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Mobile App Use Among Chronic Pain Patients  
A Gamified Approach

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IARIA



## Presenter's resume



**Duarte Duque**  
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- PhD in Technologies and Information Systems, from the University of Minho, Portugal.
- Director of the bachelor's degree in Digital Games Development Engineering, at the Polytechnic Institute of Cávado and Ave (IPCA).
- Director of the Intelligent and Creative Cyber-Physical Systems Department, at IPCA.
- Member of the steering committee of the International Conference on Serious Games and Applications for Health (SeGAH).
- Integrated member of the 2Ai – Applied Artificial Intelligence Laboratory.



## Research Interest and Current Projects



**Duarte Duque**

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### RESEARCH AREA

*Intelligent and Immersive  
Environments*

- **FAIST** – *Sustainable and Technological Smart Agile Factory Sustainable and Technological Smart Agile Factory*


In the framework of this project, IPCA is a partner in the creation of the digital platform TUTORIC - Scientific Content Platform for Personalized Learning, which aims to create an electronic platform for professional training and new digital content to address skill gaps in users of new technologies, utilizing artificial intelligence to define personalized training paths and peer assessment of new content.

- **AM2R** – *Mobilizing Agenda for business innovation in the two-wheel sector*

The Mobilizing Agenda for business innovation in the Two Wheels sector focuses on enhancing the national productive profile by targeting key areas in the value chain. This initiative aims to boost international competitiveness and reduce reliance on the Asian market through the development of advanced knowledge in products, processes, and services, emphasizing sustainability and digitalization.

# Introduction


Chronic pain affects more than 30% of adults in Portugal, requiring a multidisciplinary therapeutic approach.



**Objective:** Explore the potential of a mobile application in chronic pain management, focusing on fibromyalgia.

# Literature Review

**Previous Studies:** Mobile apps have shown significant improvements in pain severity, anxiety, and depression among fibromyalgia patients.




**Gaps:** Need for empirical validation and better understanding of app usage by fibromyalgia patients.

# Methodology



**Methods Used:** Literature review, case study analysis, and development of functional and non-functional requirements for the FisioQuest app.



**Selection Criteria:** Features most valued by patients and effective in clinical practice.

# Functional Requirements of FisioQuest



## Pain Reporting

- Users can report pain location and level of pain.
- Aids in tracking patterns for treatment adjustments.

## Medication Tracking

- Allows users to check and record daily medication intake.
- Ensures adherence to treatment plans.

## Exercise Guidance

- Provides users with prescribed daily exercises.
- Includes videos and instructions for proper execution.

## Daily Questionnaires

- Prompts users to fill in morning and evening questionnaires.
- Monitors symptoms and identifies patterns.

## Health Monitoring

- Enables users to record daily weight and blood pressure.
- Correlates with pain levels and medication adherence.

# Non-Functional Requirements



## Usability

- Intuitive interface with basic icons.
- Minimalist design for reduced cognitive load.

## Engagement

- Integration of push notifications for task reminders.
- Gamification elements for user motivation.

## Performance

- Prompt loading.
- Effective response to user interactions

## Reliability

- Minimization of crashes and service interruptions.
- Temporary data storage during network failures.

## Security and Privacy

- Protection of user data.
- Compliance with GDPR regulations.



# Use Cases in Chronic Pain Management



## Pain Report

After experiencing an outbreak of pain, the patient opens the pain reporting page. The user selects the location of the pain (from a list) and rates the pain on a scale of 0 to 10. The data is stored in the database and can be viewed in the user's profile in the form of a daily pain graph. Over time, the user and their healthcare provider can track pain patterns and adjust treatments accordingly.

## Daily Medication Check

A user opens the Physician page to check their medication plan for the day. The page displays a list of medications with checkboxes next to each one. As the user takes their medication, he/she ticks the checkboxes, and the app records the intake. This information is then synchronized with the main screen, showing the "Physician" task as completed for the day.

## Performing Exercises

The user navigates to the physiotherapist's page, where he/she is presented with the list of daily exercises that have been prescribed. Each exercise includes a short video/image and notes on how to properly perform the exercise. The user completes the exercise and marks it as finished. The application records the completion and updates the streak counter.

## Morning/Evening Questionnaires

In the morning and evening, the user is notified to fill in the daily questionnaires. The Morning Questionnaire asks about the user's sleep quality and morning pain levels, while the Evening Questionnaire asks about general daily pain and how he/she felt throughout the day. The answers are recorded and stored in the database, providing data for monitoring symptoms and identifying potential triggers or patterns.

## Health Monitoring

On the Nursing page, users can record their daily weight and blood pressure. They should also mark the daily tasks they have been prescribed, such as "Bathing", "Making the bed", among other activities. This information is stored in the database.

Healthcare professionals will be able to observe how weight and blood pressure vary and correlate with pain levels and medication adherence.

# Integrated Gamification Elements in FisioQuest



## Streak System

- Encourages daily app use by tracking consecutive days.

## Reward System

- Users can redeem rewards after completing streaks.
- Includes scheduling teleconsultations with healthcare professionals.

## Instant Feedback

- Provides feedback on user progress.
- Reinforces positive behavior.

## Daily Questionnaires

- Promote self-reflection.
- Continuous symptom monitoring.

Enhances user participation and adherence to treatment.

# Application Design and Mockups Overview



- **Application Design Process**

The application design process for FisioQuest began by selecting the Flutter framework for development, ensuring a single code base for Android and iOS platforms.

