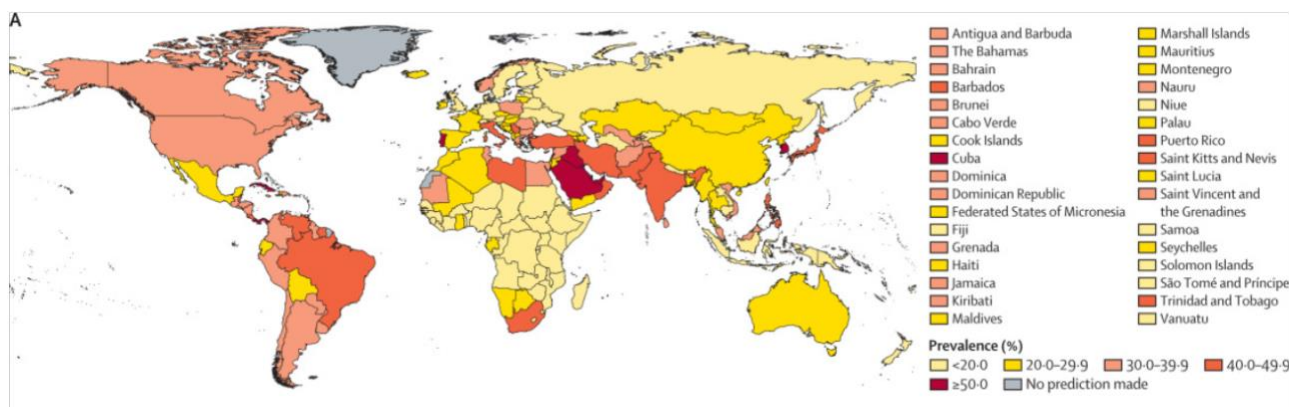


**Title: Digital Technologies for Health Promotion: Critically Examining Wearables and a
Novel Designed Intervention to Address Physical Inactivity**

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Blog 1: Empowering Steps-The Impact of Wearable Fitness Trackers in Digital Health Promotion for Physical Inactivity



Introduction

Lack of physical activity is one of the most common modifiable risk factors for non-communicable diseases (NCDs). Of all adults in the world, 1.8 billion adults or 31 per cent do not have at least 150 minutes of moderate-intensity exercise per week as advised by the WHO (World Health Organisation, 2024).

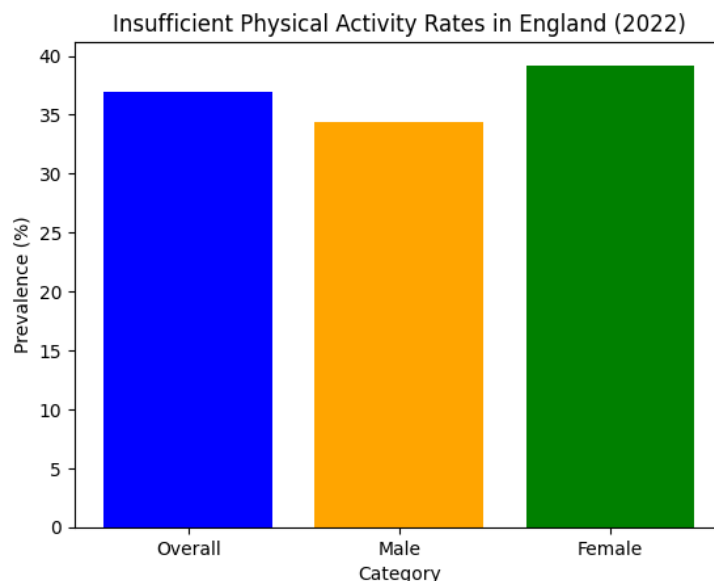


Figure: Physical Inactivity Rates (Ethnicity facts and figures, 2024)

In England, 36.9% of adults aged 16 and above are not exercising enough as recommended by WHO, which is 150 minutes of moderate-intensity activities per week (Ethnicity facts and figures,

2024). This rate is increased among women (39.2%) compared with men (34.4%), as women are less active than men by about 4.8 percentage points. This figure is a big health issue for the population.

