

Quality Assessment of Nutrition-Related Apps and Determinants of Their Use: Barriers and Facilitators

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Abstract

Aim: This study aimed to evaluate the quality and functionality of mobile nutrition apps available on the Polish Google Play Store using the *uMARS* (user version of the Mobile App Rating Scale) questionnaire, and to identify barriers and facilitators associated with their use in the mHealth domain.

Method: The app review was conducted in June 2023 within the Health & Fitness category. The selection was restricted to the free, most popular calorie-counting apps with a user rating of at least 4.0 and at least 5 million downloads, available in both Polish and English. Four apps met the inclusion criteria: MyFitnessPal, FatSecret, Fitatu, and YAZIO. Each app was tested for 14 days and subsequently assessed using *uMARS* across three age groups, with gender accounted for. Qualitative data on barriers and facilitators to app use were also collected.

Results: FatSecret achieved the highest overall mean score, followed by Fitatu and MyFitnessPal, while YAZIO received the lowest. Functionality was the highest-rated domain, whereas greater variability was observed in information quality and engagement. In the qualitative analysis, key barriers included concerns about data privacy, the cost of premium features, and difficulties maintaining consistent self-monitoring and data entry. Reported facilitators included progress tracking, personalisation, integration with wearable devices, and motivation-support features.

Implications and recommendations: The findings of this study indicate that the scientific evaluation of nutrition-related mobile apps should extend beyond technical functionality to include the quality of the information provided and their potential to sustain user engagement. The results further support the validity of combining standardised app quality assessment with an analysis of the barriers and facilitators influencing their use, as these factors determine their practical utility and the sustainability of long-term use. In addition, this study contributes to the existing body of research on the quality of nutrition-related apps available on the Polish market, providing a basis for further comparative analyses and for future investigations into their effectiveness in shaping dietary behaviour.

Originality/value: This study integrates a standardised user-centred quality assessment of nutrition apps with a qualitative analysis of barriers and facilitators of use, providing insights relevant to app design, health education, and further research on the effectiveness of mHealth tools.

Keywords: mobile apps, nutrition, uMARS, mHealth, quality assessment

1. Introduction

In the era of accelerating digitalisation and the widespread availability of mobile technologies, an increasing number of persons seek tools to support everyday health-related decisions, including those related to diet and nutrition. From a public health perspective, mobile solutions fall within the scope of mHealth (mobile health), understood as medical and public health practice supported by mobile devices and wireless technologies. One of the most dynamically developing mHealth subcategories comprises nutrition apps which—via smartphones, tablets, and wearable devices (e.g. smartwatches and fitness bands)—enable the real-time monitoring of dietary and health-related behaviour in naturalistic settings. Such functions include food diary logging, estimation of dietary energy and nutrient intake, hydration tracking, and support for meal planning (Stoyanov et al., 2016).

The relevance of this class of tools continues to grow alongside their market scale and availability within the major distribution ecosystems, Google Play Store and Apple App Store. Estimates indicate that by mid-2024, tens of thousands of apps in the 'health' and 'medical' categories would be available in mobile stores (approximately 35-41 thousand in the Apple App Store and approximately 36-57 thousand in Google Play) (Azevedo et al., 2025). At the same time, the market has been subject to substantial qualitative change: in 2024-2025, a pronounced 'clean-up' of Google Play was observed, which—according to external analyses—resulted in the removal of a large number of apps with limited functionality or non-compliance with store policies, underlining the importance of evaluating the quality and safety of solutions available to end users (Roth, 2025).

The increase in app supply has also coincided with the growth of the economic segment associated with mHealth and digital health tools. Market reports estimate the global mHealth app market at multi-billion-dollar levels and forecast continued growth in coming years. For nutrition apps in particular, available data suggest that the international nutrition apps market generated approximately USD 5.4 billion in revenue in 2024, with projections to increase to approximately USD 9.15 billion by 2029, alongside rising user penetration (Statista, n.d.). However, rapid market expansion does not necessarily translate into high-quality tools. The literature emphasises that health apps may vary considerably in the reliability of their information, usability, user engagement, aesthetics, and the transparency and security of data processing (Stoyanov et al., 2016).

