Recommendations for the Design of a Mobile Application to Personalize Training Routines and Provide Nutritional Support

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***Abstract*— The increasing reliance on mobile applications for fitness and nutrition management highlights the need for customized and adaptive solutions. This article proposes eight recommendations for designing mobile apps that tailor workout routines and provide nutritional support. These recommendations were based from the analysis of 22 scientific articles and 3 mobile fitness applications. The recommendations proposed are divided in two categories: (i) Recommendations for the content and visual design visual of the mobile application, and (ii) Recommendations for user interaction and motivation in the mobile application. For a better understanding, an illustrative example was developed with the use of the proposed recommendations. This work aims to help designers create more effective and engaging mobile fitness applications.**

Keywords*— *recommendations, mobile app, personalized fitness, nutritional support, artificial intelligence, augmented reality, gamification.

I. Introduction

The increasing reliance on mobile applications to manage fitness and nutrition highlights the need for personalized and adaptive solutions. Personalized fitness programs, tailored to the user's body type, goals and lifestyle, increase fidelity and improve overall performance [1]. Emerging technologies such as Artificial Intelligence (AI), Augmented Reality (AR) and gamification techniques have shown high potential to boost user engagement and motivation [2], [3]. AI allows training plans to be dynamically adjusted according to the user's progress [4], while AR offers real-time corrections, reducing the risk of injury and optimizing training effectiveness [5]. Gamification, through rewards and challenges, turns exercise into an engaging and rewarding experience, essential to maintain long-term engagement [6]. Studies highlight that fitness applications that combine personalized training features and nutritional support improve user loyalty and performance outcomes [7]. Thompson et al [8] highlight that personalized nutritional support within mobile fitness apps contributes to increased user adherence and satisfaction. In addition, the incorporation of real-time nutritional feedback mechanisms, such as calorie tracking and nutrient balance assessments, encourages users to make informed decisions about their diet, thus supporting their fitness goals [9].

The contribution of this paper presents eight recommendations for the design of mobile applications that personalize training routines and offer nutritional support, based on a comprehensive literature review and analysis of successful applications. These recommendations were based on 22 research articles and fitness applications such as MyFitnessPal [11], Nike Training Club [12] and Freeletics [13]. The eight recommendations proposed are distributed in two categories: (i) Recommendations for the content and visual design visual of the mobile application, including the use of calming colors and readable fonts to improve accessibility and user experience, levels difficulty in exercise routines, progress visualization, and personalization of duration of exercise sessions, (ii) Recommentaions about of gammification techniques, forums Artificial Intelligence (AI), Augmented Reality (AR), and nutritional support, including personalized meal planning, calorie tracking, and real-time feedback. These approaches have been shown to improve motivation and loyalty to fitness programs [14]. The paper shows an illustrative example of the design of a mobile application to personalize training routines and provide nutritional support based on the recommendations proposed in this study. This paper shows an illustrative example of the design of a mobile application that incorporates the proposed recommendations, demonstrating how to apply them in the process of designing graphical user interfaces. This example focuses on the visual interaction of the interfaces, without addressing the complete navigation of the application, and provides designers with recommendations on how to integrate key elements into mobile fitness applications to enhance the user experience.

This paper is structured as follows: Section II presents the analysis of mobile fitness applications and their integration with nutritional support. Section III details a set of recommendations based on the reviewed literature and applications analyses. Section IV presents an illustrative example that demonstrates the application of selected recommendations in a mobile fitness applications context. Finally, Section V provides conclusions and outlines directions for future work.

II. State of Art

This section reviews previous work on mobile fitness applications that optimize visual design, user interaction, and offer personalized nutritional support. A Targeted Literature Review (TLR) was conducted in Scopus to identify relevant studies, using a query focused on mobile fitness apps and nutritional support, including artificial intelligence (AI) and gamification [15].

("mobile application" OR "fitness app" OR "health app") AND ("personalized workout" OR "customized training" OR "adaptive training") AND ("nutritional support" OR "meal planning" OR "dietary advice") AND ("artificial intelligence" OR "AI") AND ("study")

The papers were classified into two categories: (a) development of mobile applications that optimize visual design and functionality, and (b) studies on interaction and

motivation techniques, such as gamification, social support and real-time feedback.