Application of Wearable Fitness Trackers in Health Promotion

Fitbit, Garmin, or Apple Watch are examples of consumer wearables that could be used as self-observation instruments. Through sensors and accelerometers, they monitor the steps, heart rate, active minutes, and sleep and connect to smartphone apps (Wang et al., 2020). Users are provided with real-time feedback and daily goals (e.g. 10,000 steps), badges and progress reports. Most of them are intertwined with social functionality to share some success or compete with friends (Ferguson et al., 2022). Wearables are used in public health campaigns to aid intervention programs such as workplace wellness programmes or national step challenges.

Evidence of Health Promotion Impact

The reviews related to systematic reviews and meta-analyses show significant but insignificant advantages. A meta-analysis (n=1,693 healthy adults) of 12 RCTs observed the effect of wearables on physical activity (standardised mean difference [SMD] 0.449, 95% CI 0.1000.80), and steps per day (SMD 0.332) (Canali, Schiaffonati and Aliverti, 2022). A meta-analysis of several meta-analyses found that those who gained the same number of steps as an umbrella review (1,800) or of minutes per day (40) of walking, and minor decreases in body weight (1 kg) (Ferguson et al., 2022). Trackers enhanced compliance with exercise programmes in cardiometabolic populations (Ferguson et al., 2022). These impacts are consistent with behaviour change methods of self-monitoring, goal setting, and feedback, which are the key components of the COM-B model and Self-Determination Theory.

Advantages and Disadvantages of Wearable Fitness Trackers

Aspect	Advantages	Disadvantages / Shortfalls
Effectiveness	Modest increase in steps and activity (SMD ~0.3–0.6).	Short-term only; high heterogeneity in studies (Ferguson et al., 2022).
Equity	Widely available in high-income settings (Wang et al., 2020).	Exacerbates the digital divide; cost and tech barriers

Privacy	User-controlled data in some models	Risks of breaches, third-party sharing
Behaviour Change	Supports self-monitoring and feedback (Ferguson et al., 2022).	Reduce intrinsic motivation over time (Wang et al., 2020).
Scalability	Easy integration with apps	Requires smartphone; limited offline functionality

Addressing the Shortfalls

These shortfalls can be overcome by incorporating wearables into multi-component interventions and supporting them by health professionals, providing subsidies to low-income users, and enhancing data protection (e.g., designs that comply with the GDPR) (The Lancet Global Health, 2024). Devices in community programmes may be subsidised using public-private partnerships. In future designs, the focus should be on open standards, offline, and voice interfaces to provide greater accessibility (Ferguson et al., 2022). It requires policy-level measures, including national digital health strategies which contain equity audits.

References

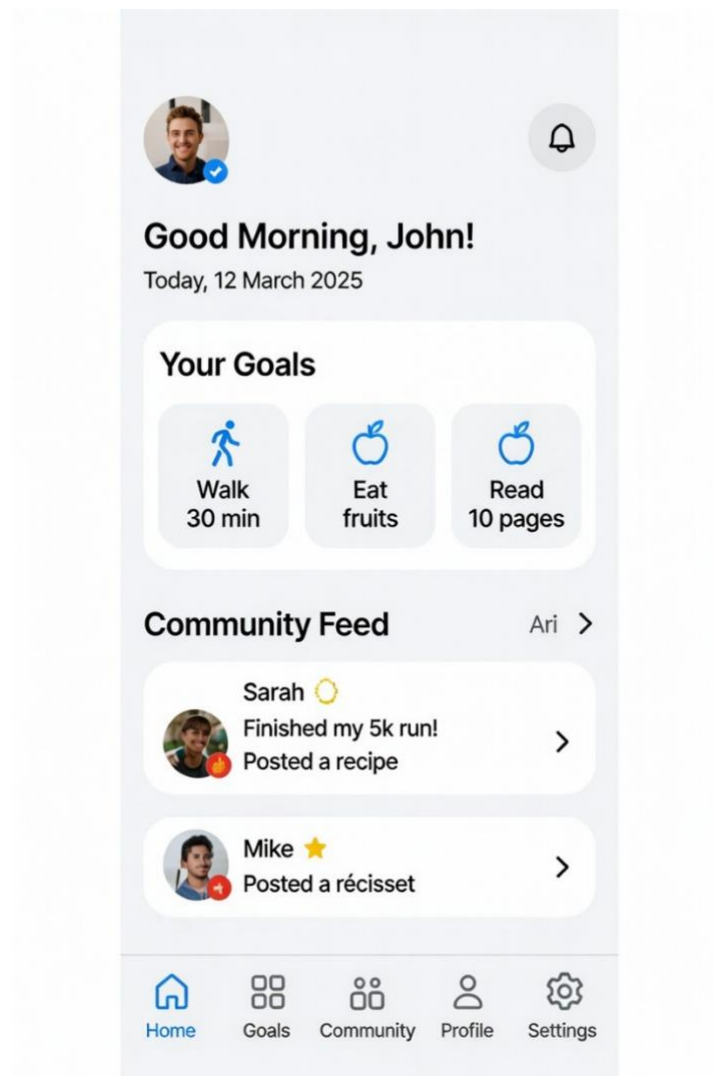
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Blog 2: ActiLink-AI-Enhanced mHealth Platform for Physical Activity Promotion

