Journal of Infrastructure, Policy and Development 2024, 8(15), 9215.
https://doi.org/10.24294/jipd9215

Article

Determinants of adoption process with lifestyle applications: Findings from an exploratory study

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CITATION

Ercsey I, Keller V. (2024). Determinants of adoption process with lifestyle applications: Findings from an exploratory study. Journal of Infrastructure, Policy and Development. 8(15): 9215. https://doi.org/10.24294/jipd9215

ARTICLE INFO

Received: 19 September 2024
Accepted: 21 October 2024
Available online: 12 December 2024

Abstract: This study examines the adoption and usability of lifestyle (LS) apps, considering demographic factors like age and education that influence adoption decisions. The study employed a mixed-methods design, combining an experiment (spanning 14 weeks of app use) with semi-structured interviews and periodic measurements. The researchers employed the Mobile Application Usability Questionnaire (MAUQ) to identify pivotal aspects of standalone app usability, interface satisfaction, and usefulness at various stages of use, with a particular emphasis on the experiences of Hungarian students (n = 36). The results demonstrate that health-related factors have a significant impact on students' behavior and evaluation of lifestyle apps over the 14-week period. Overall, the analyzed LS apps demonstrated positive outcomes in terms of supporting subject health and significantly improving the perceived health state. The findings highlight both practical and theoretical contributions to the field of mobile health applications, suggesting avenues for further research to either confirm or challenge existing theories.

Keywords: lifestyle apps; adoption process; utility factors; health, qualitative research

1. Introduction

The wellness and fitness industry is undergoing a digital transformation, with a notable increase in the number of fitness, mental health, and mindfulness apps. Such applications provide consumers with more convenient, personalized, and efficient methods to achieve their health objectives. As Tong et al. (2021) observe, mobile health interventions are more efficacious than traditional approaches. Lifestyle (LS) apps, including tools for fitness, nutrition, and meditation, play a pivotal role in the promotion of prevention-based care for patients and healthcare providers (McKay et al., 2019).

However, nearly half of m-health app users cease using them due to high data entry burdens and loss of interest (Krebs and Duncan, 2015), underscoring the necessity for optimal usability, encompassing adoption, engagement, and retention (Shabir et al., 2022). This paper examines the adoption and usability of lifestyle (LS) apps, considering demographic factors like age and education that influence adoption decisions.

To address the limitations of generic app evaluation tools, Zhou et al. (2019) developed and validated the mHealth Application Usability Questionnaire (MAUQ). In this study, participants will select lifestyle (LS) apps based on their personal needs, with a 14-week usage period to explore their adaptation experiences.

The timeliness and relevance of the research topic can be observed from both a national and an international perspective. In a previous study conducted in Hungary (Kovács and Várallyai, 2021), the adoption of mobile health applications among young people was investigated using the UTAUT model. However, the article did not consider health-related factors. Several international studies have examined the adoption of various lifestyle apps. However, the MAUQ scale was not employed as a theoretical framework for the usability dimensions, and health and lifestyle characteristics were not a significant focus in these studies. On this basis, two important research objectives were formulated. The first objective is to ascertain whether the MAUQ scale can be considered an appropriate measure of the usability of LS applications in the adoption process. The second objective is to examine the role of the usability and health dimensions in the different stages of the adoption of LS applications.

The researchers investigate the theoretical basis and user experiences with m-health apps, focusing on LS apps. The findings will help healthcare managers and IT professionals identify key aspects of standalone app usability, interface satisfaction, and usefulness at different stages of use.

2. Materials and methods

In this session, the authors initially identify the factors that influence the adoption process of LS apps, before providing a concise overview of the usability factors. In conclusion, the methodology is presented.

2.1. Adoption process of lifestyle apps

The success of lifestyle (LS) applications is significantly contingent upon the extent of user adoption, which is shaped by a multitude of personal, social, and technical factors. A number of studies have examined the factors that influence users' decisions to adopt lifestyle (LS) and mobile health (m-health) applications. Credibility, app quality, and key features have been identified as the primary drivers of user preferences on numerous occasions. For example, Kanthawala et al. (2018) discovered that American respondents placed a premium on these attributes when contemplating the use of mobile health applications. Similarly, Régnier and Chauvel (2018) underscored the influence of pre-use preferences on adoption decisions.

Moreover, marketing communication and word-of-mouth are vital for the uptake of paid LS apps, where users must perceive value for money before committing (Krishnan and Lokachari, 2019; Peng et al., 2016). The influence of social networks on user decisions is evidenced by the significant role of recommendations from friends and family in the adoption process. Moreover, evidence-based content is crucial, particularly for promoting active lifestyles among users with lower socioeconomic backgrounds or education levels (Castro et al., 2020; Simons et al., 2018).

Another critical factor is ease of use; users tend to abandon apps that are complex or require excessive effort (Čuš et al., 2021). The personalization of content to meet the specific needs of individual users is also of vital importance for the adoption of such applications, as demonstrated by the study conducted by Laurie and Blandford (2016) on the mindfulness app "Headspace."

