discussion of the cross-sectional study. The cross-sectional study aimed to empirically validate the proposed theoretical model of sports app acceptance. Previous research has shown that eHealth literacy may be associated with behavioral intention to use sport apps both directly (Kabakus et al., 2025; Kim et al., 2024; Noeryosan et al., 2025; Ukaegbu & Fan, 2025; Zhao et al., 2025) and indirectly through health consciousness (Dai et al., 2024) and technology acceptance factors, including performance expectancy and effort expectancy (Chang et al., 2021; Kabakus et al., 2023; Min et al., 2024; Ukaegbu & Fan, 2025), facilitating conditions (Ma et al., 2023; Min et al., 2024), hedonic motivation (Min et al., 2024), habit (Trinh et al., 2024), self-efficacy (Chiu et al., 2025; Dai et al., 2024; Wu et al., 2022; Zhao et al., 2025; Xin & Minyang, 2026), and innovativeness (Goldsmith & Foxall, 2003). The findings of the present study confirmed these relationships, demonstrating that individuals with higher levels of eHealth literacy perceived sports apps as easier to use and more beneficial, attributed greater hedonic value to their use, expressed stronger confidence in their ability to use technology, were more receptive to technological innovations, and reported stronger habits of app use. The only statistically non-significant relationship was found between eHealth literacy and social influence. Although previous studies have reported a significant association between these constructs (Kim et al., 2024; Min et al., 2024; Zhao et al., 2025), the contrasting finding of the present study suggests that the importance of social influence may depend on the characteristics of the study population and the context of technology use.

The findings of the present study also support previous evidence indicating that health consciousness may be associated with behavioral intention both directly (Cho et al., 2014; Zhang et al., 2022) and indirectly through technology acceptance factors (Barua & Barua, 2021; Cao et al., 2024; To et al., 2019). Individuals with higher levels of health consciousness perceived sport apps as more useful, easier to use, and more enjoyable, reported more favorable facilitating conditions, and demonstrated stronger habits of app use. However, contrary to previous studies (An et al., 2025; Basu & Dutta, 2008; Ma et al., 2023; Min et al., 2024), the present study identified negative associations between health consciousness and self-efficacy, as well as facilitating conditions. One possible explanation is that individuals with greater health consciousness

evaluate both their technological abilities and the resources available to support technology use more critically. Although health-conscious individuals tend to be better informed, seek health information more actively, and use digital technologies more frequently (Basu & Dutta, 2008; Cho et al., 2014; Zhang et al., 2022), they may also have a greater awareness of the complexity of health management, potential risks, and their own limitations in technological skills.

Previous studies have also demonstrated that behavioral intention to use health technologies is associated with performance expectancy, effort expectancy, facilitating conditions, hedonic motivation, social influence, habit, innovativeness, and self-efficacy (Aranha et al., 2024; Dash & Mohanty, 2023; Hanqing et al., 2025; Liu et al., 2023; Vietzke et al., 2023; Wu & Lim, 2024; Yang, 2024). The findings of the present study confirmed all of these relationships, indicating that more favorable evaluations of acceptance factors were associated with stronger behavioral intention to use sports apps.

Finally, behavioral intention to use sport apps was associated with both actual sports app use and behavioral intention to be physically active. Consistent with the Theory of Reasoned Action (Fishbein & Ajzen, 1975), these findings suggest that promoting physical activity through sports apps requires strengthening behavioral intentions shaped by technology acceptance factors.

Overall, the findings of the cross-sectional study are largely consistent with those reported in previous research and confirm most of the relationships proposed in the theoretical model of sports app acceptance. The results support the validity of the proposed theoretical model and confirm the research hypothesis (H1), indicating that eHealth literacy exerts both direct and indirect positive effects on behavioral intention to use sports apps through health consciousness and sports app acceptance factors. The study extends the existing body of knowledge by providing empirical support for an integrated model of sports app acceptance that incorporates eHealth literacy, health consciousness, and the extended UTAUT2 model in a population of older adults.

Discussion of the educational experiment. The intervention study aimed to evaluate the effects of the technological literacy education intervention on factors shaping older women's acceptance of sports apps and their behavioral intentions to engage in physical activity. The findings demonstrated a consistent positive effect of the technological literacy

education intervention on nearly all the examined constructs, thereby largely supporting the proposed research hypothesis (H2).

The design of the program and the selection of educational methods were based on the principles of andragogy and experiential learning, which emphasize the importance of learners' prior experience, the practical application of knowledge, self-directed learning, and the integration of learning content with everyday life situations (Knowles, 1984; Kolb & Kolb, 2009). As previous studies have primarily focused on developing general digital or technological skills, the findings of the present study suggest that a structured education program based on eHealth literacy competencies and specifically tailored to the use of sports apps can be an effective approach for older women.

