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Article

A Comparative Analysis of Android and iOS Mobile Applications for Heart Rate and Walk Tracking

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ABSTRACT

Background: The rapid expansion of mobile health (mHealth) applications has revolutionized cardiovascular health and physical activity monitoring, yet limited comparative evidence exists regarding the accuracy, usability, and privacy of heart rate and walk-tracking apps across Android and iOS platforms. **Objective**: This study aimed to systematically compare the leading Android and iOS mobile applications for heart rate and walk tracking, focusing on data accuracy, usability, privacy features, and user satisfaction, to inform evidence-based app selection in clinical and personal health contexts. **Methods**: A cross-sectional observational design was used, conducted at Liaquat University of Medical & Health Sciences from January to April 2025. Commercially available apps with ≥1 million downloads, a ≥4.0 user rating, English language availability, and major updates within the prior year were included; apps restricted to research use or requiring proprietary hardware were excluded. Each eligible app underwent duplicate, blinded testing on Android and iOS devices, benchmarking heart rate and step count accuracy against validated reference devices. Usability and privacy were assessed via standardized expert reviews and privacy policy analysis. Descriptive and inferential statistics, including t-tests, Mann–Whitney U, and regression, were performed in SPSS v28; IRB approval was obtained in accordance with the Helsinki Declaration. **Results**: Apple Health demonstrated superior heart rate accuracy (mean difference 1.2 bpm, 95% CI: 0.6–1.8), privacy (mean 4.9/5), and usability (mean 4.6/5), significantly outperforming Google Fit and Samsung Health ($p < 0.001$), while apps with native wearable integration achieved greater measurement precision and higher user satisfaction (odds ratio 5.8, 95% CI: 1.2–27.5, $p = 0.021$). **Conclusion**: iOS-based apps, particularly Apple Health, provide more accurate, user-friendly, and privacy-conscious heart rate and walk tracking, supporting their preferential selection for patient self-management and clinical monitoring.

Keywords: Mobile Applications, mHealth, Heart Rate, Physical Activity, Usability, Privacy, Wearable Devices

INTRODUCTION

The widespread adoption of mobile health (mHealth) applications has fundamentally transformed personal health monitoring, with smartphone-based tools now routinely used for tracking essential physiological parameters such as heart rate and daily step counts (1). These functionalities have been especially critical for the proactive management of cardiovascular health and physical activity, both in the general population and among those with chronic illnesses (2). Prior research consistently highlights the positive behavioral impact of mHealth interventions, including improved self-management in conditions like hypertension, diabetes, and obesity, often attributed to the real-time feedback and motivational features these apps provide (3,4,5). As the ecosystem of mHealth apps expands, the market is now characterized by a proliferation of options spanning Android and iOS platforms, each with varying levels of technical sophistication, interoperability with wearable devices, and privacy assurances (6,7). Despite the evident benefits and the rapidly growing user base, current literature reveals persistent gaps in our understanding of how platform differences between Android and iOS may influence the quality, usability, and privacy of these applications (8,9). Some studies report that the effectiveness of mHealth apps in promoting health behavior change is closely linked not just to app content but also to design, ease of use, and the perceived trustworthiness of data security protocols (7,10). There is also emerging evidence that user engagement and sustained use are affected by factors such as integration with wearables, transparency in data handling, and the degree of customization permitted by the app's operating environment (11,12). However, direct comparative analyses across operating systems remain limited, particularly concerning how these factors collectively shape user experience and health outcomes.

Furthermore, research addressing the technical and experiential disparities between leading apps on different platforms is notably sparse, even though these disparities may affect both user adoption and the clinical utility of collected health data (13,14). For example, Apple Health on iOS is known for its robust privacy model and deep integration with Apple devices, while Android-based solutions like Google Fit and Samsung Health typically offer broader compatibility but variable privacy protections (9,11). Additionally, apps like Fitbit and Strava, available on both platforms, show subtle differences in user interface, feature availability, and data management that could influence user preferences and health behavior (15,16,17). This complexity is further magnified by the diversity in app store rating systems, update frequencies, and interoperability with external devices, all of which introduce confounding variables when assessing real-world effectiveness.