Inclusion criteria were: (i) fitness applications with visual design and interaction features, (ii) studies evaluating effectiveness on user engagement and performance. Exclusion criteria encompassed topics not related to design personalization or motivation, and applications without interaction features. From an initial search of 120 articles, 11 were selected that met the relevance criteria.

A. Visual design and functionality in Mobile Fitness

Papers on the design of mobile fitness applications were analyzed, focusing on the visual content, accessibility and organization of functionality to identify best practices in user experience. Desai et al. [16] developed FitLife, a user-centric app that optimizes the use of accessible colors and fonts, incorporating intuitive navigation and customizable fitness modules. The application offers personalized routines and meal plans based on the user's preferences, health goals, and fitness level, allowing for a consistent and flexible experience that adapts to different profiles.

Beck et al [1] developed NutriFit, which personalizes meal plans and facilitates interaction through an attractive visual interface with easy-to-interpret graphic elements, such as information cards and interactive menus. This design improves user satisfaction by offering a fluid and motivating experience, which in turn increases long-term engagement with the app.

Kaur et al. [2] developed an AI-based app that dynamically adjusts physical routines based on real-time physical performance, using built-in sensors and feedback from the user's recorded activity. This approach allows for continuous adaptation of the intensity and type of physical exercise, improving training effectiveness and reducing the risk of demotivation.

Patel et al [10] presented SmartDiet, which uses AI to offer predictive nutritional support through the analysis of previous eating patterns and metabolic goals. The app not only recommends balanced meals but also anticipates dietary deviations and suggests proactive adjustments, ensuring a personalized and engaging experience with a preventative focus.

Fang et al. [37] proposed a machine learning-based approach to setting personalized exercise goals in digital health services. Their system used activity patterns and user behavior data to generate adaptive daily step goals, showing significant improvements in physical activity levels compared to fixed-goal systems.

In conclusion, the studies reviewed indicate that the development of effective mobile fitness apps requires a focus on visual and functional design that fosters a positive user experience, using advanced technologies such as AI for continuous personalization.

B. User interaction and motivation techniques in Fitness Applicationes

Studies on the impact of user interaction and motivation techniques, such as gamification, social support and real-time feedback, on mobile fitness apps were analyzed. Govender et al [7] examined how personalized exercise and nutrition plans, combined with immediate feedback, significantly improve user adherence and physical performance. Their study, based on a sample of active health applications users, showed that those who received recommendations tailored to their goals and received immediate notifications about their progress showed higher adherence rates and longer program retention.

Thompson et al [8] explored the impact of personalized social support within mobile applications, highlighting that the inclusion of forums, discussion groups, and social support functions significantly increases satisfaction with the diet and continued use of the application.

Johnson et al. [9] investigated the role of real-time nutritional feedback and found that providing immediate information on caloric intake, macronutrient balance, and recommended levels facilitates healthy decision-making at the time of food choice.

Nguyen et al [18] discussed the use of predictive analytics to adjust dietary recommendations based on the user's historical data, recorded progress, and behavioral patterns. By employing machine learning models, the apps are able to anticipate future nutritional needs and propose more precise eating strategies, increasing user engagement.

Fatima et al [19] They presented that mobile applications that integrate gamification elements along with nutritional support tend to generate sustained long-term engagement, especially when they use progressive rewards, achievements, and challenges that align with the user's personal goals.

Brons et al [38] presented an exploratory review of machine learning methods for personalizing persuasive strategies in mobile health interventions aimed at promoting physical activity. The study identifies and categorizes personalization approaches such as the use of classification models based on behavioral characteristics, user segmentation based on activity patterns, and dynamic adaptation of persuasive messages.