The existing literature indicates that nutrition-related mobile apps available in app stores generally achieve moderate to good overall quality ratings. Functionality is typically the highest-rated dimension, whereas user engagement and information quality tend to receive lower scores. Moreover, it has been noted that a substantial proportion of available apps focus primarily on monitoring food intake, body weight, and physical activity, while offering in-depth nutrition education, dietary structure analysis, or solutions supported by healthcare professionals much less frequently. It is also pointed out that user

ratings posted in app stores do not fully reflect the actual quality of these applications when assessed using standardised research instruments, and that the available evidence relates mainly to selected national markets, such as the French and Spanish ones. However, the literature has not yet provided a comprehensive evaluation of popular nutrition-related apps available in the Polish Google Play Store using the *uMARS* tool, along with a parallel reference to the barriers and facilitators of their use described in the scientific literature. This issue is particularly important because the characteristics of the local app market, the interface language, the criteria used to select the most frequently downloaded tools, and user preferences may all affect both the quality of the available solutions and how they are perceived and used in practice (Fernandez-Lazaro et al., 2024; Martinon et al., 2022). Another important limitation of the current body of research is the small number of studies integrating a standardised quality assessment of apps with an analysis of barriers and facilitators affecting their use. Although previous studies suggest that intuitive design and ease of use may promote engagement with mobile apps, limited information credibility and a low level of nutrition education may significantly reduce their usefulness and the sustainability of their long-term use in practice (Faessen et al., 2022).

Given the above, it was necessary to examine both app quality and user experiences, including factors that facilitate adoption and long-term use (e.g. ease of use, personalisation, credibility of content) as well as barriers (e.g. costs, feature overload, technical issues, privacy concerns, and low information quality). A tool enabling standardised, user-centred quality assessment is *uMARS* (user version of the Mobile App Rating Scale), a validated rating scale that captures, among other dimensions, engagement, functionality, aesthetics, and information quality (Stoyanov et al., 2016).

Accordingly, this study aimed to evaluate the quality and functionality of mobile nutrition apps available from the Google Play Store using the user version of the Mobile App Rating Scale, and to identify barriers and facilitators to the use of mHealth apps as reported in the scientific literature.

In the first part of the study, the procedure for selecting mobile apps, the methodology used to assess their quality with the *uMARS* tool, and the approach for identifying barriers and facilitators of their use, based on an analysis of the scientific literature, are presented. The results section reports the findings of the app quality assessment and the main determinants affecting their use. The paper also includes a discussion of the findings in relation to the available literature and concludes with a final conclusion.

2. Methodology

2.1. Study Design and Data Source

This study was conducted as a cross-sectional evaluation of commercially available mobile nutrition (mHealth) apps, combined with an analysis of factors influencing their use (barriers and facilitators). The apps were identified in the Google Play Store under the Health & Fitness category. The store content was reviewed in June 2023. Eligibility criteria were developed based on methodological approaches used in previous studies evaluating mHealth apps, including nutrition-related ones available in app stores (Franco et al., 2016; Mandracchia et al., 2020). To maximise coverage, additional search keywords were applied: *nutrition, diet, dietary, calories, obesity, weight loss, body weight, and weight reduction*.

2.2. Inclusion Criteria

The selection process followed PRISMA (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*) guidance (Moher et al., 2009). Apps were included if they met all of the following criteria:

1. available in the Google Play Store within the Health & Fitness category,
2. listed by Google Play Store among “Top free apps”,
3. classified as “nutrition” and featuring calorie/energy intake tracking,
4. mean user rating > 4.0 stars,

5. > 5 million downloads,
6. available in both Polish and English language versions.

2.3. App Selection Procedure and Data Extraction

App selection was performed in stages: (1) identification of apps meeting store-level criteria (category and popularity ranking), (2) verification of app descriptions for nutrition-related features and calorie counting, and (3) confirmation of quantitative (user rating, download count) and language criteria. For apps included in the analysis, descriptive information available on Google Play was extracted (e.g. app name, developer, language versions, declared functionalities, number of downloads, and mean rating).

2.4. Assessment of App Functionality

Next the apps were assessed with respect to key functionalities typical of mHealth tools supporting dietary behaviour, including:

- the ability to log energy intake (and/or macronutrients),
- the ability to monitor physical activity (built-in tracking or integration),
- the characteristics and usability of the food/meal database (e.g. range of items available for selection in the food diary).

Based on the functional assessment, only apps that met predefined minimum criteria, i.e. those enabling practical, day-to-day dietary self-monitoring, were included in the analyses.

2.5. App Quality Assessment Using *u*MARS

The quality of the apps was assessed from the user perspective using the *u*MARS tool. In the next stage, the selected apps were evaluated by users across three age groups: 18-30 years, 30-45 years, and over 45 years, where each age group was represented by one female and one male participant. The testing of each app lasted 14 consecutive days under conditions approximating naturalistic use. After the testing period, the respondents completed the Mobile App Rating Scale questionnaire. For the purposes of this study, *u*MARS was translated into Polish from the original instrument, with the translation used exclusively in this research project.