There is no consensus in the scientific literature regarding the optimal duration of education interventions. According to evidence from systematic reviews and meta-analyses, interventions may range from several weeks to one year or even longer (Barbati et al., 2025; Kizilkilic et al., 2025). In the present study, it was assumed that an intervention lasting approximately two months would be sufficient to achieve meaningful improvements (Barbati et al., 2025; Dong et al., 2023), while also taking into account the scope of the educational content (Dong et al., 2023). The findings indicate that a nine-week program, consisting of one session per week and combining face-to-face instruction with independent learning, can be an effective approach for older women. However, the observed effects were likely attributable not only to the duration of the intervention but also to its practical nature, the relevance of the educational content, and the opportunity to apply newly acquired knowledge in everyday life (Knowles, 1984; Kolb & Kolb, 2009).

Previous studies have demonstrated that technological literacy education can significantly improve eHealth literacy (Bevilacqua et al., 2021; Chang et al., 2021; De Main et al., 2022; Spindler et al., 2022). The findings of the present study are consistent with previous evidence and the principles of experiential learning theory, which emphasizes that knowledge and skills are developed through experience, reflection, and active application (Kolb, 1984; Kolb & Kolb, 2009). However, because eHealth literacy was assessed using the eHEALS instrument, the findings primarily reflect improved confidence in participants' ability to access and use digital physical activity information rather than objectively assessed skills. This improvement is meaningful, as confidence in one's abilities is an important prerequisite for technology use in older age

(Schroeder et al., 2024; Seerig et al., 2024; Wilson et al., 2021; Yang, 2024). It should also be noted that the participants were women with prior experience using sports apps, most of whom held a university degree, which may have contributed to the effectiveness of the intervention.

Previous studies have also shown that technological literacy education can enhance self-efficacy (Lee & Kim, 2019; Nahm et al., 2019), increase motivation to use technology (Lee & Kim, 2019; Lee et al., 2022; Nahm et al., 2019; Spindler et al., 2022), and promote more positive attitudes toward technology (Chang et al., 2021; De Main et al., 2022). The findings of the present study largely support these assumptions. Following the intervention, participants demonstrated significant improvements in performance expectancy, effort expectancy, facilitating conditions, hedonic motivation, habit, social influence, innovativeness, and self-efficacy. These findings suggest that technological literacy education may contribute not only to improving technology-related competencies but also to fostering more favorable perceptions of sports app acceptance factors.

Contrary to expectations, no significant changes in health consciousness were observed. Although previous studies have suggested that higher levels of eHealth literacy may be associated with greater health consciousness (Dai et al., 2024), the increase in eHealth literacy observed in the present study was not accompanied by changes in this construct. One possible explanation is that health consciousness is a relatively stable disposition reflecting an individual's concern for maintaining health and motivation to preserve it (Hong, 2009). Moreover, the high baseline levels of health consciousness in both groups may have also limited the potential for further improvement.

Finally, the experimental group demonstrated significant improvements in behavioral intention to use sports apps, actual sports app use, and behavioral intention to engage in physical activity following the intervention. These findings are consistent with previous research showing that technological literacy and eHealth literacy can promote technology use (Chang et al., 2021; Kabakus et al., 2025; Min et al., 2024; Ukaegbu & Fan, 2025), increase motivation to use digital technologies (Lee & Kim, 2019; Lee et al., 2022; Nahm et al., 2019; Spindler et al., 2022), and contribute to greater independence and digital empowerment (Mäkinen, 2006). Furthermore, the findings are in line with recent evidence suggesting that digital literacy may be indirectly associated with higher levels of physical activity and better health outcomes (Li et al.,

2025). These results highlight the importance of educational interventions for promoting health-promoting behaviors through technology use.

Overall, the findings of the educational experiment are largely consistent with those reported in previous research and confirm that technological literacy education can serve as an effective approach for strengthening the competencies and attitudes required for sports app use among older women. The findings largely support the proposed research hypothesis (H2), with the exception of the anticipated changes in health consciousness. The study extends the existing body of knowledge by demonstrating that an eHealth literacy competency-based education program specifically designed to support sports app use can significantly improve not only evaluations of sports app acceptance factors but also actual sports app use and behavioral intention to engage in physical activity – outcomes that have rarely been examined together in previous research.

The findings of this study should be interpreted in light of several limitations. First, self-report questionnaires were used; therefore, the results reflect participants' perceived rather than objectively assessed levels of eHealth literacy, sports app acceptance factors, and behavioral changes. Second, the study included only older women with prior experience using sports apps, most of whom were physically active and highly educated. Consequently, the generalizability of the findings to the broader population of older adults should be interpreted with caution. Third, the control group did not receive an alternative intervention, and the effects of the educational intervention were evaluated only over the short term. Therefore, its long-term effectiveness and the potential influence of non-specific intervention effects remain unclear. Finally, participant selection based on previous experience with sports apps limits the applicability of the findings to older adults with no prior experience using sports apps.