In conclusion, the studies reviewed indicate that interaction techniques such as gamification, social support and real-time feedback promote greater user adherence, improved fitness outcomes and a high degree of overall satisfaction

III. DEFINITION OF RECOMMENDATIONS FOR MOBILE APPLICATION DEVELOPMENT

This section defines a set of eight recommendations for the design of mobile applications aimed at personalizing fitness routines, providing nutritional support, and fostering user motivation through gamification. The recommendations are based on the analysis of 22 research papers and 3 existing mobile fitness applications. Each recommendation is designed to address specific aspects of mobile application design, such as the incorporation of emerging technologies, the personalization of fitness and nutrition plans, and strengthening user engagement through innovative features and gamification techniques.

For each recommendation, an "R" prefix with a number (for example, R1, R2, R3, etc.). The following subsections detail these recommendations, supported by relevant studies and examples of successful applications.

A. Recommendations fot the design of the Mobile Application

Papers exploring the design of visual elements, functionality and content structure within mobile fitness applications were analyzed.

R1: Works on the effects of visual design on the perception of mobile applications, specifically on the choice of colors and fonts, were analyzed. In the work of (i) Chen et al. [22] and Hamari et al. [5] recommended that the use of a calming color palette and legible fonts positively affects the perception of the application, fostering user loyalty. (ii) Johnson et al. [9] suggest that, in mobile fitness applications, colors that convey energy, such as blue or green, be used along with a font size comfortable for reading on mobile devices, thus improving accessibility for a wide variety of users. A visually appealing design increases satisfaction and the likelihood that users will return to the application frequently.

In conclusion, it is recommended to employ soothing colors such as blue or green, along with legible and comfortable font types, to create a user experience that encourages continuous interaction with the application.

R2: Works on the importance of providing different levels of difficulty in exercise routines for mobile fitness applications was discussed. In the work of (i) Prakash et al. [23], they highlight the need to tailor exercise routines to the user experience, from beginner to advanced, to improve fidelity and overall performance. (ii) Silva et al. [24] mencioned that personalization of workouts, adjusting intensity and complexity according to individual capabilities, is essential to maintain motivation and prevent injuries. (iii) Applications such as MyFitnessPal, Nike Training Club implement this type of personalization, offering programs that adapt to the user's progress and specific goals.

In conclusion, it is recommended that fitness applications incorporate adjustable levels of difficulty into training routines, allowing users to progress safely and effectively, and maintaining their motivation over time.

R3: Works exploring the importance of progress visualization in fitness applications were analyzed. In the study by (i) Lister et al. [3] incorporated visual elements, such as performance charts and medals, increases the perception of achievement among users, fostering greater fidelity to exercise routines. (ii) Schoeppe et al. [25] found that applications that offer visual progress tracking, through intuitive charts reflecting daily, weekly or monthly progress, help users to stay motivated and committed to their fitness goals. (iii) Johnson et al [26] pointed out that gamification, through visual rewards and classification, transforms the exercise experience into a more engaging and rewarding process, which is crucial for maintaining user engagement over the long term.

In conclusion, it is recommended that fitness applications incorporate functionalities that allow users to visualize their progress in a clear and engaging way, using performance graphs, medals and other visual rewards, to encourage motivation and continued commitment to their health goals.

R4: Studies addressing the personalization of the duration of exercise sessions in mobile fitness applications were analyzed. In the work of (i) Govender et al [27] and Villani et al [28] mencioned that adapting the duration of sessions according to the user's available time improves fidelity to the training program (ii) Smith et al. [29] demonstrated that shorter, but more frequent exercise sessions can be equally effective in improving fitness and overall health, facilitating long-term adherence. (iii) Johnson et al. [9] concluded that the use of short, flexible workouts promotes consistency in app use and the creation of healthy habits.

In conclusion, it is recommended that fitness applications offer adaptable session length options, allowing users to select workouts that fit their daily availability, promoting a sustainable and effective long- term experience.

B. Recommendations for User Interaction and Motivation in the Mobile Application

Works exploring gamification strategies, social support, and real-time feedback within mobile fitness applications were analyzed to formulate recommendations that foster a dynamic user experience, thereby improving user engagement and adherence over time.

R5: Works was analyzed about elements of gamification techniques in mobile fitness applications to foster user engagement and loyalty. In the work of (i) Lister et al. [3] and Hamari, Koivisto, et al. [5], gamification elements, such as prizes, badges, and leaderboards, are incorporated, which help foster healthy competitiveness and a sense of achievement. (ii) Deci et al. [30] and Villani et al.[28] define that elements such as weekly challenges or rewards for reaching specific milestones promote long- term loyalty and engagement.