The *u*MARS questionnaire comprised the following sections:

- **Section A – Engagement**, assessing attractiveness, ability to sustain interest, personalisation options, and interactivity; the respondents also rated the extent to which the app content matched the intended use.
- **Section B – Functionality**, assessing performance, ease of use, navigation logic, and user comfort (including gesture control and interface responsiveness).
- **Section C – Aesthetics**, assessing layout, quality of graphic materials, and overall visual appeal.
- **Section D – Information quality**, assessing the quality and correctness of information, alignment with the app's purpose, completeness of content, clarity of data presentation, and availability and adequacy of visual elements; the credibility of sources underpinning app content and recommendations was also evaluated.
- **Section E – Subjective quality**, assessing willingness to recommend the app to others, anticipated frequency of use over the next 12 months, and overall appraisal.
- **Section F – Perceived impact**, assessing perceived effects on user awareness and knowledge, attitudes, and intentions to change, motivation to seek help, and potential behavioural change.

In the final step, the respondents provided open-ended responses describing both positive and negative aspects of the apps, as well as factors that encouraged or discouraged mHealth app use. These statements were used to identify barriers and facilitators to app use.

2.6. Reliability of the uMARS Questionnaire and Consistency of Ratings

Internal consistency of responses obtained with uMARS was assessed by calculating Cronbach’s alpha (α) for the overall scale and, where sample size allowed, for the main domains (Sections A–D). Alpha values were interpreted using commonly accepted thresholds: $\alpha \geq 0.70$ as acceptable internal consistency, $\alpha \geq 0.80$ as good, and $\alpha \geq 0.90$ as excellent.

Cronbach’s alpha was computed using the following formula

$$\alpha = \frac{k}{k - 1} \left(1 - \frac{\sum_{i=1}^k S_i^2}{S_T^2} \right),$$

where: k — number of items in the scale, S_i^2 — variance of the i -th item, S_T^2 — variance of the total score (sum of item scores).

2.7. Statistical Analysis

Statistical analyses were performed using Statistica 13.1 (TIBCO/StatSoft) and Microsoft Excel. For uMARS outcomes, descriptive statistics (mean, standard deviation, median, and range) were calculated for the overall score and for individual domains.

3. Results

In this study, which aimed to evaluate the quality of nutrition-related mobile apps, a stepwise elimination-based selection procedure was applied in accordance with the PRISMA guidelines. The search was conducted on one of the leading digital distribution platforms—the Google Play Store—using a set of predefined keywords: *nutrition, diet, dietary, calories, obesity, weight loss, weight reduction, and body weight*. Data collection was carried out in June 2023. The detailed PRISMA-compliant selection process is presented in Figure 1.

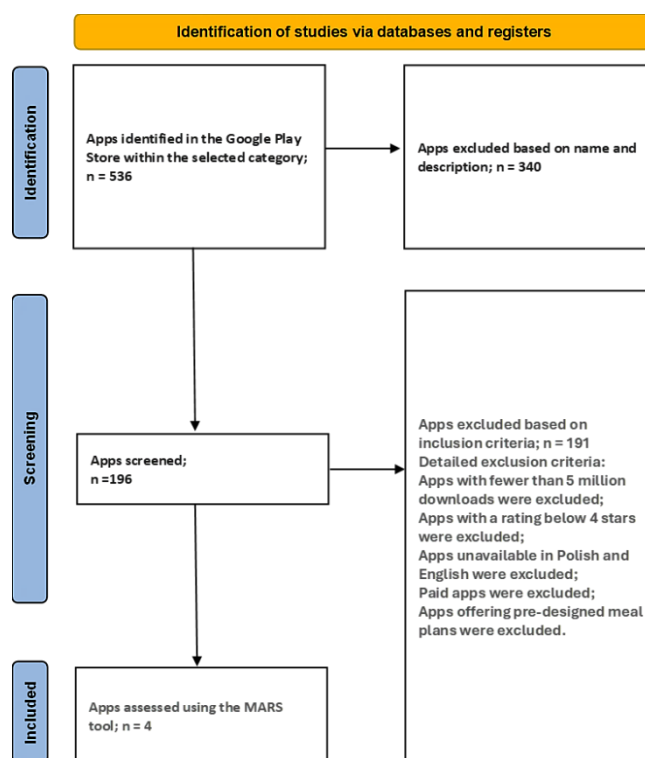


Fig. 1. Flow diagram for the selection process of the apps included in the study

Source: own work.

To identify apps for testing, the Google Play Store was reviewed within the Health & Fitness category. The search was then restricted to the top free apps, ensuring the basic version could be used cost-free. From the retrieved results, apps primarily aimed at logging energy and calorie intake were selected, whereas those focused on physical activity monitoring, training planning, or the measurement of health parameters (e.g. blood pressure) were excluded. Further selection was based on popularity and user ratings. Apps were eligible if they had a rating of at least 4.0 stars and at least 5 million downloads. In the next step, availability in both Polish and English was verified. Applying these criteria resulted in the inclusion of four apps for evaluation: FatSecret, Fitatu, MyFitnessPal, and YAZIO.