Other factors, such as time constraints and perceived usefulness, influence not only the initial adoption of a technology but also its long-term engagement and retention. App discontinuation is often attributed to forgetfulness or perceived time limitations (Zhang et al., 2014). Conversely, technologies that are straightforward to use and provide tangible benefits—such as enhanced physical fitness or improved sleep—encourage continued use (Chong et al., 2022). The financial outlay required for the app and its perceived utility also affect users' intentions to continue using it (Khalil et al., 2020).

The role of user experience in driving retention is of paramount importance. Positive experiences, personalized guidance, and social support have been identified as key factors that increase the likelihood of continued use of LS apps (Ferreira-Barbosa et al., 2023; Smirnova et al., 2021). The extant literature indicates that frequent app usage, particularly through self-monitoring features, reduces abandonment (Lee et al., 2018), and that personalized feedback enhances engagement (Amagi et al., 2022).

Notwithstanding these insights, the existing tools for measuring app usability, such as the System Usability Scale (SUS), may lack the requisite specificity for mobile health apps (Zhou et al., 2017). To address this gap, the Mobile Application Usability Questionnaire (MAUQ) was developed, comprising 18 items distributed across three subscales: ease of use, interface satisfaction, and usefulness (Zhou et al., 2019a). However, the MAUQ has not yet been widely used, particularly in the European context.

These findings highlight the importance of usability, personalization, and social support in promoting user retention and app success. A summary of the principal factors influencing the adoption, engagement, and retention of mobile applications can be found in **Table 1**.

Table 1. Some noted studies on drivers of LS apps.

Phase	Finding	Author
Adoption	Credibility	Kanthawala et al., 2018
	Supporting feature	Lieffers et al., 2018 Laurie and Blandford, 2016
	Quality, evidence-based content	Simons et al., 2018
	Marketing communication	Krishnan and Lokachari, 2019
	Positive word of mouth (family, friends)	Peng et al., 2016
Adoption	Ease of use, interface & satisfaction, usefulness	Zhou et al., 2019a, Kong et al., 2023, Amagi et al., 2022
Retention	Perceived usefulness	Khalil et al., 2020
	Positive user experience	Ferreira-Barbosa et al., 2023 Smirnova et al., 2021
	Ease of use	Chong et al., 2022

Source: Own compilation.

This study aims to address this gap in the literature by exploring the roles of usability and health-related factors throughout the various stages of LS app usage, with a particular focus on the experiences of Hungarian students. It is hypothesized that LS

apps have a beneficial impact on users' health and their future intentions to continue using them. The following research questions will be addressed and investigated:

The primary objective of this study is to ascertain the efficacy of the MAUQ scale as a tool for measuring the usability of LS apps during the adoption process. This research will address the following questions:

Q1: Is MAUQ a good scale to measure usability of lifestyle applications in the adoption process?

Q2: What is the role of the usability and health dimensions in the different phases of lifestyle app adoption?

2.2. Methodology

The majority of studies analyzing lifestyle (LS) apps have employed empirical methods, primarily quantitative or qualitative approaches, particularly in-depth interviews. For instance, Flaherty et al. (2019, 2021) employed a qualitative research methodology to examine user engagement with health apps, adopting a phenomenological and experience-centered design perspective. In their 2023 study, Yan et al. employed a qualitative methodology to examine the factors that influence the utilization of self-monitoring practices among individuals with chronic illnesses. They conducted semi-structured interviews with 38 patients, embedded within a three-month trial. Maguire (2024) provides comprehensive instructions on the experimental assessment of usability, while Or et al. (2024) delineate the inspection method for evaluating usability.

The study employed a mixed-methods design, combining an experiment (spanning 14 weeks of app use) with semi-structured interviews and periodic measurements. This approach allowed for a comprehensive examination of the lived experiences of participants, uncovering personal, social, and environmental factors that shape app usage.

In this study, a quasi-experimental design method was employed, incorporating periodic measurements, to investigate the impact of LS applications on subjects' health status. This experimental approach enables subjects to more readily empathize with the circumstances, thereby facilitating more precise consumer ratings. This methodology facilitated an in-depth comprehension of lived experiences, encompassing personal, social and environmental factors. A notable limitation of this experimental method is the absence of a control group.

The subjects were required to meet two specific criteria: firstly, they were required to have an Android device; secondly, they had to have no prior experience of using any m-health apps. The health status of the participants is a crucial factor in the experiment, as it is a confidential variable. Therefore, at the outset and conclusion of the experiment, we conducted comprehensive interviews to ascertain the subjects' perceptions of their own health status. At the conclusion of the study, participants were asked to provide an overall assessment of the LS app they had selected. This included ratings of satisfaction, perceived usefulness, and any observed changes in health and lifestyle. The experimental groups were defined according to the type of LS app: the sports and fitness app treatment group, the diet and nutrition app treatment group, and the other apps treatment group.