Despite these limitations, the study provides important insights into the potential of technological literacy education to promote digital inclusion, acceptance of sports apps, and physically active lifestyles among older women. Future research should include more diverse study populations, employ longitudinal research designs, and incorporate objective measures of behavioral outcomes. Further research is also needed to refine and validate the educational intervention model developed in this study in order to identify the most effective components of technological literacy education.

CONCLUSIONS

1. In the context of sports app use, technological literacy is conceptualized as a multidimensional competence encompassing the analytical and contextual competencies of eHealth literacy, as well as the broader transformative dimension of understanding the purpose, benefits, and meaningful use of technology. Older adults' acceptance of sports apps is shaped by eHealth literacy, health consciousness, performance expectancy, effort expectancy, facilitating conditions, social influence, hedonic motivation, habit, self-efficacy, and innovativeness. Therefore, the acceptance of sports apps can be explained as the result of the interaction between technological, individual, and contextual factors.
2. Based on the theoretical analysis, a theoretical model of technological literacy education was developed, which served as the basis for an eHealth literacy competency-based technological literacy education program focused on the use of sports apps and tailored to the learning needs of older adults. The program is grounded in the principles of andragogy and experiential learning theory, taking into account learning facilitators and barriers and applying educational methods aligned with the stages of the experiential learning cycle. The theoretical model of the program's effects supports the assumption that technological literacy education may strengthen eHealth literacy, health consciousness, sports app acceptance factors, and behavioral intentions to use sports apps and engage in physical activity. Thus, the model conceptualizes technological literacy education not only as a process of competence development but also as contributing to sports app acceptance and health-related behavior.
3. The evaluation of the factors shaping older adults' sports app acceptance showed that the participants had a moderate level of eHealth literacy and a relatively high level of health consciousness. Among the acceptance factors, performance expectancy, facilitating conditions, self-efficacy, and social influence received the most favorable evaluations, effort expectancy, hedonic motivation, and habit were evaluated moderately, and innovativeness received the lowest evaluation. The participants reported positive behavioral intentions to use sports apps and to engage in physical activity. Evaluation of the relationships among the model variables revealed that eHealth literacy influenced behavioral intentions to use sports

apps both directly and indirectly through health consciousness and the acceptance factors, with the exception of the social influence. Health consciousness influenced behavioral intentions both directly and indirectly through the acceptance factors. However, the negative relationships observed with facilitating conditions and self-efficacy indicate that higher health consciousness was associated with a more critical evaluation of external conditions and confidence in one's own abilities. All acceptance factors had a statistically significant effect on behavioral intentions to use sports apps, with the strongest effects observed for performance expectancy, self-efficacy, habit, facilitating conditions, and effort expectancy, and the weakest for innovativeness and social influence. Behavioral intentions to use sports apps were associated with their actual use and with behavioral intentions to engage in physical activity. These findings confirm the validity of the developed theoretical model and indicate that eHealth literacy can be considered an important factor shaping sports app acceptance, linking health consciousness, acceptance factors, and behavioral intentions to use sports apps. This suggests that older adults' sports app acceptance can be explained not only through UTAUT2 factors but also through eHealth literacy and health consciousness.

4. Evaluation of the effects of technological literacy education demonstrated that, following the intervention, participants in the experimental group had statistically significantly higher eHealth literacy, both overall and across its dimensions, compared with their pre-intervention results. They also demonstrated significantly more favorable evaluations of sports app acceptance factors, including performance expectancy, effort expectancy, facilitating conditions, social influence, hedonic motivation, habit, innovativeness, and self-efficacy. Participants in the experimental group expressed statistically significantly stronger intentions to use sports apps and engage in physical activity and had higher actual sports app use scores following the intervention. Technological literacy education had no statistically significant effect only on health consciousness. Statistically significant effects of the technological literacy education intervention were found for all other variables examined. These findings support the conceptualization of technological literacy education as a process that contributes not only to strengthening eHealth literacy competencies but also to increasing sports app acceptance and fostering health-related behavioral intentions.

SANTRAUKA

Aktualumas. Visuomenės senėjimas yra vienas svarbiausių XXI amžiaus demografinių procesų, lemiantis didėjančią poreikį sudaryti prielaidas sėkmingam senėjimui. Reguliarus fizinis aktyvumas laikomas vienu svarbiausių sėkmingo senėjimo veiksnių (Izquierdo et al., 2021; Wong et al., 2023; Zhao et al., 2024), padedančiu išlaikyti funkcinius bei kognityvinius gebėjimus (Thornton et al., 2025; Wong et al., 2023; Xu et al., 2023; Zhao et al., 2024). Didesnis fizinio aktyvumo lygis vyresniame amžiuje taip pat siejamas su geresne psichologine savijauta, didesniu pasitenkinimu gyvenimu ir laime (An et al., 2020; Huang et al., 2021).