Each of the analysed apps offered the set of functions presented in Table 1. All provided information on the energy value of individual products and complete dishes, and enabled the monitoring of daily energy and nutrient intake through a food diary. The apps also delivered personalised prompts supporting users in achieving their goals and flagged potential health risks when declared targets could be unsafe. Each app visualised goal progress using charts and allowed users to record physical activity. Dietary logging was most commonly based on product weight in grams, however Fitatu also allowed users to choose between grams and portions. Ready-to-use recipe features were available in Fitatu and YAZIO. All the evaluated apps included social components, such as sharing recipes and tracking other users' progress, which may strengthen motivation to maintain dietary behaviour change.

Table 1. Functional characteristics of the selected mobile nutrition apps (Google Play Store)

App function	FatSecret	Fitatu	MyFitnessPal	YAZIO
Information on the calorie content of a single product	X	X	X	X
Information on the calorie content of a prepared dish/meal	X	X	X	X
Daily total energy balance information	X	X	X	X
Information on carbohydrate, fat, and protein intake	X	X	X	X
Food intake logging by weight (grams)	X	X	X	X
Food intake logging by serving/portion size		X		
Ready-to-use recipes provided by the app		X		X
Goal-achievement suggestions provided by the app	X	X	X	X
Visualisation of dietary changes via charts/graphs	X	X	X	X
Communication with other app users (community/blog)	X	X	X	X
Ability to log physical activity	X	X	X	X

Source: own work.

Table 2 presents the results of the assessment of four nutrition apps conducted using the *uMARS* questionnaire. The ratings were summarised across six quality domains: engagement, functionality, aesthetics, information quality, subjective quality, and perceived impact on health-related behaviour. Scores were reported on a five-point scale, with higher values indicating more favourable ratings.

Overall, the analysed apps achieved mean scores above 3.5, indicating moderate-to-high quality. FatSecret had the highest overall mean score (4.11), followed by Fitatu (4.01) and MyFitnessPal (3.72). The lowest mean score was observed for YAZIO (3.54).

Within the engagement domain, Fitatu received the highest rating (4.33), closely followed by FatSecret (4.27). MyFitnessPal scored 3.67, whereas YAZIO scored 3.33. In this domain, the highest subcategory ratings for target group appeal were very high across all the apps, ranging from 4.83 to 5.00. The lowest ratings for entertainment value were recorded for YAZIO (2.67), suggesting limited ability to sustain user interest.

Table 2. Mean uMARS scores assigned to the apps by respondents

Section	Item	MyFitnessPal	FatSecret	Fitatu	YAZIO	Mean
Engagement	Entertainment	3.17	4.33	3.67	2.67	3.46
	Interest	3.50	4.33	4.17	3.00	3.75
	Customization	3.17	3.33	4.33	3.17	3.50
	Interactivity	3.67	4.50	4.50	3.00	3.92
	Target group appeal	4.83	4.83	5.00	4.83	4.88
	Mean (domain)	3.67	4.27	4.33	3.33	
Functionality	Performance	4.83	4.83	4.83	4.17	4.67
	Ease of use	3.67	4.33	4.00	3.67	3.92
	Navigation	3.33	3.67	3.83	3.50	3.58
	Gestural design	3.83	4.33	4.00	3.83	4.00
	Mean (domain)	3.92	4.29	4.17	3.79	
Aesthetics	Layout	4.00	4.00	4.17	3.50	3.92
	Graphics	4.17	4.17	4.00	3.83	4.04
	Visual appeal	3.83	3.83	3.67	3.33	3.67
	Mean (domain)	4.00	4.00	3.94	3.56	
Information	Information quality	3.83	4.33	4.50	3.33	4.00
	Quantity of information	3.00	3.33	3.33	3.00	3.17
	Visual information	3.33	3.67	2.33	3.83	3.29
	Credibility of source	3.83	4.00	3.83	4.00	3.92
	Mean (domain)	3.50	3.83	3.50	3.54	
Subjective app quality	Would you recommend this app?	3.33	3.83	4.33	3.33	3.71
	How often do you think you would use this app?	3.50	4.00	4.00	3.00	3.63
	Would you pay for this app?	1.67	3.67	4.33	3.83	3.38
	What is your overall rating of the app?	3.50	4.33	4.17	4.00	4.00
	Mean (domain)	3.00	3.96	4.21	3.54	
Perceived impact	Awareness	3.33	4.33	4.17	2.00	3.46
	Knowledge	2.33	4.50	4.17	2.00	3.25
	Improvement in health-related behaviour	3.83	4.50	4.83	3.00	4.04
	Intention to change	4.17	4.83	4.50	2.67	4.04
	Help-seeking	3.00	4.00	4.17	1.17	3.08
	Behaviour change	4.00	4.83	4.33	3.00	4.04
	Mean (domain)	3.44	4.50	4.36	2.31	
Overall app mean score	3.72	4.11	4.01	3.54		
Cronbach's alpha coefficient	0.7	0.9	0.7	0.9	1.0	

Source: own work.