In order to avoid any potential confounding factors, the following measures were taken during the experimental period: (1) participants were required to refrain from accepting other similar applications during the course of the experiment; (2) during the recruitment phase, the general purpose of the experiment was outlined, while the exact details were not revealed; (3) a prerequisite for participation in the study was the absence of any significant chronic illness or mobility disability that would preclude the use of sports, fitness, and diet apps.

Prior to the experimental procedure, the subjects were provided with a comprehensive explanation of the research's general objective, their specific responsibilities, and the research process. The participants were informed about the purpose of the in-depth interview and the voluntary nature of their participation. They were also asked to indicate their consent to be audio-recorded and were assured that the results of the interviews would be used without any personal data.

In order to ascertain the stages of the adoption process, situational techniques were employed during the interviews. The initial phase of interviews was conducted subsequent to the selection of LS applications and the completion of registration. A series of open-ended questions were devised to ascertain the subjects' lifestyles over the course of a full week, their level of physical activity, and their perceptions of their health. With regard to the LS application, we sought feedback on the appropriateness of its use from a technical and functional standpoint following registration. The second round of interviews was conducted at the conclusion of the 14-week trial period. In this phase, participants were invited to share their perspectives on the impact of various factors on their health and the usability features of the selected LS app, as well as its perceived importance across different stages of the overall usage period. These stages included the initial period of app use and its subsequent adoption. Each stage was treated as a discrete situation, and both positive and negative experiences were elicited.

Table 2. Interview guide.

Question	Elaboration Questions	Theory, study
Health state	How would you characterize your health? Do you suffer from an illness?	
Lifestyle	Do you live an active lifestyle? (Active vs. Sedentary lifestyle) What about regular exercises (at least 150–300 minutes of moderate-intensity aerobic physical activity) on a week?	WHO Adults aged 18–64 year
Ease of use	(1) Was it easy to use the app? (2) How long did it take to learn to use an app? (3) What do you think about the navigation? (4) What about the functions (entering information, responding to reminders, viewing information)? (5) Was it easy to correct mistakes?	MAUQ ease of use
Interface and satisfaction	(6) Did you like the interface of the app? (7) Was the information well organized? Could you find everything you needed easily? (8) Did the app provide enough information about your progress? (9) Was the usage comfortable for you? (10) What do you think about the time that was required to use the app? (11) Would you use this app again? Do you plan to use the app in the future? (12) All in all, were you satisfied with the app? How would you evaluate the app (1-star, 5 star)?	MAUQ interface and satisfaction
Intention	(13) Would you recommend this app to your friends, and relatives? (14) Would you pay for the app?	Self-developed
Usefulness	(15) What do you think about the usefulness of the app? What kind of changes could you experience on yourself? (progress) (16) Did you have access to health care services? (17) Did the app help you to manage your health effectively? (18) What about the functions (missing, useless)? (19) Could you use the app when there was a problem with internet access? (20) What do you think about the educational materials, and tracking your activities? Any ideas for developers?	MAUQ usefulness

Source: Based on WHO (2022) and Zhou et al. (2019).

The interview guide was developed based on previous studies focusing on the MAUQ scale, which encompasses three dimensions of usability: (1) ease of use, (2) interface satisfaction, and (3) usefulness. The research team analyzed the effects of these dimensions on users' perceived health status (see **Table 2**). The study examined three categories of lifestyle (LS) apps: exercise and fitness apps, diet and weight management apps, and other health management apps.

The participants in this study were full-time Bachelor of Arts (BA) students enrolled in health management and wellness programs. Prior research by Jemere et al. (2019) highlighted the influence of age and education on health app usage. The researchers assumed that health management students would have positive attitudes toward health and m-health apps, which would enable them to complete the three-month usage period. As Čvirik (2022) notes, health-conscious individuals tend to adopt healthy practices such as nutritious eating and physical activity. Given that university students are typically young, educated, and health-conscious, they are an ideal subject group for this study.

The research was designed to align with the course profile, enabling students to be supervised by their lecturer. Participants were instructed to utilize a single lifestyle (LS) app for a minimum of 14 weeks during the spring semester of 2022/2023. They were permitted to select apps based on their personal interests and objectives, such as weight loss or enhanced physical activity. This approach was designed to enhance engagement and retention.

At the beginning of the semester, the lecturer provided an overview of mobile health apps and their classifications, followed by in-depth interviews to assess the participants' health statuses. By the second week, students presented their chosen LS app, providing basic information and reasons for their selection. All participants used Android smartphones, and the apps were required to be free or offer free features. Flaherty et al. (2019) observed that motivation to use apps is often higher at the outset of behavioral change.

At the conclusion of the semester, in-depth interviews were conducted to gain insight into participants' experiences with the LS apps after extended use. The interviews were conducted in the researchers' office in May 2023 and lasted between 20 and 30 min. All interviews were recorded, transcribed, and reviewed for accuracy.

Thematic analysis was employed to identify key themes within the data set (Braun and Clarke, 2006). The first and second authors conducted a thorough review of each transcript, identifying relevant segments and developing a preliminary code list. Regular meetings provided an opportunity to discuss any discrepancies and develop a codebook that grouped codes into themes. Any redundant themes were removed in collaboration with the research team (Bryman, 2016).