In conclusion, the use of gamification elements such as prizes, badges, rewards, and leaderboards are recommended to motivate users to continue with exercise routines and improve their long- term commitment.

R6: Works about community forums among users, identifying that in the work of (i) Thompson et al [31] and García [32] defined that the integration of community forums or support groups in the application allows users to share experiences, which increases engagement and loyalty to training routines. (ii) Chen et al. [22] indicated that studies reveal that applications that integrate these features, such as social incentives through cooperation and competition among users, increase user retention, as users feel that they have a greater sense of belonging to the application and that they are more engaged in the application. Part of a community that motivates them to continue training and improving their lifestyle.

In conclusion, it is recommended that the use of community forums and elements of cooperation and competition in the application allow users to relate and motivate each other, increasing their participation and fidelity to exercise routines.

R7: Works about real-time feedback to improve execution and accuracy in exercise routines in fitness applications were analyzed using technologies such as Artificial Intelligence (AI) and Augmented Reality (AR). In the work of (i) Abosbaa et al [33], mencioned that AR is shown to provide immediate posture corrections, reducing the risk of injury and increasing training effectiveness. (ii) Silva et al [24] found that AR significantly improves user engagement by providing interactive feedback during exercise execution. (iii) Fieraru et al [34] developed AIFit, an AI-based system that reconstructs the human pose in 3D to provide real-time feedback, which helps users to correct their technique accurately. (iv) Chen et al [35] implemented an AR system that provides immediate visual feedback, achieving significant improvement in the accuracy of exercises performed by users.

In conclusion, the integration of real-time feedback using AI and AR technologies in fitness applications is recommended in order to optimize users technique and provide an interactive and engaging user experience.

R8: Works on providing customizable nutritious meals in fitness applications. In the work of (i) Smith et al. [36] and Johnson et al. [9] defined that applications should offer customizable meal plans and real-time feedback on nutrient intake. Studies show that users who receive immediate feedback on their caloric intake and nutrient balance tend to make healthier dietary choices. (ii) Nguyen, Tran & Hoang [37] define that predictive analytics using AI allows adjusting nutritional recommendations according to the user's progress, encouraging a balanced diet and improving health outcomes.

In conclusion, the use of customizable nutritional meal information in fitness applications is recommended to promote healthy eating habits and improve users' health outcomes.

Table 1 shows a summary of a set of eight proposed recommendations (R1, R2, R3, R4, R5, R6, R7, and R8) for mobile fitness applications. The set of proposed recommendations is divided into two categories: (i) Recommendations for the content and Visual design of the mobile application, and (ii) Recommendations for user interaction and motivation in the mobile application.

TABLE I. SUMMARY OF RECOMMENDATIONS PROPOSED

Category	Recommendation	Details
Recommendations for the content and visual design of the mobile application	R1	Calming color palette and legible fonts
	R2	Providing different levels of difficulty in exercise routines
	R3	Progress visualization
	R4	Personalization of the duration of exercise sessions
Recommendations for user interaction and motivation in the mobile application	R5	Elements of gamification techniques
	R6	Community forums among users
	R7	Real-time feedback to improve execution and accuracy in exercise routines
	R8	Providing customizable nutritious meals

IV. ILLUSTRATIVE EXAMPLE

This section shows an illustrative example demonstrating the mobile application of training routines and nutritional diets that contains six recommendations (recomendations R1, R2, R3, R5, R7 and R8) proposed in this study. The aim is to provide a visual and conceptual reference on how these recommendations can be effectively implemented to enhance personalization, engagement, and adherence to training routines and nutrition plans.

The illustrative example is based on a hypothetical mobile application named "FitWell+", which integrates artificial intelligence (AI), augmented reality (AR), gamification elements, and nutritional feedback to deliver a personalized fitness experience. This represent conceptual screens from the application and illustrate how multiple recommendations can be combined in practical design features.