In the functionality domain, FatSecret achieved the highest score (4.29), followed by Fitatu (4.17), MyFitnessPal (3.92), and YAZIO (3.79). High performance ratings were consistent across all the apps (range 4.17-4.83), suggesting stable operation and good responsiveness. In contrast, navigation was the lowest-rated functionality component, particularly in MyFitnessPal (3.33), which may reflect less intuitive user flows compared with the other apps.

In the aesthetics domain, MyFitnessPal and FatSecret received the highest scores (both 4.00). Fitatu scored 3.94, and YAZIO 3.56. Within this domain the ratings for layout and graphics were relatively comparable across the apps, whereas visual appeal was consistently lower (range 3.33-3.83), indicating potential for further optimisation of the visual layer.

Regarding information quality, FatSecret ranked highest (3.83). The remaining apps showed similar scores: MyFitnessPal and Fitatu at 3.50, and YAZIO at 3.54. The highest-rated subcategory was information quality, particularly in Fitatu (4.50). The lowest ratings concerned the quantity of information, which across all the apps was evaluated at approximately 3.00-3.33. Notably, Fitatu received a low score for visual information (2.33), suggesting limited clarity or lower usability of visual data presentation.

For subjective app quality, Fitatu achieved the highest score (4.21), followed by FatSecret (3.96) and YAZIO (3.54). MyFitnessPal was rated lowest (3.00). The most considerable between-app differences were observed for willingness to pay. The lowest score was reported for MyFitnessPal (1.67), whereas Fitatu scored 4.33 and YAZIO 3.83. These findings may reflect substantial variation in perceived value for money.

In the perceived impact domain, FatSecret (4.50) and Fitatu (4.36) were rated highest. MyFitnessPal scored 3.44, while YAZIO 2.31. Particularly low ratings for YAZIO were observed for awareness and knowledge (both 2.00) and help-seeking (1.17). In contrast, Fitatu and FatSecret received high scores for intention to change and improvements in health-related behaviour, suggesting greater potential for these apps to support habit modification.

The reliability of the ratings, measured by Cronbach's alpha, varied across the apps and ranged from 0.7 to 0.9, indicating acceptable to perfect internal consistency. The table also shows an aggregated value of 1.0, suggesting very high overall agreement when scores were pooled, interpreting such a high value should take into account the sample size and data structure.