A deductive and semantic approach was used to analyze research questions focused on ease of use, interface satisfaction, usefulness, and health impact (Caulfield, 2022). The six-step qualitative data analysis procedure was followed in order to ensure the highest level of accuracy and precision. The six-step qualitative data analysis procedure was followed as follows: (1) familiarization, (2) coding, (3) generating themes, (4) reviewing themes, (5) defining themes, and (6) reporting (Caulfield, 2022). In this study, the researchers employed a structured thematic analysis to identify themes related to lifestyle app usage. The researchers began by thoroughly examining

the data, identifying recurring patterns, and applying codes based on the participants' responses. The codes were then grouped into overarching categories corresponding to the stages of app usage: the initial adoption phase, the adoption phase, and the continued intention to use.

To guarantee the accuracy and consistency of the coding process, the data was analyzed by multiple coders, and the reliability of their coding was evaluated using Cohen's Kappa and percentage agreement. Any discrepancies were resolved through discussion and the coding scheme was refined as needed. The researchers documented the coding process to ensure transparency and practiced reflexivity to acknowledge their perspectives' influence on the analysis. They also enhanced credibility through data triangulation and participant feedback (member checking), which added rigor to the thematic analysis and increased confidence in the study's conclusions.

3. Results

3.1. Description of participants

This chapter commences with a description of the experiment's participants and an analysis of their experiences with the apps based on the research questions. A total of 36 students participated in the study, comprising 14 men and 22 women, with an average age of 21.11 years (SD: 1.19). The youngest participant was 21 years of age, while the oldest was 26. The mode and median age were 22 years.

Table 3. Basic information about the participants.

Gender	Age	Health state	Lifestyle	App
Type of the app: Sport and fitness management (16)				
M1	26	Good	Active	Garmin Connect
M2	24	Very good	Active	Garmin Connect
M3	21	Very good	Active	Garmin Connect
M4	22	Very bad	Inactive, sedentary	Daily workout Fitness
M5	23	Good	Active	Garmin Connect
M6	22	Good	Active	Garmin Connect
M7	24	Bad	Mainly inactive	Daily workout-Fitness
M8	21	Very good	Active	Garmin Connect
M9	22	Neither bad, nor good	Mainly sedentary	Daily workout Fitness
F1	22	Bad	Neither inactive, nor active	Daily workout Fitness
F2	22	Quite good	Very active	My Workout Plan
F3	21	Neither bad, nor good	Active	Pedometer
F4	21	Neither bad, nor good	Active	FitApp running and walking
F5	21	Bad	Inactive	30 Days Fitness Challenge: Workout
F6	21	Bad	Inactive	FitApp running and walking
F7	24	Good	Active	FitApp running and walking

Table 3. (*Continued*).

Gender	Age	Health state	Lifestyle	App
Type of the app: Diet and nutrition apps (11)				
F8	22	Extremely bad	Mainly sedentary	Yazio
F9	22	Bad	Mainly inactive	Yazio
F10	22	Good	Very active	Calorie Basis
F11	21	Quite good	Active	Calorie Basis
F12	22	Good	Very active	Water Reminder Daily Tracker
F13	21	Good	Mainly active	Water Time
F14	22	Neither bad, nor good	Mainly active	Water Time
M10	21	Good	Mainly active	Yazio
M11	22	Quite good	Neither inactive, nor active	Yazio
M12	22	Quite good	Active	Yazio
M13	23	Neither bad, nor good	Mainly sedentary	Calorie Basis
Type of the app: Other health management apps (9)				
M14	24	Very good	Very active	Daily Yoga
F15	21	Neither bad, nor good	Active	Forest
F16	22	Quite good	Very active	Daily Yoga
F17	22	Neither bad, nor good	Very active	Yoga Challenge
F18	21	Very good	Very active	Ladies calendar
F19	21	Rather bad	Mainly sedentary	Flo Ovulation and Period Tracker
F20	21	Neither bad, nor good	Mainly active	MyTherapy
F21	23	Quite good	Neither inactive, nor active	Ladies calendar
F22	24	Good	Active	Yoga Challange

F1-22: Female; M1-14: Male.

Seven participants reported poor health at the study's outset. Four were overweight and two had high blood pressure. These individuals led mostly sedentary lifestyles. The remaining students reported being in good health and engaged in physical activity at least three times per week. Over a 14-week period, the subjects evaluated 16 different apps, which were categorized into three types: (1) sports and fitness tracking, (2) diet and nutrition, and (3) other health management apps (see **Table 3**). The sample of the research was subject to several biases. Focusing on a homogeneous group of university students may have introduced sampling bias, limiting the generalizability of the findings. Response bias may have occurred as participants may have presented favorable experiences due to social desirability or inaccurate recall of their app usage. Conversely, ensuring participant anonymity can encourage honest feedback, and involving multiple researchers in the coding process can enhance reliability and reduce individual biases.

