ExActHealth: A Mobile App for Food and Activity Data Collection in Type 1 Diabetes Management

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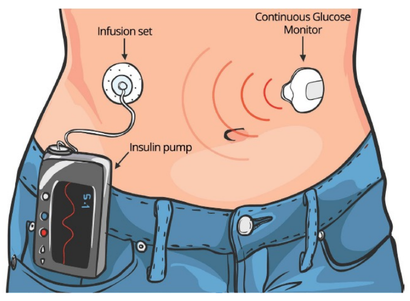
INTRODUCTION

Effective management of **Type 1 Diabetes (T1D)** requires comprehensive understanding of patient behavior, including food intake, physical activity, and physiological signals.

While **continuous glucose monitoring (CGM)** devices log glucose levels and insulin delivery, they often omit key lifestyle metrics critical for interpreting glycemic fluctuations. Collecting such real-world data is challenging due to technical, financial, and privacy barriers when relying on third-party tools [1, 2].



To address this gap, we developed **ExActHealth**, a **mobile application** designed for comprehensive and structured data collection. The app allows manual logging of detailed meals (name, macronutrients, time, image), tracks heart rate, steps, exercise, and sleep through **smartwatch integration**, and synchronizes data in real time with a secure private server. Its dual functionality—as a **research tool** and a lightweight food tracker—promotes better **engagement and glycemic awareness** in patients.

PILOT STUDY

While the ExActHealth system facilitates data acquisition, the objective of this study extends beyond the technical development of the platform. This work addresses the following research question:

Can an integrated mobile and wearable framework support real-world engagement and glycemic awareness in Type 1 Diabetes management?

Smartwatch Data

CGM Sensor Data

Food Logs Data

To investigate this question, we conducted a **30-day real-world pilot study** in collaboration with **Mayo Clinic Arizona**, involving **20 patients with T1D**. Participants used the ExActHealth app to **log meals**—capturing timing, portion size, and nutritional content—while the Apple Watch Series 10 passively recorded **physiological and behavioral signals** such as heart rate, activity, and sleep. **CGM data** were also collected one month before, during, and after the study to evaluate longitudinal glycemic patterns.

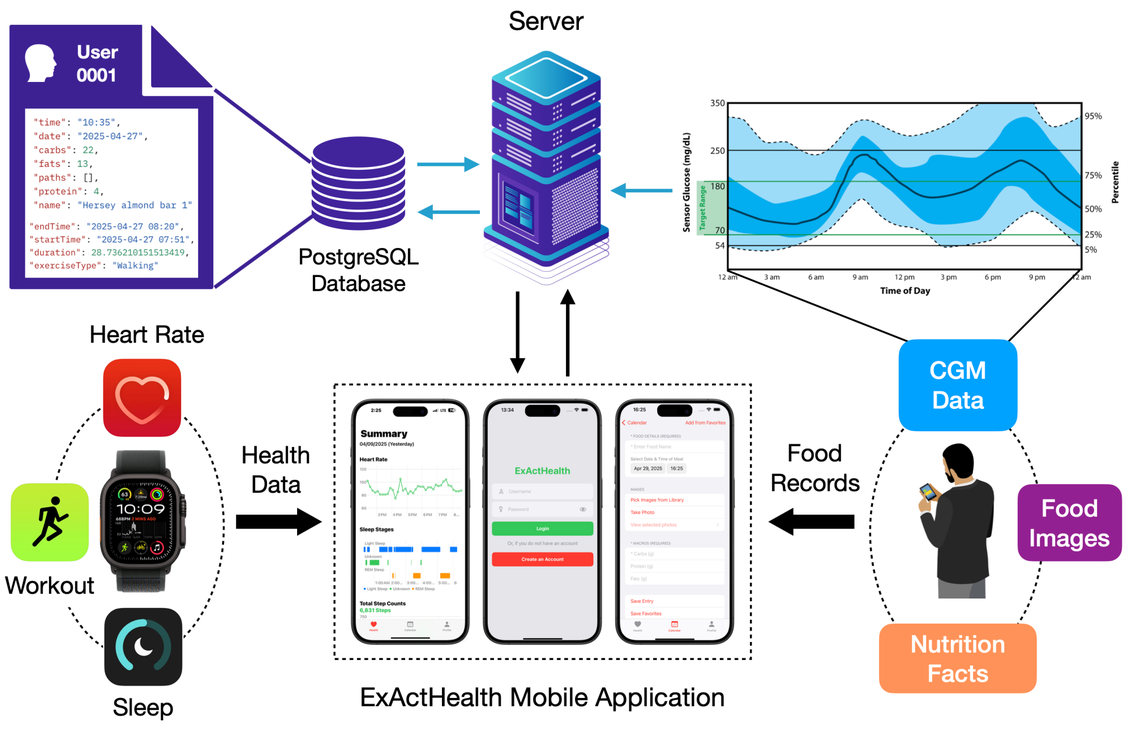


Fig. 2: Process of Data Collection Using the ExActHealth Application and Smartwatch

METHODOLOGY

The ExActHealth system comprises a smartphone interface, server API, and cloud database. Development was done natively for **Android** and **iOS**, ensuring platform-specific optimizations. The architecture follows a modular design, allowing scalable integration of new features such as real-time notifications or analytics modules. The **app automatically collects smartwatch data**—including heart rate, step count, and exercise sessions—and syncs it continuously with a secure server, where data is organized per user for researcher access.