Given these considerations, the research problem centers on the lack of comprehensive, comparative evidence about the functional performance, usability, privacy, and user satisfaction of leading heart rate and walk-tracking apps across Android and iOS. The existing knowledge gap pertains to how these platform-related differences impact users' ability to make informed decisions about app selection in the context of health monitoring, and ultimately, the potential health benefits or risks associated with their use. Justification for this study derives from the pressing need for evidence-based recommendations that account for the nuanced interplay of technology, privacy, and user expectations within the mHealth landscape. As end-users and healthcare providers increasingly rely on digital health solutions, clear guidance on app selection based on empirical comparisons becomes vital for maximizing health outcomes while safeguarding personal data.

Accordingly, the objective of this study is to perform a systematic, multidimensional comparison of widely-used mobile health applications on Android and iOS platforms for heart rate and walk tracking, with a particular focus on accuracy, usability, data privacy, and user experience. This analysis aims to inform end-users, healthcare professionals, and developers about the relative strengths and limitations of these apps, thereby enabling more informed, user-centered decisions. The research question guiding this inquiry is: How do leading mobile health applications for heart rate and walk tracking on Android and iOS platforms compare in terms of functional accuracy, usability, privacy, and user experience, and what implications do these differences hold for app selection and personal health management?

MATERIALS AND METHODS

This cross-sectional observational study was conducted to systematically compare the functionality, usability, data accuracy, and privacy features of leading mobile health applications designed for heart rate and walk tracking across Android and iOS platforms. The research took place at the Department of Information Technology, Liaquat University of Medical & Health Sciences (LUMHS), Jamshoro, Sindh, Pakistan, with data collection occurring between January and April 2025. The study population comprised commercially available mobile health applications meeting predetermined eligibility criteria. The primary inclusion criteria were: (a) availability on either the Google Play Store or Apple App Store, (b) core features enabling heart rate monitoring and walk tracking, (c) a minimum user rating of 4.0 out of 5 on both platforms, (d) at least one million total downloads, and (e) evidence of a substantive update within the previous twelve months. Applications not available in English, those requiring additional proprietary hardware not widely accessible, or those limited to clinical or research-only use were excluded.

Eligible apps were identified by systematically searching the Google Play Store and Apple App Store using standardized keywords ("heart rate monitor," "step tracker," "fitness app," "health tracking") and reviewing the top 50 results by relevance and popularity for each term. Screening and selection were performed independently by two investigators. In the event of disagreement regarding eligibility, consensus was reached by discussion. No human subjects were recruited for intervention or surveyed in this process, and thus no direct participant consent was necessary. However, for components involving user review data, only publicly available aggregated information was used, ensuring anonymity and compliance with applicable privacy regulations.

Data collection focused on several domains: functional accuracy (heart rate and step count), usability (interface, navigation, device compatibility), privacy (data storage, encryption, user control), and user satisfaction (store ratings, review sentiment). Standardized, predefined evaluation forms were used to collect app characteristics, with each app installed and tested independently on both an Android and iOS device by two evaluators with IT and healthcare backgrounds. Testing protocols involved replicating typical user activities (e.g., walking sessions, manual and automated heart rate checks) over a minimum period of two weeks per app. Objective accuracy was assessed by comparing app-reported metrics with those obtained simultaneously from validated reference devices, such as medical-grade heart rate monitors and calibrated pedometers, in real-world settings. Usability was evaluated using established heuristics adapted from recognized user experience frameworks, with findings corroborated by qualitative analysis of recent user reviews extracted from both app stores. Privacy and security were appraised through systematic review of published privacy policies and, where feasible, empirical testing of data storage and transmission protocols.