3.2. Evaluation of usability factors of LS apps among the participants

The ease of use of the app was identified as a critical criterion for evaluation, in line with the findings of previous studies (Čuš et al., 2021; Chumkasian et al., 2021; Sun et al., 2017). All participants indicated that ease of use was the primary factor in

selecting lifestyle (LS) apps. Members of Generation Z, who are digital natives, reported no significant difficulties in using the applications, indicating a higher level of technological acceptance. While the learning phase for nutrition apps required slightly more time, most participants found that using other LS apps required minimal effort.

Participants expressed satisfaction with the intuitive navigation and comprehensive functionality of the apps, with many affirming that the apps met their needs. For instance, one participant stated, "I believe this app offers a comprehensive approach to health management," highlighting its multifaceted functionality (M11). However, some users expressed dissatisfaction with specific features, such as the intrusive notifications from water reminder apps and the limitations of free versions, which hindered usability. Some participants expressed concern about the potential stress associated with constant monitoring, particularly with nutrition apps. While most studies focus on technological acceptance models in m-health app analysis, personal traits remain an understudied area.

Participants indicated a preference for functionality over aesthetics, asserting that ease of use was the most important factor.

The participants found that the organization of information within the apps facilitated their ability to locate necessary details. Many participants expressed enjoyment in the challenges presented by fitness and nutrition apps, such as step goals or dietary restrictions, while also indicating a preference for personalized feedback on their health. Overall, the majority of respondents expressed satisfaction with the fitness and nutrition apps, with many rating them 4 to 5 stars. Among the participants, 11 expressed intentions to continue using fitness apps, while feedback regarding nutrition apps was mixed. Eight participants indicated that they intended to continue using these apps, while one participant deleted an app due to annoying notifications. While some apps, such as Forest and Ladies Calendar, were identified as areas for improvement, the vast majority of students expressed a willingness to recommend their preferred applications.

In terms of health outcomes, 12 out of 16 participants who used sports and fitness measurement apps reported positive changes, including improved fitness and well-being. Similarly, 10 out of 11 users of diet and nutrition apps reported positive health outcomes, including weight loss and enhanced energy levels. However, only five out of nine users of other health management apps noted positive changes, as these apps were less focused on direct health improvement. The table outlines the health improvements experienced by participants throughout the 14-week study period, as measured by the use of lifestyle apps. Overall, participants reported increased physical activity, with a notable increase in their daily step count. Additionally, there were positive changes in weight management and body mass index (BMI), indicating successful outcomes in physical health. There was a notable improvement in mental well-being, as participants reported reduced stress levels and an increase in overall life satisfaction. Furthermore, the apps' positive impact on physical health was corroborated by improved blood pressure readings. These findings demonstrate the substantial impact that lifestyle apps can have on promoting both physical and mental health improvements (**Table 4**).

Table 4. Some notable health outcomes from lifestyle app usage over the 14-week study period.

App	Gender	Measurement metric	1st week	14th week	Health outcome
Pedometer	F3	Steps per day (average)	7000	10,000	Physical activity levels
Fit App running and walking	F6	Systolic/Diastolic (mmHg)	150/90 mmHg	130/85 mmHg	Blood pressure
Daily workout - Fitness	M7	BMI (kg/m^2)	27.5	26.5	BMI (Body Mass Index)
Yazio	F9	Weight (kg)	70 kg	65 kg	Weight loss
Calorie Basis	M13	Waist size (cm)	80 cm	75 cm	Weight loss
Garmin Connect	M1	Stress level (stress reminder/week)	5 times/week	one in a week	Stress levels
Yoga Challenge	F17	Subjective perception	tired, depressed	energetic, active, relaxed	Well-being

Source: Based on qualitative research.

Overall, the analyzed LS apps demonstrated positive outcomes in terms of supporting subject health and significantly improving the perceived health state (**Table 5**).

Table 5. Improvement of perceived health-state due to the usage of LS apps.

Lifestyle apps	First week	14th week	t-statistics (*p*)
Sports and fitness activity measurement apps (6*) (16***)	4.03 (1.94**)	6.02 (1.03**)	−3.05 (0.01)
Diet and nutrition apps (4*) (11***)	4.00 (1.78**)	6.33 (0.51**)	−2.53 (0.05)
Other health management apps (6*) (9***)	4.33 (1.52**)	5.33 (1.15**)	−1.73 (0.22)
Count (36***)	4.22 (1.63**)	6.00 (0.97**)	−4.55 (0.00)

*number of analyzed apps. ** standard deviation. ***number of evaluators. Source: Experiment.

In summary, all seven items measuring interface and satisfaction were deemed relevant constructs. While positive word of mouth and willingness to pay for premium features should be considered, the item "the app improved my access to health services" was not applicable to LS apps. Instead, the authors recommend including constructs focusing on mental health and overall well-being.

3.3. Role of usability and health dimensions in adoption process

The usability and health dimensions are of great consequence in the process of adopting lifestyle (LS) apps. However, the findings indicate that the impact of these elements differs depending on the stage of adoption. To identify the stages of the adoption process, we employed situational techniques during interviews, identifying three key stages: the initial adoption stage, the adoption stage, and the stage of continuous intention to use.