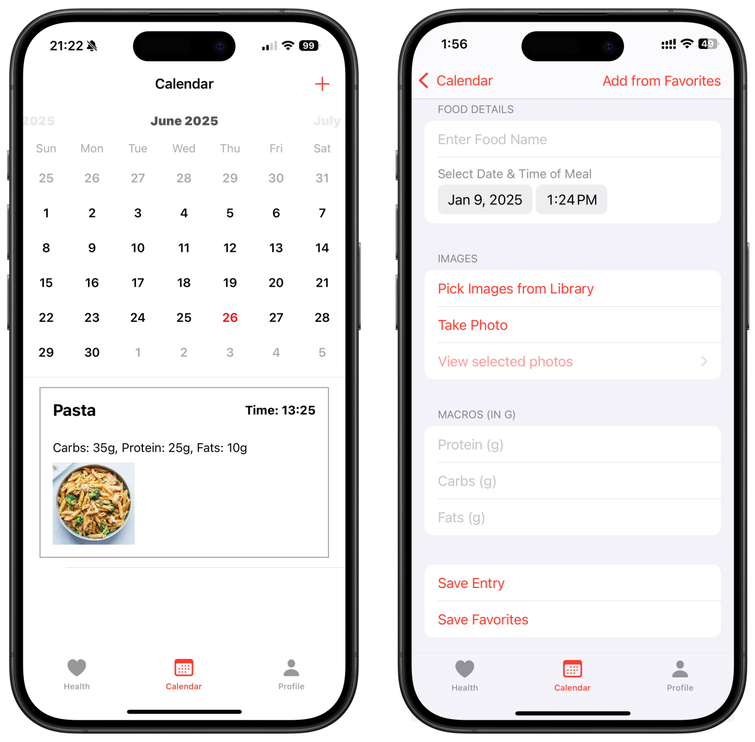


Fig. 1: ExActHealth Mobile Application Interface

RESULTS

At the end of the study, participants completed a **structured survey** evaluating **usability**, **ease of use**, and **perceived impact**.

Results showed high user satisfaction: **100% agreed the smartwatch was easy** to use and required no technical support, while **88% found the mobile app easy** to use and 94% believed most people would learn to use it quickly. Additionally, **87% felt that the smartwatch helped them manage their diabetes**, and 73% reported similar benefits from using the mobile app.

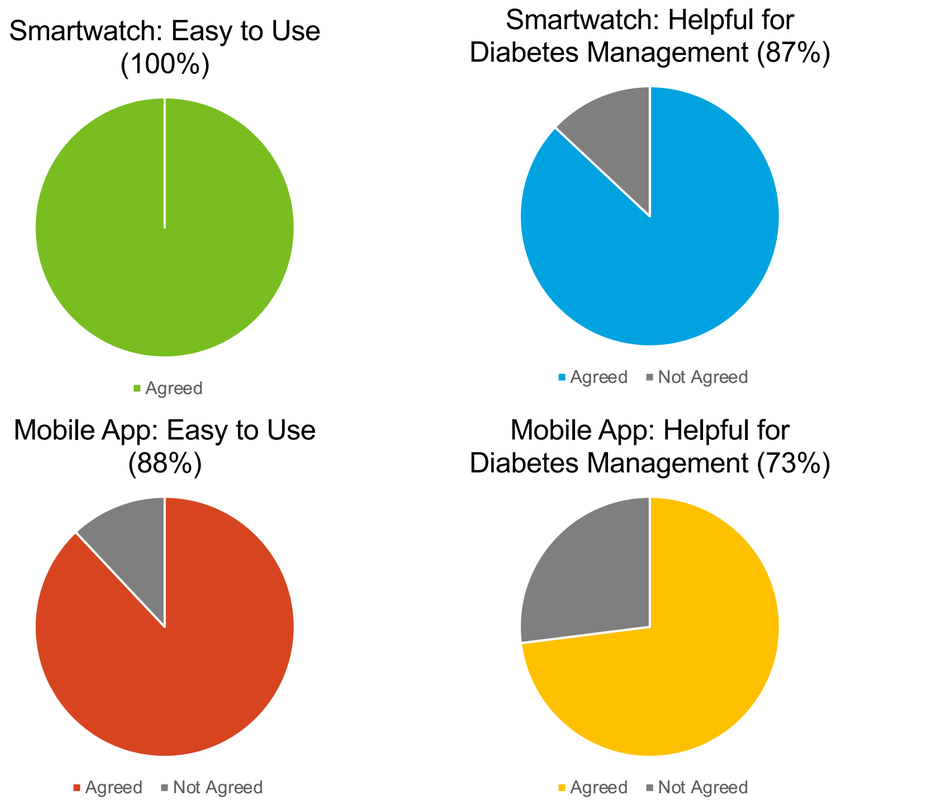


Fig. 3: Survey results showing user satisfaction with ExActHealth and smartwatch features.

These findings highlight the system's usability and its potential to support real-world behavior tracking and glycemic awareness.

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