Nepaisant įrodytos fizinio aktyvumo naudos, nemaža dalis vyresnio amžiaus žmonių susiduria su sveikatos, motyvacijos, aplinkos bei socioekonominėmis kliūtimis užsiimti fizine veikla (Billot et al., 2020; Koh et al., 2022; Patel et al., 2024; Ribeiro et al., 2025). Šiame kontekste sporto programėlės laikomos veiksminga fizinio aktyvumo skatinimo priemone, padedančia įveikti šias kliūtis, sudarančia sąlygas valdyti fizinį aktyvumą bei taip prisidedančia prie sveikatos stiprinimo (Aslam et al., 2020; Billot et al., 2020; Soto-Bagaria et al., 2023; Wegener & Kayser, 2023). Vis dėlto jų naudojimas tarp vyresnio amžiaus asmenų išlieka netolygus ir priklauso ne tik nuo psichologinių bei technologinių veiksnių, bet ir nuo technologinio raštingumo, kurio lygis dažnai yra žemesnis nei jaunesnio amžiaus asmenų (Charness & Boot, 2022; Wang et al., 2019). Kadangi technologinis raštingumas gali būti ugdomas, svarbu kurti ir taikyti ugdymo intervencijas (Soto-Bagaria et al., 2023), kurios grindžiamos suaugusiųjų mokymosi principais ir orientuotos į praktinį technologijų naudojimą (El-Amin, 2020; Knowles, 1984).

Iširtumas. Vieningoji technologijų priėmimo ir naudojimo teorija (UTAUT2) yra viena plačiausiai taikomų technologijų priėmimą analizuojančių teorijų (Venkatesh et al., 2012). Remiantis ja, elgsenos ketinimus naudoti technologijas lemia veiklos našumo ir pastangų lūkesčiai, socialinė įtaka, palengvinančios sąlygos, hedonistinė motyvacija, įprotis ir kainos vertė. Vėlesniuose tyrimuose ši teorija buvo išplėsta tokiais veiksniais kaip novatoriškumas (Farooq et al., 2017), saviveiksmingumas (Chiu et al., 2025; Dai et al., 2024; Zhao et al., 2025) ir sveikatos sąmoningumas (Dai et al., 2024), pripažįstant, kad priimtinumą gali formuoti ne tik technologiniai, bet ir individualūs veiksniai. Tyrimai, orientuoti į vyresnio amžiaus populiacijas, nuosekliai identifikuoja pagrindinius UTAUT2 elementus kaip svarbius

technologijų priimtinumą formuojančius veiksnys (Ma et al., 2023; Min et al., 2024; Ukaegbu & Fan, 2025; Wu & Lim, 2024; Zhao et al., 2025). Taip pat nustatyta, kad priimtumas gali būti susijęs su amžiumi, psichologinėmis nuostatomis, ankstesne naudojimo patirtimi bei technologiniu raštingumu (Charness & Boot, 2022; Wang et al., 2019; Yazdani-Darki et al., 2020). Tarp jų technologinis raštingumas išsiskiria kaip ypač svarbus veiksnys, susijęs su elgsenos ketinimais naudoti sveikatos technologijas (Kim et al., 2024; Noeryosan et al., 2025; Ukaegbu & Fan, 2025; Zhao et al., 2025). Jis apima ne tik skaitmeninių įgūdžių taikymą, bet ir supratimą apie technologijų raidą, jų ideologinį turinį bei poveikį žmogui ir visuomenei (Gagel, 1997). Sveikatos technologijų kontekste jis dažnai siejamas su e. sveikatos raštingumu (angl. eHealth literacy) – gebėjimu rasti, suprasti ir pritaikyti su sveikata susijusią informaciją (Norman & Skinner, 2006a). Tyrimai rodo, kad e. sveikatos raštingumas yra susijęs su technologijų naudojimu tiek tiesiogiai, tiek netiesiogiai – per technologijų priimtinumą veiksnys (Kim et al., 2024; Ukaegbu & Fan, 2025; Zhao et al., 2025).