- **Mockups**

Detailed mockups were created to preview the layout and functionality of the application, serving as models during development.

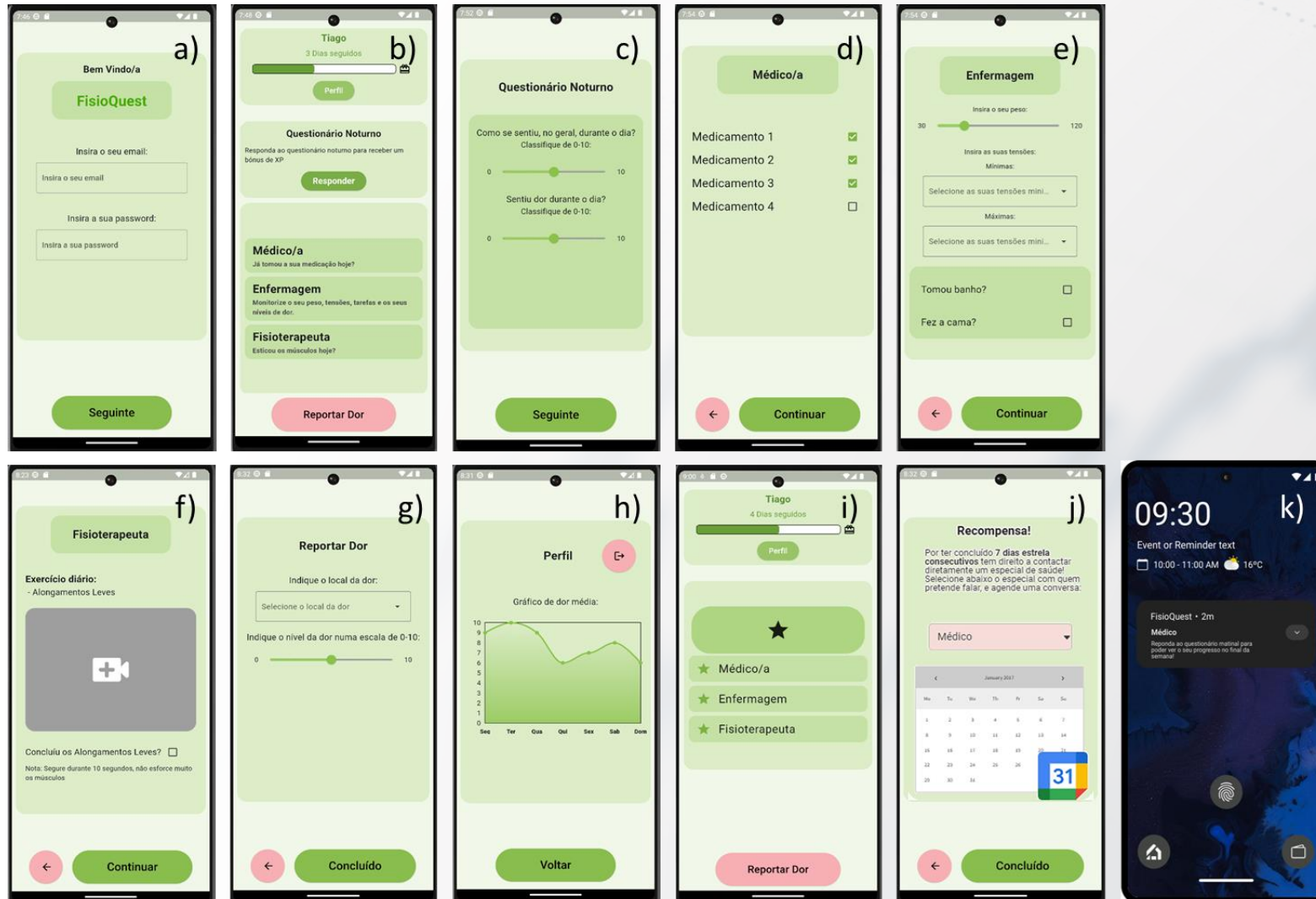
- **Key Screens**

Key screens of the FisioQuest app include the Login page, Main page, Morning/Evening Questionnaire, Physician Page, Nursing Page, Physiotherapist Page, and Pain.

- **Wireframes and Mockups**

Wireframes and mockups were essential in testing the application's functionality and user interface design.

# Application Design and Mockups Overview





# Conclusions

- **Effectiveness of Mobile Apps**

Previous studies indicate that mobile applications can reduce pain intensity and improve symptoms like anxiety and depression in chronic pain management.

- **Functional Benefits**

Key features of mobile apps—such as exercise guidance, psychotherapeutic support, and continuous symptom monitoring—are particularly beneficial for patients with Fibromyalgia Syndrome (FMS).

- **Engagement through Gamification**

Sustained use of the app is crucial for effectiveness, with gamification identified as a key strategy to enhance patient engagement and self-management.

- **FisioQuest Development**

Incorporating gamification, the app aims to provide a convenient complement to traditional treatments, potentially minimizing reliance on pharmacological interventions.



# Future Work

- **Conduct Usability Testing**

Usability assessments using the System Usability Scale (SUS) will evaluate user experience and ease of use.

- **Initiate Co-Design Process**

Involve end-users to enhance the application based on feedback.

- **Validation Study**

A controlled study will be conducted to distinguish between true benefits and placebo effects, ensuring the reliability of observed outcomes.

- **Expand App Features**

Maintain user engagement through further gamification.

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Thank you!

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