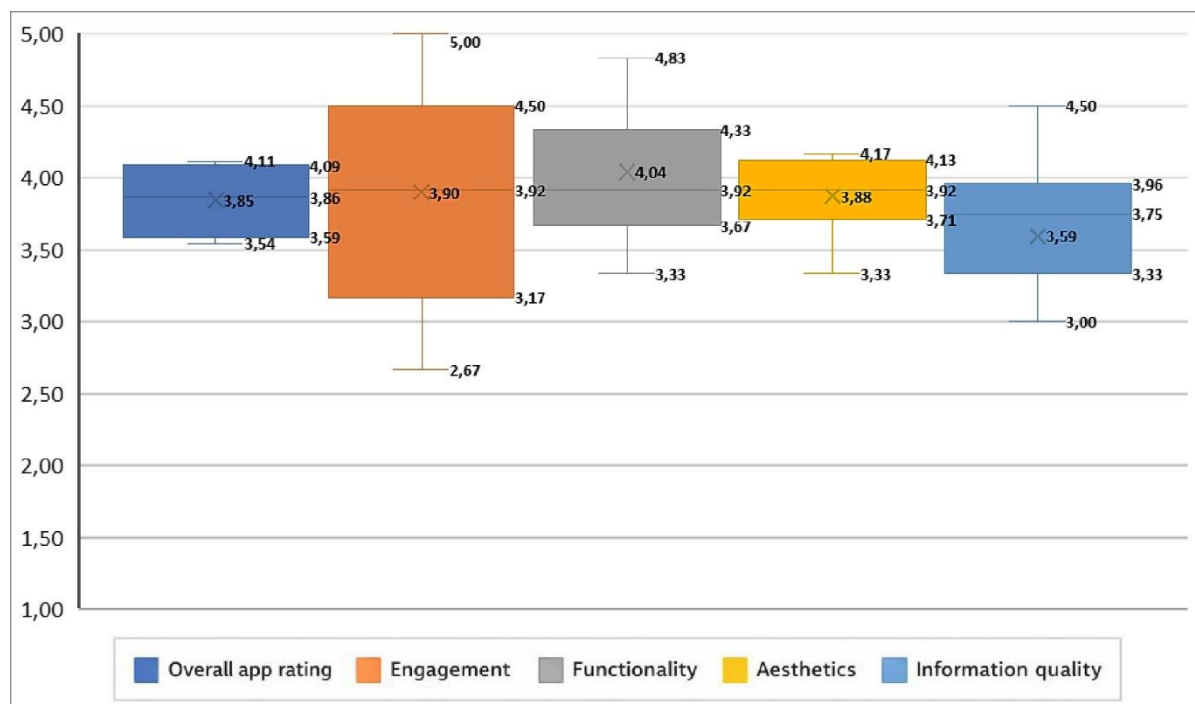


Fig. 2. Distribution of *uMARS* scores across the evaluated quality domains of nutrition apps

Source: own work.

Figure 2 presents the distribution of *uMARS* scores for the overall rating and four quality domains of nutrition apps evaluated in a sample of four tools. The highest mean scores were observed in the functionality domain, indicating favourable ratings of performance and usability across the assessed apps. Aesthetics and information quality achieved moderately high levels, with relatively limited variability. The most excellent dispersion was found in the engagement domain, suggesting heterogeneous perceptions of features such as entertainment value, customisation, and interactivity. The overall app rating was relatively high and showed low dispersion, indicating a comparable level of quality across the evaluated solutions.

After completing the *uMARS* questionnaire, the respondents reported factors that facilitated or hindered the use of mobile nutrition apps, as shown in Table 3. The most frequently reported barriers included concerns about data privacy and security related to the need to provide personal information, as well as the costs associated with accessing premium features. A further significant limitation was

the requirement for regular, time-consuming data entry, which, in everyday conditions, may hinder adherence, reduce consistency of use, and contribute to demotivation. Reported facilitators were predominantly motivational and self-regulatory, including the ability to monitor progress, track dietary habits, personalize settings, integrate with wearable devices, and use social/community features.

Table 3. User-reported barriers and facilitators to using mobile nutrition apps

Barriers	Facilitators
The need to provide personal data before use raises concerns about privacy and data security	Motivation to lose weight or maintain weight control
Requirement to pay to use some apps	Easier monitoring of dietary habits and support for modifying them
Additional costs related to access to premium versions and extended features	Perceived improvements in health and daily functioning due to controlling meal timing, including improved sleep quality
Reduced the usefulness of the app after achieving the preset goal	Increased motivation for physical activity to offset energy surplus
Demotivation when no visible progress is observed	Real-time monitoring of goal attainment, which strengthens motivation
Difficulties maintaining consistent data logging due to work responsibilities	Ability to personalise settings, improving convenience and alignment with user preferences
A sense of dependence on the phone, driven by the need for continuous data entry	Integration with wearable devices and automatic data transfer (e.g. from a smartwatch or fitness band)
Regular use is a prerequisite for obtaining reliable results	Social features enabling recipe sharing and mutual support in achieving goals
Difficulty selecting an appropriate app among numerous solutions available across platforms	Access to an extensive food database enabling assessment of the nutritional value of products and meals
Limited digital literacy is hindering app use	Support for monitoring daily fluid intake
The need to have suitable electronic hardware/devices	Ability to record body measurements and photo documentation, supporting monitoring of changes in body weight and appearance

Source: own work.

4. Discussion

Applying the predefined inclusion and exclusion criteria, four apps (FatSecret, Fitatu, MyFitnessPal, and YAZIO) were identified that simultaneously met the requirements for high popularity, favourable user ratings, and language availability, thereby enhancing the practical applicability of the findings in real-world app market conditions. The *uMARS* assessment enabled a multidimensional characterisation of app quality, consistent with the intended use of this instrument as a standardised user-based evaluation method for mHealth apps (Teixeira et al., 2018). In the presented study, all the apps achieved moderately high overall quality scores (MyFitnessPal: 3.72; FatSecret: 4.11; Fitatu: 4.01; YAZIO: 3.54). Functionality was the highest-rated domain, particularly for FatSecret and Fitatu (4.29 and 4.17, respectively), aligning with observations that diet self-monitoring apps are typically rated most favourably in terms of performance and usability, whereas greater differences are often observed in engagement and content quality (Bzikowska-Jura et al., 2021; Shinozaki & Murakami, 2020). At the same time, the information domain remained moderate or relatively weaker in several apps (MyFitnessPal 3.50, Fitatu 3.50, YAZIO 3.54), which corresponds with literature indicating that errors and heterogeneity in food databases may limit the reliability of calculations and displayed nutritional values (Baumel & Yom-Tov, 2018; Martinon et al., 2022).