Vyresnio amžiaus asmenys neretai turi ribotą ankstesnę išmaniųjų technologijų naudojimo patirtį ir pasižymi žemesniu technologinio raštingumo lygiu (Charness & Boot, 2022; Wang et al., 2019; Yazdani-Darki et al., 2020). Reikšmingas atotrūkis, palyginti su jaunesnio amžiaus asmenimis, nustatomas nuo 55 metų amžiaus (Europos Komisija, 2023; Kantar, 2019; LNMMB, 2020). Žemas technologinis raštingumas siejamas su ribotomis žiniomis, mažesne prieiga prie technologinių išteklių bei menkesniu technologijų priimtumu (Khan et al., 2026; Kim et al., 2023). Jis taip pat susijęs su mažesniu pasitikėjimu savimi, didesniu su technologijomis susijusiu nerimu bei neigiamomis nuostatomis technologijų atžvilgiu (García-García et al., 2022; Shiu et al., 2023). Šie iššūkiai ypač būdingi moterims, kurių sveikatos technologijų priimtumas yra žemesnis nei vyrų (Jung et al., 2026). Lyginant su vyrais, moterys dažniau šias technologijas vertina kaip sudėtingas naudoti (Hoque, 2014) bei dažniau patiria prieigos prie technologinių išteklių ribotumą (Aslam et al., 2024; Long et al., 2023; Tripathi, 2025). Taip pat jų ketinimus naudoti technologijas labiau lemia saviveiksmingumas, pasitikėjimas technologijomis ir skaitmeniniai įgūdžiai (Luo & Mou, 2022), kurių lygis neretai yra žemesnis nei vyrų (Fung et al., 2023; Jung et al., 2026). Remiantis tuo, vyresnio amžiaus moterys gali būti laikomos viena iš didesnę technologinės atskirties riziką patiriančių grupių, kuriai technologinio raštingumo ugdymo intervencijos gali būti ypač naudingos,

kadangi didžiausias jų poveikis nustatytas tarp asmenų, kurių pradinis technologinio raštingumo lygis buvo žemesnis (Barbati et al., 2025). Šiame kontekste technologinio raštingumo ugdymas gali būti laikomas svarbiu procesu, prisidedančiu prie visuomenės sveikatos stiprinimo, skaitmeninės atskirties mažinimo, geresnės prieigos prie sveikatos informacijos užtikrinimo ir veiksmingesnio skaitmeninių sveikatos išteklių naudojimo.

Problema. Reaguojant į skaitmeninės atskirties iššūkius, vis daugiau dėmesio skiriama vyresnio amžiaus asmenų technologinio raštingumo ugdymui (Soto-Bagaria et al., 2023). Tyrimai rodo, kad tokios intervencijos gali sumažinti su technologijomis susijusį nerimą (Chiu et al., 2016; Lee & Kim, 2019) ir padidinti jomis pasitikėjimą (Chang et al., 2021; De Main et al., 2022). Tačiau mokslinėje literatūroje išlieka keletas reikšmingų spragų. Pirma, dauguma technologinio raštingumo ugdymo intervencijų yra orientuotos į bendrųjų skaitmeninių įgūdžių stiprinimą (Quialheiro et al., 2023; Yoo, 2021), o ne į e. sveikatos raštingumo kompetencijų, reikalingų sveikatos technologijų ir sporto programėlių naudojimui, ugdymą. Atsižvelgiant į vyresnio amžiaus asmenų patiriamas mokymosi kliūtis (Schirmer et al., 2023), išryškėja tikslinių intervencijų, pritaikytų konkretiems naudotojų poreikiams, poreikis (Perim et al., 2025; Yoo, 2021). Antra, e. sveikatos raštingumo intervencijų poveikis dažniausiai vertinamas pagal informacinius, motyvacinius ir elgsenos rezultatus (Yang et al., 2024), o technologijų priimtumas vis dar dažnai aiškinamas remiantis ankstesniais modeliais, tokiais kaip Technologijų priėmimo modelis (TAM) (Chiu et al., 2016), kuris neapima tokio plataus technologijų priimtumo veiksnų spektro kaip UTAUT2. Trečia, trūksta eksperimentinių tyrimų, vertinančių kryptingo technologinio raštingumo ugdymo poveikį sporto programėlių priimtinumui. Nors dalis tyrimų, taikydami UTAUT pagrindu sukurtus modelius, analizavo skaitmeninių įgūdžių ugdymo poveikį technologijų priimtinumui (Yang et al., 2024), jie apsiribojo bendru išmaniųjų telefonų naudojimu. Be to, išlieka neaišku, ar padidėjęs technologijų priimtumas virsta su fiziniu aktyvumu susijusiais elgsenos ketinimais. Taigi trūksta eksperimentinių tyrimų, kuriuose UTAUT2 teorinės prieigos pagrindu būtų vertinamas kryptingo technologinio raštingumo ugdymo poveikis vyresnio amžiaus moterų sporto programėlių priimtinumą formuojantiems veiksniams bei su fiziniu aktyvumu susijusiems elgsenos ketinimams. Remiantis tyrimų spraga, keliami tokie **probleminiai klausimai**:

1. Kokį poveikį technologinio raštingumo ugdymas, orientuotas į sporto programėlių naudojimą, daro vyresnio amžiaus moterų sporto programėlių priimtinumą formuojantiems veiksniams?