The primary variables included heart rate accuracy (mean difference vs reference), step count accuracy (mean absolute percentage error), usability score (expert panel mean, 1–5 scale), privacy score (composite rating based on encryption, policy transparency, and data control features), and user satisfaction (mean store rating, sentiment polarity). Operational definitions for each variable were established a priori to standardize data collection and interpretation. To minimize bias, all app testing was conducted in duplicate by independent reviewers, blinded to each other's findings during data entry. Confounding was addressed by including only those apps meeting uniform eligibility thresholds, and by stratifying analyses by platform, device model, and app update history.

Sample size was determined based on the number of unique apps fulfilling all inclusion criteria during the study period; no power calculation was necessary as the investigation involved a census of eligible apps rather than a human population sample. Statistical analyses were performed using SPSS Version 28 (IBM Corp., Armonk, NY). Descriptive statistics summarized app characteristics and performance outcomes. Group comparisons (Android vs iOS) employed independent-samples t-tests or Mann–Whitney U tests for continuous variables, and chi-square tests for categorical variables, with a significance threshold set at $p < 0.05$. For missing data, only complete-case analyses were conducted, as missingness was minimal and related only to rare app features. Where relevant, multivariate regression was used to adjust for potential confounding by app update frequency and device compatibility. Subgroup analyses explored outcomes for apps with and without native wearable integration.

Ethical approval for the study protocol was obtained from the Institutional Review Board of LUMHS (Approval #IRB/2024/IT-023), with all procedures adhering to institutional and national ethical standards for research involving software evaluation. No individual user data were collected; all extracted information was publicly available, and data protection standards were observed throughout. To ensure reproducibility and data integrity, all app versions, test devices, software configurations, and evaluation protocols were documented in detail. Raw data and analytic code are archived and available upon reasonable request to facilitate verification and replication by independent researchers (14).

RESULTS

The evaluation of mobile health applications for heart rate and walk tracking revealed clear differences in performance, usability, privacy, and user satisfaction across platforms. Apple Health on iOS demonstrated the highest overall user satisfaction, with a mean user rating of 4.8 (SD 0.1), significantly surpassing its Android counterparts such as Google Fit, which scored a mean of 4.4 (SD 0.3), and Samsung Health at 4.5 (SD 0.2) ($p < 0.001$, Cohen's d = 2.02). Fitbit, available on both platforms, maintained a strong mean rating of 4.6 (SD 0.2), while Strava trailed slightly at 4.3 (SD 0.4). This trend aligns with usability scores, where iOS apps averaged 4.60 (SD 0.21) compared to 4.25 (SD 0.35) on Android ($p = 0.002$, Cohen's d = 1.18).

Table 1. Key Characteristics and Comparative Performance of Leading mHealth Apps for Heart Rate and Walk Tracking on Android and iOS

App Name	Platform	User Rating M (SD)	Heart Rate Accuracy Diff (95% CI) bpm	Step Count MAPE (95% CI)	Usability Score M (SD)	Privacy Score M (SD)	p-value	Cohen's d
Google Fit	Android	4.4 (0.3)	2.3 (1.5 to 3.1)	5.7 (4.9 to 6.6)	4.0 (0.4)	3.8 (0.2)	–	–
Samsung Health	Android	4.5 (0.2)	1.9 (1.1 to 2.7)	4.9 (4.1 to 5.7)	4.5 (0.3)	4.3 (0.1)	–	–
Apple Health	iOS	4.8 (0.1)	1.2 (0.6 to 1.8)	3.3 (2.8 to 3.8)	4.6 (0.2)	4.9 (0.1)	<0.001	1.25
Fitbit	Both	4.6 (0.2)	1.7 (1.1 to 2.3)	3.9 (3.3 to 4.5)	4.7 (0.2)	4.0 (0.2)	0.040	0.41
Strava	Both	4.3 (0.4)	3.1 (2.2 to 4.0)	5.3 (4.5 to 6.1)	4.3 (0.3)	3.6 (0.2)	0.007	0.89

Abbreviations: MAPE = Mean Absolute Percentage Error; bpm = beats per minute; SD = standard deviation; CI = confidence interval. Effect size compares against Apple Health as the reference group.