3.3.1. Initial adoption phase

In the preliminary stage of the study, participants identified four principal factors motivating their use of LS mobile apps: lifestyle modifications, health status, pertinent features, and the availability of complimentary apps. Many participants expressed a desire to make lifestyle changes or address personal challenges, such as stress or relationship issues. The interviews yielded significant insights into the correlation

between pre-experimental health status and levels of lifestyle activity. Furthermore, students highlighted the significance of essential functions in LS apps as a key factor in their initial engagement. The positive perception of free app options, including features available without charge, is in line with findings from prior studies that also highlight the significance of functionality and cost in the adoption of health apps (Laurie and Blandford, 2016; Vaghefi and Tulu, 2019; Xie et al., 2023). The author's findings indicate that an individual's level of educational attainment and their previous experience of using mobile applications are significant factors influencing their willingness to pay (Liu et al., 2024). These results demonstrate that, in addition to health considerations, the relevance of app features and the availability of free access are crucial factors in the selection of lifestyle apps.

3.3.2. Adoption

The adoption process is characterized by ongoing user engagement, whereby individuals may elect to continue or discontinue app usage at any time. Our research identified three key drivers influencing the intention to adopt LS health-related apps: perceived ease of use, interface design, and perceived usefulness. Participants indicated that ease of use and user-friendly interfaces are crucial factors in LS app acceptance, with perceived ease of use influencing adoption intentions both directly and indirectly through perceived usefulness. This finding aligns with the predictions set forth in established models, including those proposed by Davis (1989) and Davis et al. (1989). Similar outcomes have been documented by multiple researchers in their investigation of usability dimensions influencing adoption. However, Simons et al. (2018) employed a more expansive evaluation framework than usability, namely quality, and identified quality features as a significant determinant of the adoption of apps designed to support young people's active lifestyles. In addition to quality factors, Kanthawala et al. (2018) highlighted credibility as a key factor influencing the adoption of m-health apps by US respondents. Moreover, a straightforward interface minimizes perceived complexity and boosts the inclination to adopt the app. The utility of LS apps is instrumental in facilitating healthy behavior management, particularly through the provision of educational resources and tracking functionality.

3.3.3. Continuous intention to use

The research team identified four key factors that influence users' intention to continue using lifestyle (LS) apps. It was observed that the continued usage of these applications assisted in the management of physical activities, dietary choices, and the monitoring of progress, which served to enhance their perceived usefulness. This, in turn, significantly impacted their intention to maintain usage, which aligns with the findings of McKay et al. (2019) and Zhang et al. (2014). However, some students acknowledged that sustained app usage requires discipline and adjustments to routines, with a lack of discipline being a common barrier, as previously noted by Peng et al. (2016). Over the course of the 14-week trial, the apps facilitated healthier behaviors, which in turn led to a more active lifestyle and improved health outcomes. Improved usability and perceived health benefits were identified as critical factors influencing continued use. In the absence of these factors, users were more likely to cease using the apps. Interviews indicated that usability was a significant determinant of satisfaction, with participants who reported health improvements exhibiting higher

levels of satisfaction. In terms of continued use of apps, Khalil demonstrated that perceived usefulness is a key factor, whereas the ease of use was identified as a more significant predictor in the research conducted by Chong et al. (2022).

The Trans-theoretical Model of Change (TTM) developed by Prochaska and DiClemente and Self-Determination Theory (SDT) developed by Deci and Ryan (1985) offer significant insights into these behavioral patterns. The Transtheoretical Model of Change (TTM) posits that behavior change progresses through distinct stages, from precontemplation to maintenance. The provision of personalized goal-setting and educational content aligned with a user's stage of change can serve to enhance engagement and retention, as evidenced by the efficacy of such approaches in enhancing user satisfaction. The Self-Determination Theory (SDT) posits that long-term behavior change is driven by intrinsic motivation, which is nurtured by fulfilling three basic needs: autonomy, competence, and relatedness. Apps that offer user control, provide clear feedback, and foster social connections are more likely to maintain user engagement. Fitness apps, with their immediate feedback and social features, tend to perform better in sustaining engagement compared to nutrition apps, where benefits take longer to manifest.

This study identifies several factors that influence students' intention to adopt and continue using LS apps. It identifies key triggers for initial adoption, drivers of sustained use, and factors that determine long-term engagement (**Figure 1**).

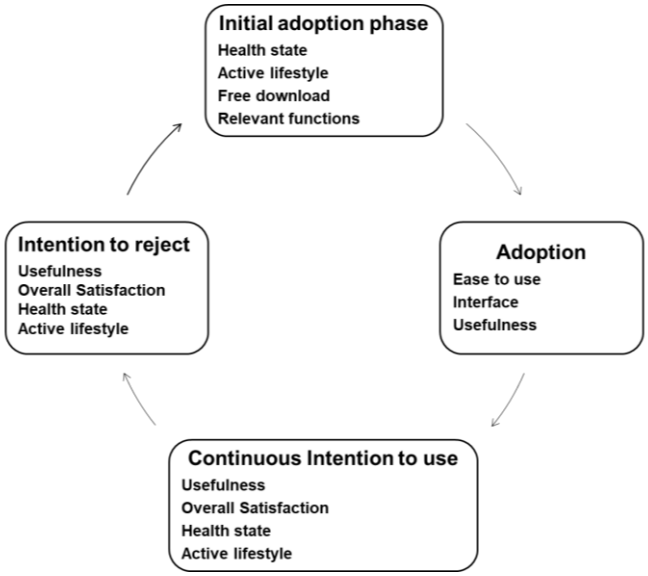

Figure 1. Drivers of LS apps in phases of adoption process.