Figure 1 shows the fitness application that contains recommendations R1 and R3, recommendation R1 regarding typography and the use of calming colors in the fitness applications graphical components, and recommendation R3 regarding user progress with their training routines. For this reason, the fitness application includes the use of calming colors, for example, shades of blue and green, and legible typography to create a welcoming and accessible graphical user interface (recommendation R1). Furthermore, the fitness application shows a dashboard that provides the user's activity progress, goals, and badges, reinforcing motivation through progress tracking and visual feedback (recommendation R3).

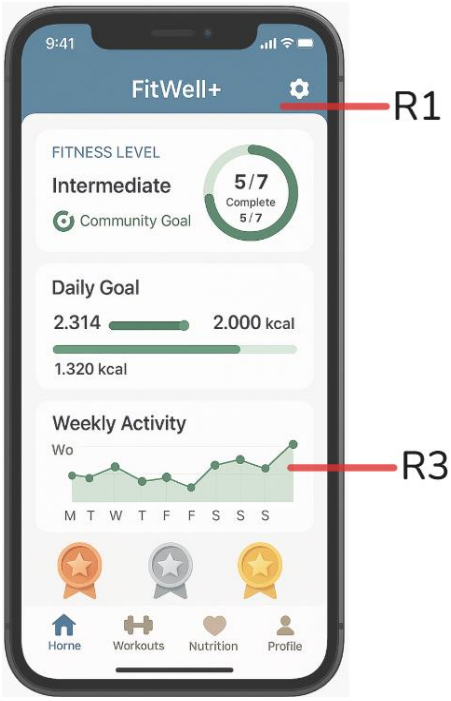

Fig. 1. Personalized home dashboard

Figure 2 shows the fitness application that includes recommendations R2 and R5, recommendation R2 regarding adaptive training plans, and recommendation R5 regarding gamification techniques (badges, prizes, rewards, and others). For this reason, the fitness application allows users to select customizable training plans based on their skill level (beginner, intermediate, or advanced) and their time availability, thus offering an experience more suited to their abilities and daily routine (recommendation R2). In addition, gamification techniques such as badges, experience points, and weekly challenges are incorporated into the graphical user interface, which incentivize users to maintain adherence,

reinforce their commitment, and achieve their personal goals in a fun way (recommendation R5).

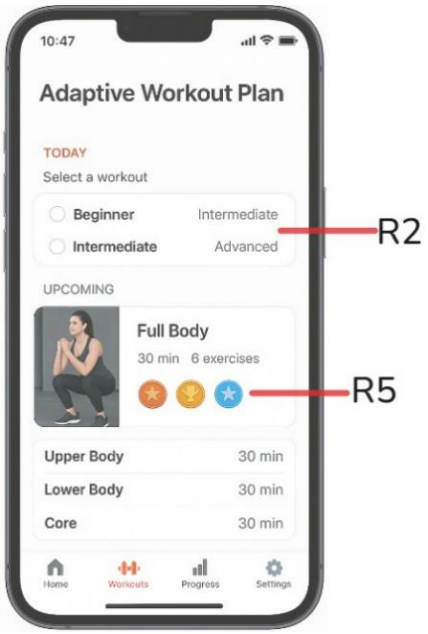

Fig. 2. Adaptative workout plan with difficulty levels

Figure 3 shows the gym app that includes recommendation R7 on the use of real-time feedback through artificial intelligence (AI) and augmented reality (AR) technologies to improve exercise execution. For this reason, the app uses the mobile device's camera to superimpose visual cues directly onto the user's image during physical activity, correcting their posture and technique in real time and thus reducing the risk of injury (recommendation R7). Additionally, AI models reconstruct body position in 3D, enabling precise and interactive corrections that optimize training effectiveness and enhance the user experience.