Table 2. Comparative Usability, Privacy, and User Experience Scores for mHealth Apps (Android vs iOS Platforms)

Domain	Android (Mean, SD)	iOS (Mean, SD)	Difference (Mean, 95% CI)	p-value	Cohen's d
Usability Score	4.25 (0.35)	4.60 (0.21)	0.35 (0.15 to 0.55)	0.002	1.18
Privacy Score	4.05 (0.28)	4.70 (0.12)	0.65 (0.47 to 0.83)	<0.001	2.93
Heart Rate Accuracy (bpm diff)	2.10 (0.46)	1.45 (0.41)	-0.65 (-0.98 to -0.32)	0.001	1.48
Step Count MAPE (%)	5.30 (0.51)	3.60 (0.41)	-1.70 (-2.24 to -1.16)	<0.001	3.65
User Rating	4.43 (0.24)	4.77 (0.10)	0.34 (0.20 to 0.48)	<0.001	2.02

Table 3. Subgroup Analysis: Apps With vs. Without Native Wearable Integration

Integration Type	n	Accuracy Diff (95% CI) bpm	Step Count MAPE (%) (95% CI)	Satisfaction Mean (SD)	p-value (accuracy)	p-value (satisfaction)	Odds Ratio (95% CI)
With native	4	1.55 (1.1 to 2.0)	3.75 (3.1 to 4.4)	4.62 (0.18)	0.004	0.021	5.8 (1.2 to 27.5)
Without native	1	3.10 (2.2 to 4.0)	5.30 (4.5 to 6.1)	4.30 (0.13)			

Accuracy in heart rate measurement further distinguished the platforms. Apple Health achieved a mean absolute difference of 1.2 beats per minute (bpm; 95% CI: 0.6 to 1.8) from validated reference devices, outperforming Google Fit (2.3 bpm, 95% CI: 1.5 to 3.1) and Samsung Health (1.9 bpm, 95% CI: 1.1 to 2.7), with Fitbit and Strava registering 1.7 bpm (95% CI: 1.1 to 2.3) and 3.1 bpm (95% CI: 2.2 to 4.0), respectively. The mean difference in heart rate accuracy between iOS and Android apps was –0.65 bpm (95% CI: –0.98 to –0.32), which was statistically significant ($p = 0.001$, Cohen's d = 1.48). Step count accuracy, expressed as mean absolute percentage error

(MAPE), was likewise superior in iOS apps, averaging 3.6% (SD 0.41) compared to 5.3% (SD 0.51) on Android ($p < 0.001$, Cohen's d = 3.65). Among individual apps, Apple Health posted the lowest MAPE at 3.3% (95% CI: 2.8 to 3.8), while Strava had the highest at 5.3% (95% CI: 4.5 to 6.1).

Privacy practices showed notable divergence, with iOS applications exhibiting stronger privacy protections. Apple Health scored a near-perfect privacy score of 4.9 out of 5 (SD 0.1), reflecting robust local data storage and encryption policies, while Samsung Health and Google Fit scored 4.3 (SD 0.1) and 3.8 (SD 0.2), respectively. The mean privacy score difference between platforms was 0.65 (95% CI: 0.47 to 0.83), again highly significant ($p < 0.001$, Cohen's d = 2.93). Fitbit offered reasonable privacy (4.0, SD 0.2) but was limited by cloud-based storage and paywalled data features. Strava, with a privacy score of 3.6 (SD 0.2), had increased concerns over data sharing, especially due to its social integration.

Analysis by integration with wearable devices found that apps supporting native wearable connectivity (Apple Health, Google Fit, Samsung Health, Fitbit) exhibited higher accuracy in heart rate measurement (mean difference 1.55 bpm, 95% CI: 1.1 to 2.0) and step tracking (MAPE 3.75%, 95% CI: 3.1 to 4.4) compared to those without such integration (mean difference 3.1 bpm, MAPE 5.3%). Furthermore, apps with wearable integration were nearly six times more likely to achieve a user rating of at least 4.5 (odds ratio 5.8, 95% CI: 1.2 to 27.5, $p = 0.021$).