MyFitnessPal received favourable ratings for functionality and aesthetics (functionality: 3.92, aesthetics: 4.00), but a lower score in the information domain (3.50). This pattern is consistent with validation and comparative studies suggesting that the app can reasonably well reflect total energy intake and selected macronutrients. At the same time, accuracy for specific nutrients may be poorer, potentially affecting perceived information quality (Teixeira et al., 2018). The study by Evenepoel et al.

(2020) showed that MyFitnessPal is relatively accurate for total energy and several parameters but less reliable, among others, for sodium and cholesterol, supporting the interpretation of lower ratings in the information domain.

FatSecret achieved the highest overall rating in the research sample (4.11) and high scores for engagement and functionality (4.27 and 4.29, respectively), as well as the strongest information-domain score among the four apps (3.83). The literature indicates that, despite high user-perceived utility, the app may underestimate selected nutritional parameters, including protein and sodium, which may partly explain why even the highest-rated app did not achieve very high values in the information domain (Fallaize et al., 2019; Jospe et al., 2015). Such discrepancies stress the need to evaluate usability and nutritional accuracy in parallel, particularly when apps are used in contexts requiring greater precision (Zhang et al., 2021).

Fitatu was rated highly for engagement (4.33) and functionality (4.17), suggesting strong alignment of features with user needs and favourable usability. However, its information-domain score was moderate (3.50), and at the subcategory level, a limitation was evident for visual information (2.33), suggesting an area for improvement in data presentation. These findings are consistent with comparative research showing limited comparability of results across apps and highlighting the need for further validation and standardization of food databases (Bzikowska-Jura et al., 2021).

YAZIO received the lowest overall score (3.54), with the most limiting domains being engagement (3.33) and perceived impact (2.31), while maintaining moderate functionality (3.79). Similar observations have been reported in evaluations of nutrition apps in French app stores, where functionality often exceeds engagement, and YAZIO is described as having good usability parameters, though it struggles to sustain engagement and maintain content quality. Reviews of nutrition app accuracy also suggest that some popular tools, including YAZIO, may tend to underestimate energy intake, which could reduce users' trust in the information provided and consequently contribute to lower scores in domains related to impact and content (Martinon et al., 2022).

The qualitative findings regarding barriers and facilitators are consistent with prior research on nutrition apps. In interviews with testers, a total of 11 obstacles and 11 facilitators were identified, and their heterogeneity may be interpreted in the context of differences in age and digital literacy described as determinants of adoption and sustained use of health applications (Dennison et al., 2013; Peng et al., 2016). The most frequently reported barrier concerned privacy and data security, aligning with population-based studies and analyses indicating that data sharing by health apps can be routine and that transparency of data-processing practices is often limited (Grundy et al., 2019; Knight et al., 2015; Krebs & Duncan, 2015). Costs—particularly paid premium features—were also a substantial barrier, consistent with literature reviews identifying pricing and subscription models as common deterrents to the use of nutrition apps (König et al., 2021). In this study's data, willingness to pay differed across apps (16.67% for MyFitnessPal, 66.67% for FatSecret, and 83.33% for Fitatu), suggesting that payment acceptance depends on perceived value relative to price and the availability of goal-supporting features. Barriers related to maintaining regular use and declines in motivation after lack of progress or after achieving the goal are also consistent with qualitative findings in which low self-discipline, the burden of continuous self-monitoring, and rapid app abandonment are frequently reported mechanisms of disengagement (Peng et al., 2016).

Among the facilitators, motivational and self-regulatory factors predominated, including support for weight loss and improved fitness, progress monitoring, and personalisation. This corresponds with evidence indicating that goals related to weight loss and fitness improvement are among the most common reasons for continued use of health apps (Marston & Hall, 2016; Mustafa et al., 2022). The respondents also emphasised the importance of integration with wearable devices and social features, which may enhance perceived agency and sustain engagement. This is supported by studies on weight-loss and diet apps showing that social support and social comparison can function as important motivational mechanisms (Chen et al., 2024).