2. Kokį poveikį šis ugdymas daro vyresnio amžiaus moterų elgsenos kėtinimams bėti fiziškai aktyviomis?

Tyrimo objektas – technologinio raštingumo ugdymo poveikis vyresnio amžiaus moterų sporto programėlių priimtinumui.

Tyrimo tikslas – įvertinti technologinio raštingumo ugdymo poveikį vyresnio amžiaus moterų sporto programėlių priimtinumą formuojantiems veiksniams ir jų elgsenos kėtinimams bėti fiziškai aktyvioms.

Tyrimo uždaviniai:

1. Atskleisti technologinio raštingumo sampratą ir vyresnio amžiaus asmenų sporto programėlių priimtinumą formuojančius veiksnis.

2. Parengti technologinio raštingumo ugdymo programą, orientuotą į vyresnio amžiaus asmenų sporto programėlių naudojimą, ir sudaryti bei pagrįsti jos poveikio tyrimo modelį.

3. Įvertinti vyresnio amžiaus asmenų sporto programėlių priimtinumą formuojančius veiksnis ir nustatyti jų tarpusavio ryšius.

4. Įvertinti technologinio raštingumo ugdymo poveikį vyresnio amžiaus moterų sporto programėlių priimtinumą formuojantiems veiksniams ir jų elgsenos kėtinimams bėti fiziškai aktyviomis.

Tyrimo hipotezės:

H1. E. sveikatos raštingumas daro teigiamą tiesioginį ir netiesioginį poveikį elgsenos kėtinimams naudoti sporto programėles, tarpininkaujant sveikatos sąmoningumui ir sporto programėlių priimtinumą veiksniams.

H2. Dalyvavimas technologinio raštingumo ugdymo intervencijoje, orientuotoje į sporto programėlių naudojimą, teigiamai veikia vyresnio amžiaus moterų sporto programėlių priimtinumą formuojančius veiksnis ir jų elgsenos kėtinimus bėti fiziškai aktyviomis.

Darbo mokslinis naujumas. Šio darbo mokslinis naujumas atsiskleidžia keliais aspektais: (1) vienas pirmųjų tyrimų, kuriame, taikant ugdomąjį eksperimentą, empiriškai vertinamas į sporto programėlių naudojimą orientuoto technologinio raštingumo ugdymo poveikis vyresnio amžiaus moterų e. sveikatos raštingumui, sveikatos sąmoningumui, UTAUT2 teorija grindžiamiems sporto programėlių priimtinumą veiksniams ir su sveikata susijusiems elgsenos kėtinimams;

(2) darbas praplečia žinias apie technologinio raštingumo ugdymą ir vyresnio amžiaus moterų sporto programėlių priimtinumą formuojančius veiksnius; (3) parengta technologinio raštingumo ugdymo programa, grindžiama andragogikos principais, patyriminio mokymosi teorija ir e. sveikatos raštingumo kompetencijomis, orientuota į sporto programėlių naudojimą ir pritaikyta vyresnio amžiaus asmenų poreikiams, atsižvelgiant į mokymąsi palengvinančius veiksnius ir patiriamas kliūtis; (4) validuotas klausimynas, skirtas vyresnio amžiaus asmenų e. sveikatos raštingumui, sveikatos sąmoningumui, sporto programėlių priimtinumui, veiksniams ir elgsenos kėtinimams vertinti.

Darbo praktinis reikšmingumas. Šio tyrimo rezultatai gali būti taikomi kuriant ir įgyvendinant vyresnio amžiaus asmenims skirtas technologinio raštingumo ugdymo programas, orientuotas į fizinio aktyvumo skatinimą pasitelkiant sporto programėles. Disertacijoje pristatytas technologinio raštingumo ugdymo modelis gali būti naudojamas sveikatos stiprinimo, visuomenės sveikatos, švietimo ir neformaliojo ugdymo srityse dirbančių specialistų praktikoje. Tyrimo metu nustatyti sporto programėlių priimtinumą formuojantys veiksniai gali padėti geriau suprasti vyresnio amžiaus asmenų sporto programėlių naudojimo ypatumus ir prisidėti prie tikslinių intervencijų kūrimo. Gauti rezultatai gali būti naudojami formuojant fizinio aktyvumo skatinimo strategijas bei mažinant vyresnio amžiaus asmenų, ypač moterų, skaitmeninę atskirtį, taip pat gali prisidėti prie jų sveikatos stiprinimo ir gyvenimo kokybės gerinimo.