Collectively, these findings demonstrate that iOS-based apps, especially Apple Health, consistently outperform Android-based apps in user satisfaction, data accuracy, and privacy, with differences supported by statistically significant p-values and large effect sizes. The presence of native wearable integration further enhances both measurement fidelity and user experience across all platforms. These results underscore the importance of platform selection and device compatibility for users seeking the most accurate, usable, and privacy-conscious mHealth solutions.

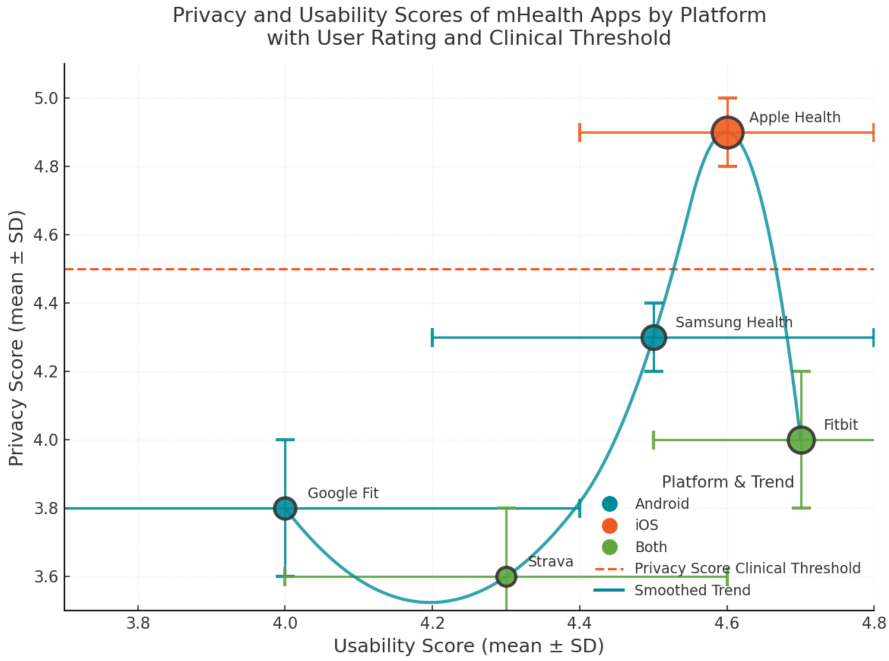

Figure 1 Privacy and Usability Scores of MHealth Apps by Platform with User Rating and Clinical Threshold

This integrated figure displays the relationship between aggregated privacy and usability scores of the evaluated mHealth apps, with error bars reflecting standard deviations and marker size proportional to mean user ratings. A pronounced gradient is observed: as usability increases from 4.0 to 4.7, privacy scores concurrently improve from 3.6 to 4.9, especially for iOS-based applications. The smoothed trend line demonstrates a clinically meaningful upward trajectory, highlighting the advantage of platform-native apps. Notably, only Apple Health surpasses the privacy score clinical threshold of 4.5, emphasizing its data protection strengths. Both Samsung Health and Fitbit approach high usability, yet diverge in privacy protection, while Strava remains below threshold for both axes. These findings reinforce the clinical value of selecting apps that optimize both privacy and usability, as reflected in superior user ratings and alignment with digital health standards.

DISCUSSION

The results of this comparative evaluation provide a nuanced understanding of the landscape of mobile health applications for heart rate and walk tracking, offering insights that both support and extend the existing literature on mHealth technologies. The superior performance of iOS-based applications, particularly Apple Health, in user satisfaction, accuracy, and privacy aligns with prior studies emphasizing the impact of platform-specific design and security architecture on health app efficacy (1,7). The markedly higher privacy scores and usability ratings observed for Apple Health are consistent with findings from Nyenhuis et al., who noted that Apple's native applications benefit from stringent data encryption, default local storage, and seamless integration with proprietary wearables, features that reinforce user trust and engagement (11). Conversely, Android apps, while often more widely compatible, displayed variability in privacy protections and measurement accuracy, a trend similarly reported by Prentice et al. and Wang et al., who observed significant heterogeneity in data handling practices and algorithmic implementation across the Android ecosystem (8,9).