The methodological limitations of the presented research include the lack of complete standardisation of the app versions evaluated during the assessment period, and potential differences in the raters' interpretation of *uMARS* items, which may affect comparability across apps. Heterogeneity in the rater group in terms of age and digital literacy is an additional limitation, as these factors have been shown in mHealth research to influence user experience and app evaluations. At the same time, the literature highlights the need for further validation and harmonisation of the *uMARS* app protocols to reduce variability arising from differences in rating procedures (Lyzwinski et al., 2019; Stoyanov et al., 2015, 2016). Furthermore, *uMARS* does not fully capture the technical dimensions of apps, such as privacy and data security, interoperability, or accessibility, which represent important directions for future research on digital health tools (Levine et al., 2020).

The findings indicate that the design of nutrition apps should more strongly integrate functionality with reliable informational content, engagement-sustaining mechanisms, and psychosocial components that support long-term behaviour change. It is also advisable to complement app quality assessment with technological criteria, particularly those related to privacy and data security, to better reflect real-world risks and user needs. Future research should focus on evaluating the impact of apps on sustained change of health behaviour under everyday conditions and on identifying design features associated with long-term adherence.

5. Conclusions

Based on the *uMARS* assessment and analysis of user statements, the evaluated nutrition apps demonstrated at least moderate overall quality, with the highest scores observed for FatSecret and Fitatu and the lowest for YAZIO. Functionality was the best-rated domain, whereas greater differences were found in information quality and components supporting sustained engagement. The respondents indicated that the apps facilitate dietary self-monitoring and goal attainment through personalisation, progress tracking, and integration with wearable devices. Key barriers included concerns about data privacy and security, the costs of premium features, and difficulties maintaining regular data logging, which may limit long-term use. The findings support combining standardised user-based quality assessment with qualitative analysis of user experience and highlight the need to extend app evaluation to include technological aspects, such as data transparency and protection.

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Ocena jakości aplikacji żywieniowych oraz uwarunkowania ich stosowania: bariery i czynniki sprzyjające

Streszczenie

Cel: Celem badania była ocena jakości i funkcjonalności mobilnych aplikacji żywieniowych dostępnych w Google Play Store na rynku polskim z wykorzystaniem kwestionariusza uMARS oraz identyfikacja barier i ułatwień związanych z ich użytkowaniem w obszarze mHealth.

Metodyka: Przegląd aplikacji przeprowadzono w czerwcu 2023 roku w kategorii Health and Fitness, zawężając wybór do bezpłatnych, najpopularniejszych aplikacji ukierunkowanych na liczenie kalorii, z oceną użytkowników co najmniej 4,0 oraz liczbą pobrań co najmniej 5 milionów, dostępnych w języku polskim i angielskim. Do analizy włączono cztery aplikacje: MyFitnessPal, FatSecret, Fitatu oraz YAZIO. Każdą aplikację testowano przez 14 dni, a następnie oceniano przy użyciu uMARS w trzech grupach wiekowych z uwzględnieniem płci. Zebrano również dane jakościowe dotyczące barier i ułatwień korzystania z aplikacji.

Wyniki: Najwyższą średnią ocenę ogólną uzyskała aplikacja FatSecret, następnie Fitatu i MyFitnessPal, natomiast najniższą YAZIO. Najlepiej ocenianym obszarem była funkcjonalność, podczas gdy większe zróżnicowanie dotyczyło jakości informacji oraz zaangażowania. W analizie jakościowej jako istotne bariery wskazywano obawy o prywatność danych, koszty funkcji premium oraz trudność utrzymania regularności rejestrowania danych. Ułatwienia obejmowały możliwość monitorowania postępów, personalizację, integrację z urządzeniami ubieralnymi oraz funkcje wspierające motywację.

Implikacje i rekomendacje: Wyniki badania wskazują, że naukowa ocena aplikacji żywieniowych powinna wykraczać poza analizę ich funkcjonalności technicznej i obejmować również jakość informacji oraz potencjał do podtrzymywania zaangażowania użytkownika. Uzyskane rezultaty potwierdzają także zasadność łączenia standaryzowanej oceny jakości aplikacji z analizą barier i czynników sprzyjających ich stosowaniu, ponieważ to właśnie te elementy warunkują ich praktyczną użyteczność i trwałość użytkowania. Dodatkowo praca uzupełnia badania dotyczące jakości aplikacji żywieniowych dostępnych na rynku polskim, tworząc podstawę do dalszych analiz porównawczych oraz badań nad ich skutecznością w kształtowaniu zachowań żywieniowych.

Oryginalność/wartość: Badanie łączy standaryzowaną ocenę jakości aplikacji z perspektywę użytkownika z analizą jakościową barier i ułatwień korzystania, dostarczając wniosków przydatnych dla projektowania aplikacji, edukacji zdrowotnej oraz dalszych badań nad skutecznością narzędzi mHealth.

Słowa kluczowe: aplikacje mobilne, żywienie, uMARS, mHealth, ocena jakości