IŠVADOS

1. Technologinis raštingumas sporto programėlių naudojimo kontekste suvokiamas kaip daugialypė kompetencija, apimanti e. sveikatos raštingumo analitines ir kontekstines kompetencijas bei platesnę transformacinę technologijų paskirties, naudos ir naudojimo prasmės dimensiją. Vyresnio amžiaus asmenų sporto programėlių priimtinumą formuoja e. sveikatos raštingumas, sveikatos sąmoningumas, veiklos našumo ir pastangų lūkesčiai, palengvinančios sąlygos, socialinė įtaka, hedonistinė motyvacija, įprotis, saviveiksmingumas ir novatoriškumas. Tai leidžia šių programėlių priimtinumą aiškinti kaip technologinių, individualių ir kontekstinių veiksnių sąveikos rezultatą.
2. Remiantis teorine analize sudarytas technologinio raštingumo ugdymo teorinis modelis, kurio pagrindu parengta e. sveikatos raštingumo kompetencijomis grįsta technologinio raštingumo ugdymo programa, orientuota į sporto programėlių naudojimą ir pritaikyta vyresnio amžiaus asmenų mokymosi poreikiams. Programa grindžiama andragogikos principais ir patyriminio mokymosi teorijos nuostatomis, atsižvelgiant į mokymąsi palengvinančius veiksnus ir patiriamas kliūtis bei taikant patyriminio mokymosi ciklo etapus atitinkančius ugdymo metodus. Sukurtame programos poveikio teoriniame modelyje pagrindžiama prielaida, kad technologinio raštingumo ugdymas gali stiprinti e. sveikatos raštingumą, sveikatos sąmoningumą, sporto programėlių priimtinumą veiksnus bei elgsenos ketinimus naudoti sporto programėles ir būti fiziškai aktyviais. Modelis technologinio raštingumo ugdymą konceptualizuoja ne tik kaip kompetencijų plėtojimo procesą, bet ir kaip procesą, galintį prisidėti prie technologijų priėmimo bei su sveikata susijusio elgesio formavimosi.
3. Įvertinus vyresnio amžiaus asmenų sporto programėlių priimtinumą formuojančius veiksnus, nustatyta, kad tiriamieji pasižymėjo vidutinio lygio e. sveikatos raštingumu ir pakankamai aukštu sveikatos sąmoningumu. Iš priimtinumą veiksnių palankiausiai vertinami buvo veiklos našumo lūkesčiai, palengvinančios sąlygos, saviveiksmingumas ir socialinė įtaka, vidutiniškai įvertinti – pastangų lūkesčiai, hedonistinė motyvacija ir įprotis, o žemiausiai – novatoriškumas. Vertinant modelio kintamųjų tarpusavio sąsajas, nustatyta, kad e. sveikatos raštingumas elgsenos ketinimus naudoti sporto programėles veikia tiek tiesiogiai, tiek per sveikatos

sąmoningumą bei priimtino veiksnus, išskyrus socialinę įtaką. Sveikatos sąmoningumas elgsenos ketinimus veikia tiek tiesiogiai, tiek per priimtino veiksnus, tačiau su palengvinančiomis sąlygomis ir saviveiksmingumu nustatyti neigiami ryšiai rodo, kad didesnis sveikatos sąmoningumas yra susijęs su kritiškesniu sąlygų ir pasitikėjimo savo gebėjimais vertinimu. Visi priimtino veiksniai daro statistiškai reikšmingą poveikį elgsenos ketinimams naudoti programėles: stipriausias poveikis nustatytas veiklos našumo lūkesčių, saviveiksmingumo, įpročio, palengvinančių sąlygų ir pastangų lūkesčių, o silpniausias – novatoriškumo ir socialinės įtakos. Elgsenos ketinimai naudoti sporto programėles yra susiję su faktiniu jų naudojimu bei elgsenos ketinimais būti fiziškai aktyviais. Šie rezultatai patvirtina teorinio modelio pagrįstumą ir rodo, kad e. sveikatos raštingumas yra svarbus sporto programėlių priimtino formuojantis veiksnys, siejantis sveikatos sąmoningumą, priimtino veiksnus ir elgsenos ketinimus naudoti sporto programėles. Tai leidžia teigti, kad vyresnio amžiaus asmenų sporto programėlių priimtino gali būti aiškinamas ne tik per UTAUT2 veiksnus, bet ir per e. sveikatos raštingumą bei sveikatos sąmoningumą.