4. Discussion

The analysis of the adoption process for lifestyle (LS) applications reveals three distinct phases: initial selection, adoption, and continuous use. Our research underscores the significance of usability and health-related considerations, particularly among students. Our findings indicate that students' current health status and activity levels play a pivotal role in their app selection. In contrast to previous studies that concentrated on subsequent stages of usage, our findings underscore the

pivotal role of pertinent app features and cost-free downloads during the initial selection phase.

While existing literature emphasizes technological and motivational aspects, our study demonstrates that younger users prioritize practical usability elements, such as ease of use and functionality, over aesthetic appeal. It is noteworthy that participants placed a high value on the ability to track progress and access useful features. This finding aligns with earlier research that identified the necessity of supportive app functions for user engagement. This is in line with the findings of Flaherty et al. (2019, 2021), who highlighted the significance of functional capabilities in maintaining user engagement.

Furthermore, our study validates the importance of perceived usefulness and satisfaction with LS apps in fostering continuous usage, aligning with the conclusions of Zhang and Xu (2020) regarding the centrality of usability factors. A previous study has demonstrated that the user-centered design of mobile health technologies is a crucial factor in enhancing efficiency, effectiveness and satisfaction (Or et al., 2023). The findings of research conducted among the elderly indicate that the utilization of mobile health (mHealth) applications for the purpose of nutrition can lead to a notable enhancement in the health status of individuals diagnosed with chronic diseases (Salas-Groves et al., 2023). However, a key finding of our research is the discrepancy between users' expectations for health management support and the actual contributions of LS apps to healthcare services. Participants did not perceive significant benefits in accessing health maintenance services, indicating a need for future app development to focus on incorporating mental and physical health features. The analysis of the adoption process for lifestyle (LS) applications reveals three distinct phases: initial selection, adoption, and continuous use. Our research underscores the significance of usability and health-related considerations, particularly among students. Our findings indicate that students' current health status and activity levels play a pivotal role in their app selection. The subjects of the experiment exhibited considerable variation in their health status, as the current state of health also influenced the health outcomes perceived by LS app users. It would be beneficial to devote greater attention to the health status of the subjects in the preceding and antecedent phases of the experiment. The study yielded valuable insights pertaining to user satisfaction, recommendations, and intention to continue using the LS applications. A comprehensive analysis of the research results would be facilitated by future behavioral monitoring, for example, by measuring the continued use of the LS application one or two months after the experiment. In contrast to previous studies that concentrated on subsequent stages of usage, our findings underscore the pivotal role of pertinent app features and cost-free downloads during the initial selection phase.

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This study effectively utilizes frameworks like the Mobile Application Usability Questionnaire (MAUQ) and the Unified Theory of Acceptance and Use of Technology (UTAUT), while also emphasizing the need for theoretical advancement within these models. The findings underscore the significance of usability and health considerations in the initial adoption and sustained use of lifestyle apps, suggesting avenues for further research to either confirm or challenge existing theories. The results demonstrate that usability has a significant impact on user satisfaction and engagement, indicating potential modifications to the MAUQ and UTAUT for m-health applications. Further research should also investigate the impact of cultural and socio-economic factors on technology adoption, particularly in European contexts, in order to enhance the theoretical contributions of this study.

In conclusion, this research highlights the significance of usability and pertinent features during the initial stages of app adoption, which is crucial for maintaining user engagement. Addressing the discrepancy between user expectations and the actual support provided by lifestyle apps could result in the integration of more comprehensive health functionalities that better align with user needs.

5. Conclusion

The objective of this study was to examine the utilization of diverse lifestyle apps among university students over a 14-week period, with a particular emphasis on their influence on sports fitness, nutrition, stress management, women's health, and disease management. The findings highlight both practical and theoretical contributions to the field of mobile health applications.

Q1: Is MAUQ a good scale to measure usability and adoption of lifestyle applications?

The exploratory research assessed the suitability of MAUQ items in relation to three usability factors: ease of use, interface and satisfaction, and usefulness. All seven interface and satisfaction items were deemed relevant, and we recommend including positive word-of-mouth (willingness to recommend) and willingness to pay alongside overall satisfaction. All five items measuring ease of use were deemed relevant, while five out of six utility items were deemed pertinent. The item "The application improved my access to health services" was deemed irrelevant for lifestyle applications. We recommend replacing it with two items focused on mental and physical health.

Q2: In the different phases of lifestyle app use, what is the role of the usability and health dimensions?