Public Health Problem

As it was described in Blog 1, the lack of physical activity is one of the most urgent issues (45.4% prevalence in 2022). Factors such as urbanisation, screen time, and a lack of safe places to visit, especially in areas such as the UK, add to the problem, making women and older adults disproportionately affected (The Lancet Global Health, 2024). This is dangerous and may result in hundreds of millions of new NCD cases by 2030 without treatment (WHO, 2024).

Designed Digital Technology



ActiLink is a hybrid mHealth platform that is designed for low and middle-income individuals. It is a free smartphone application on Android and iOS platforms with an optional low-priced wearable band costing about US \$20-30, and locally produced. The platform has AI-powered, personalised coaching that builds on Self-Determination Theory to develop autonomy, competence and relatedness, and the Transtheoretical Model of providing prompts that are commensurate with a stage. Functionality features of accessibility, such as the ability to work offline first, use of multiple regional languages, and an SMS fallback option in case of limited data access, are all key ones (D’Lima, Lorencatto and Michie, 2020). The app contains gamification elements in the form of points, levels and virtual challenges to achieve better interest, and it is enhanced with moderated community forums which connect users with local community health workers (Canali, Schiaffonati and Aliverti, 2022). Moreover, there is also an anonymised aggregated data dashboard, which is available to be used by the public health authorities to track population trends. Prompts with a stage-specific level of difficulty are given to the users each day. The app is integrated with wearable or phone sensors, dynamically sets goals, and links users to walking groups or health-worker check-ins (Deci and Ryan, 2000). In the UK, local health department integration would facilitate referral channels and agreed information exchange towards national NCD surveillance.

ActiLink compared to standard wearables

Feature	Standard Wearables	ActiLink (Designed)
Cost	US\$100–300	Free app + optional US\$20–30 band
Accessibility	English-dominant, visual (Ferguson et al., 2022)	Multilingual, voice, SMS, offline
Behaviour theory	Often implicit	Explicit SDT, Transtheoretical Model, COM-B
Community support	Optional social sharing	Moderated local + virtual groups (Wang et al., 2020)
Macro-level use	Limited	Anonymised dashboards for public health
Equity focus	Market-driven	Purpose-designed for LMICs and the digital divide (Ferguson et al., 2022)

Advantages and disadvantages of the ActiLink platform

Advantages	Disadvantages and shortfalls
Offline/voice/SMS features and low cost overcome digital divides in LMICs	Potential AI bias from underrepresented training data
COM-B and Self-Determination Theory enhance sustained motivation (Wang et al., 2020)	Privacy concerns in shared-device households (Ferguson et al., 2022)
Community forums and data dashboard link individual and population levels	Requires a basic phone and occasional internet
Gamification and social support improve adherence and reduce dropout	Needs rigorous long-term RCTs for effectiveness (The Lancet Global Health, 2024)

The shortfalls may be resolved by co-designing with end-users and community health workers to reduce bias, open-source algorithms, transparent user-controllable data policies, and collaborating with the government and non-governmental organisations to offer subsidies on devices and training (Ferguson et al., 2022). It will produce strong evidence from pilot RCTs.

ActiLink demonstrates that digital health can be built to break the constraints of existing tools without contradiction to health-promotion values of equity and empowerment (Wang et al., 2020). Since it is based on proven behavioural theories and focuses on being accessible, it provides a model that can be scaled to decrease the prevalence of physical inactivity in high-burden areas.

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