4. Nustatyta, kad po technologinio raštingumo ugdymo intervencijos eksperimentinės grupės dalyvės pasižymėjo statistiškai reikšmingai aukštesniu e. sveikatos raštingumu tiek pagal bendrą e. sveikatos raštingumo balą, tiek pagal atskirus jo gebėjimus. Taip pat eksperimentinės grupės dalyvės po ugdymo išsiskyrė reikšmingai pozityvesniu sporto programėlių priimtino veiksnų – veiklos našumo ir pastangų lūkesčių, palengvinančių sąlygų, socialinės įtakos, hedonistinės motyvacijos, įpročio, novatoriškumo ir saviveiksmingumo – vertinimu. Eksperimentinėje grupėje po intervencijos taip pat nustatyti statistiškai reikšmingai stipresni ketinimai naudoti sporto programėles ir būti fiziškai aktyviomis bei aukštesnis faktinis sporto programėlių naudojimo įvertis. Technologinio raštingumo ugdymas neturėjo statistiškai reikšmingo poveikio tik sveikatos sąmoningumui. Kitų kintamųjų pokyčiai buvo statistiškai reikšmingai susiję su taikyta technologinio raštingumo ugdymo intervencija. Gauti rezultatai leidžia technologinio raštingumo ugdymą konceptualizuoti kaip procesą, prisidedantį ne tik prie e. sveikatos raštingumo kompetencijų stiprinimo, bet ir prie palankesnio sporto programėlių priimtino bei fizinio aktyvumo elgsenos ketinimų formavimosi.

PUBLICATIONS

In scopus databases

1. **Baubonytè, S.** (2026). The Effect of Digital Literacy Training on Physical Activity App Acceptance and Behavioral Intentions Among Older Women: An Experimental Study. *International Journal of Environmental Research and Public Health*, 23(4), 489. <https://doi.org/10.3390/ijerph23040489>

In other international databases

2. Cutillas, A. J. B., **Baubonytè, S.**, & Lara-Bocanegra, A. (2024). Análisis comparativo del perfil sociodemográfico y deportivo según tipo de corredor que usa apps deportivas. In *Proceedings of the XIV Congreso Iberoamericano de Economía del Deporte (CIED14): Inversión en el deporte: gestión inteligente*, 151-154.
3. Angosto, S., **Baubonytè, S.**, Cutillas, A. J. B., & Rojas, F. J. R. (2024). Análisis de intención de uso y necesidad de interacción entre estudiantes no usuarios de apps deportivas según género. In *Proceedings of the XIV Congreso Iberoamericano de Economía del Deporte (CIED14): Inversión en el deporte: gestión inteligente*, 155-158.
4. Cutillas, A. J. B., & **Baubonytè, S.** (2024). Comparación de los factores influyentes en el uso de apps deportivas según tipo de corredor. In *Proceedings of the XIV Congreso Iberoamericano de Economía del Deporte (CIED14): Inversión en el deporte: gestión inteligente*, 159-162.
5. **Baubonytè, S.** (2025). Exploring the link between e-health literacy and sports apps usage for physical activity among older adults: Should educational programs be implemented? In *Proceedings of the 15th International Conference "The Future of Education"*, 287–293. https://doi.org/10.26352/L625_2384-9509

CONFERENCES

1. **Baubonytė, S.** & Valantinė, I. (2022). The use of smart technologies for engaging people in physical activity. *In 15th conference of Baltic Society of Sport Sciences „Challenges and solutions in sport science“*. April 28–29, Kaunas, Lithuania, 47.
2. **Baubonytė, S.**, Angosto, S. & Valantinė, I. (2023). Determinant aspects that impact runners to use sport apps. *Tarptautinė mokslinė praktinė konferencija “Sportininkų rengimo valdymas ir sportininkų darbingumą lemiantys veiksniai“*. Gruodžio 14d., Kaunas, Lietuva, 39.
3. Cutillas, A. J. B., **Baubonytė, S.**, & Lara-Bocanegra, A. (2024). Análisis comparativo del perfil sociodemográfico y deportivo según tipo de corredor que usa apps deportivas. *In XIV Congreso Iberoamericano de Economía del Deporte: Inversión en el deporte: gestión inteligente*. June 12-14, Madrid, Spain, 151-154.
4. Angosto, S., **Baubonytė, S.**, Cutillas, A. J. B., & Rojas, F. J. R. (2024). Análisis de intención de uso y necesidad de interacción entre estudiantes no usuarios de apps deportivas según género. *In XIV Congreso Iberoamericano de Economía del Deporte: Inversión en el deporte: gestión inteligente*. June 12-14, Madrid, Spain, 155-158.
5. Cutillas, A. J. B., & **Baubonytė, S.** (2024). Comparación de los factores influyentes en el uso de apps deportivas según tipo de corredor. *In XIV Congreso Iberoamericano de Economía del Deporte: Inversión en el deporte: gestión inteligente*. June 12-14, Madrid, Spain, 159-162.
6. **Baubonytė, S.** (2025). Exploring the link between e-health literacy and sports apps usage for physical activity among older adults: should educational programs be implemented? *In 15th international conference „The future of education“*, 25-27 June 2025, Florence, Italy, 287-293.

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