The results of the study demonstrated that health dimensions had a significant impact on students' behavior and evaluation of lifestyle apps over the 14-week period. During the adoption phase, usability was of particular importance for health management and diet apps, which were rated as the most useful. The highest satisfaction ratings were achieved by apps designed to reduce stress and promote relaxation. All five ease-of-use items were found to be relevant, and it is recommended that factors such as positive word-of-mouth and willingness to pay be included. While students indicated a general reluctance to pay for lifestyle apps, they also noted a lack of premium features. It is therefore recommended that developers enhance the app interface, design, and organization in order to improve the user experience.

This research contributes to the theoretical understanding of usability in lifestyle apps by validating the MAUQ scale and demonstrating that health dimensions significantly influence user behavior across different adoption phases. By incorporating additional factors such as positive word-of-mouth and willingness to pay, the study provides valuable insights into user satisfaction and engagement, further reinforcing the importance of usability within technology acceptance models. Furthermore, it highlights the influence of individual health status and lifestyle choices on the adoption of mobile health technologies, particularly among university students. The findings indicate the need for refinements and adaptations to existing frameworks like MAUQ and UTAUT in the context of m-health applications. They also underscore the importance of usability and health considerations in ensuring the sustained use of lifestyle apps.

In order to enhance the real-world applicability of mobile applications, it is essential that developers prioritize the simplification of the user interface, ensuring that it can be easily navigated by both tech-savvy and less tech-savvy users alike. The implementation of personalization based on user goals and progress has the potential to enhance user engagement, as evidenced by the efficacy of behavior change models such as the Transtheoretical Model of Change (TTM). The incorporation of gamification, progress tracking, and real-time feedback can serve to enhance motivation by fostering a sense of accomplishment, which is in alignment with the tenets of Self-Determination Theory (SDT). The provision of offline functionality and the availability of lighter versions can facilitate greater accessibility for users with limited resources.

It is recommended that healthcare providers integrate these apps into patient care by recommending them, reviewing progress, and offering guidance. This can facilitate the adoption of the technology, particularly among patients who are less technologically adept. The integration of app data with electronic health records, for instance, would represent a significant step forward in enhancing the effectiveness of these apps and supporting long-term patient engagement. The aforementioned practical steps, based on the findings of this study, may facilitate the increased adoption and retention of lifestyle apps.

The findings of our study could prove invaluable to the development of preventive and promotional healthcare initiatives. To extend this research to include middle-aged and older individuals, a communication campaign could be designed for

different demographic groups. In Hungary, a range of tools are available for improving health and lifestyle, including the SMARTPLATE for diet and nutrition. However, there is a lack of effort from health organizations and non-profit organizations to promote these resources.

It should be noted that this study is not without limitations. The research focused on a homogeneous group of university students aged 21 to 26, which may limit the generalizability of the findings. This demographic is distinguished by a higher prevalence of mobile health application usage, which could introduce biases related to their health consciousness and educational background. As a result, the findings may not accurately reflect the experiences or behaviors of older adults or those with varying educational and socio-economic backgrounds. Furthermore, while the qualitative approach yielded valuable insights into user experiences, the absence of quantitative analysis limits our ability to draw broader, generalizable conclusions. It would be beneficial for future research to include a more diverse demographic in order to gain a deeper understanding of how factors such as age, education, and socio-economic background influence the adoption and sustained use of lifestyle apps. Furthermore, conducting longitudinal studies with periodic quantitative measures would provide valuable insight into the long-term impact of lifestyle app use on health outcomes. Such studies could provide insight into how consistent engagement with these applications affects users' health over time. Incorporating behavioral data from app usage—such as frequency of interaction, completion of health goals, and user retention—would provide more objective measures of success and adoption, thereby strengthening the study's findings. Moreover, an investigation into the impact of personality traits on mobile health app usage could provide valuable insights for the development of more user-centric apps. Finally, examining the long-term impact of these applications on health maintenance services could demonstrate their value in public health strategies and disease prevention efforts, contributing to a more comprehensive understanding of how lifestyle apps can support overall health and well-being.

In future studies, the authors intend to integrate quantitative assessments, such as task completion times and user satisfaction scores from validated tools like the System Usability Scale (SUS) and the m-health App Usability Questionnaire (MAUQ). This will allow us to integrate qualitative data with objective metrics, providing a more comprehensive assessment of app usability. Including a more detailed analysis of both positive and negative user feedback, alongside app usage statistics, will provide a more comprehensive understanding of usability challenges and inform future improvements. This approach will provide actionable insights for app developers seeking to optimize the design and functionality of lifestyle applications. In conclusion, lifestyle apps show great promise for improving health outcomes. However, further research is necessary to fully understand their potential across various population segments and contexts.

Author contributions: Conceptualization, IE and VK; methodology, VK; formal analysis, IE and VK; investigation, VK; resources, VK and IE; data curation, VK and IE; writing—original draft preparation, IE and VK; writing—review and editing, IE and VK; visualization, IE; All authors have read and agreed to the published version of the manuscript.

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

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