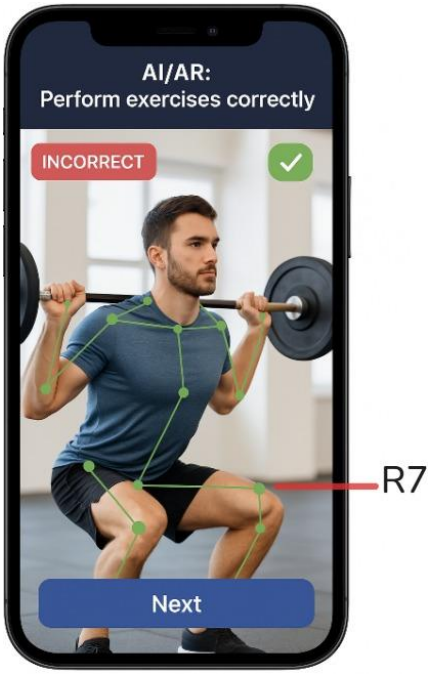

Fig. 3. Real-time posture correction using augmented reality.

Figure 4 shows the fitness application that includes the R8 recommendation on the use of real-time personalized nutritional feedback. For this reason, the fitness application allows users to log their daily meals, and uses artificial intelligence to offer dietary suggestions tailored to their nutritional goals, such as calorie and macronutrient balance (R8 recommendation). Furthermore, it features a clear and visual graphical user interface that displays daily consumption indicators, alerts about nutritional excesses or deficiencies, and specific advice for improving their diet. These features are complemented by elements of gamification techniques, such as stars or rewards for maintaining a healthy diet, thus encouraging informed decision-making and continued commitment to their health goals.

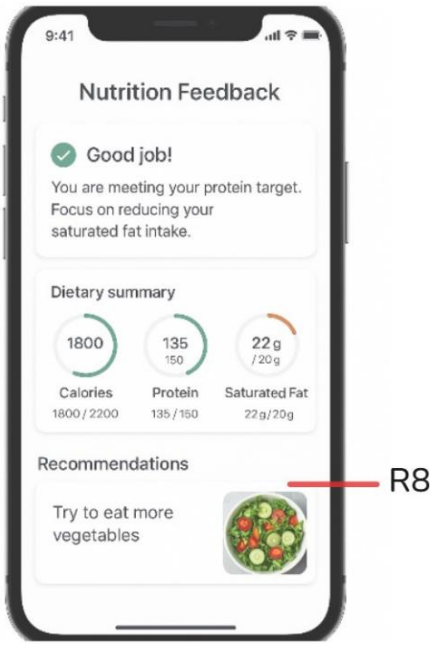

Fig. 4. Personalized nutrition feedback pane.

The illustrative example shows the design of a fitness application containing recommendations R1 (incorporates visual design and accessibility principles through the use of a calming color palette and legible typography), R2 (progress panel that reinforces user motivation), R3 (represents an adaptive training plan that adjusts to the user's level and availability), R5 (gamification elements), R7 (the use of AI and AR to provide real-time technical feedback during physical activity), and R8 (integrates personalized and dynamic nutritional feedback, incentivizing healthy habits through visual rewards). This illustrative example facilitates understanding how the proposed recommendations can be practically and effectively applied in the design of mobile application for physical activities and nutritional suggestions.

V. Conclusions and Future Work

This paper presents a set of eight recommendations for the design of mobile applications aimed at personalizing exercise routines and providing nutritional support, based on a comprehensive review of scientific studies and the analysis of successful applications in the field of physical fitness. The recommendations were based on 22 research articles, the recommendations are structured in two categories: (i) Recommendations for the content and visual design visual of the mobile application, including the use of calming colors and readable fonts to improve accessibility and user experience, levels difficulty in exercise routines, progress visualization, and personalization of duration of exercise

sessions, (ii) Recommentaions about of gammification techniques, forums Artificial Intelligence (AI), Augmented Reality (AR), and nutritional support, including personalized meal planning, calorie tracking, and real-time feedback.

An illustrative example is also included, visually demonstrating the mobile app based on the proposed recommendations. The developed mockups reflect the integration of features such as visual progress tracking, adaptive training plans, real-time postural correction using augmented reality, and personalized nutritional feedback with gamified rewards. These examples strengthen the study's practical contribution by providing clear design guidelines that promote usability and foster sustained user engagement.

In addition, future lines of research are raised that include extending these recommendations and evaluating their satisfaction on user experience. This approach provides a solid foundation for the design of innovative mobile applications that promote adherence to exercise routines and healthy habits.

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