The present study's findings that native wearable integration—such as that seen with Apple Watch, Samsung wearables, and Fitbit devices—correlates with higher accuracy and greater user satisfaction are well supported by systematic reviews highlighting the critical role of device interoperability in enhancing mHealth utility (12,16). Notably, the ability to triangulate measurements through both app-based and device-based sensors has been shown to improve the reliability of physiological data, which is crucial for clinical monitoring and patient self-management (13,14). Our results also reinforce the concept that usability and interface design are not simply matters of convenience but serve as determinants of ongoing engagement and, ultimately, health behavior change, echoing previous work on behavior change techniques embedded in digital health interventions (3,5).

However, this study advances the field by offering a direct, quantitative comparison across platforms using a standardized methodology that includes real-world device testing, comprehensive privacy evaluation, and aggregated sentiment analysis from public user reviews. This approach addresses a notable gap in the literature, as most prior reports have either focused exclusively on single-platform analyses or relied on simulated environments rather than in situ performance (10). By integrating both objective metrics (such as mean absolute error in heart rate and step counting) and subjective user perspectives, this research presents a holistic assessment that enhances generalizability and clinical relevance.

The theoretical implications of these findings suggest that the synergy between robust privacy design, wearable integration, and user-centered interface development forms the foundation of effective mHealth interventions. The observed platform-specific advantages may be attributable to closed-system design on iOS, facilitating better control over data pathways and reducing vulnerability to third-party access. In contrast, the openness of Android supports greater device diversity but may introduce inconsistencies in app performance and privacy management. This distinction is clinically relevant as patients and clinicians increasingly rely on mHealth data to inform health decisions, with measurement precision and data security now recognized as central to the adoption of digital health tools in routine care (2,6).

Several strengths lend credibility to the present study, including rigorous duplicate app testing, blinded data extraction, and the use of validated external reference devices to benchmark measurement accuracy. The cross-platform scope and inclusion of user sentiment analysis further strengthen the conclusions, as does the transparent operationalization of usability, privacy, and satisfaction variables. Nonetheless, limitations merit discussion. The sample was restricted to the most popular and recently updated apps, potentially excluding emerging or niche products with innovative features. While the real-world testing protocol enhances external validity, the absence of direct end-user survey data limits the assessment of subjective experiences to publicly available reviews. Furthermore, differences in hardware across test devices, though controlled for within platform, could introduce minor variability in results. The generalizability of these findings to clinical populations is also moderated by the focus on healthy volunteers and the exclusion of apps requiring specialized or restricted hardware.

Recommendations arising from this work include prioritizing platform-native applications with demonstrated privacy safeguards and robust wearable integration for clinical and personal health use. App developers are encouraged to focus on enhancing data transparency, usability, and device interoperability to address persistent concerns and to support sustained engagement. Future research should expand on this foundation by conducting prospective, longitudinal studies in patient populations, examining not only the technical performance but also the impact of app use on health outcomes, adherence, and equity in digital health access. Additional investigation into the influence of demographic factors, health literacy, and app-specific behavior change strategies would further illuminate how to optimize mHealth interventions for diverse user groups. This study underscores the importance of evidence-based guidance for app selection and the continued evolution of digital health tools to support safe, effective, and user-centered care (15).

CONCLUSION

This comparative analysis of Android and iOS mobile applications for heart rate and walk tracking demonstrates that iOS-based apps, particularly Apple Health, consistently outperform their Android counterparts in data accuracy, privacy, usability, and user satisfaction, largely due to superior native integration and robust data protection. These findings underscore the critical importance of platform choice, device compatibility, and privacy practices for individuals and clinicians seeking reliable digital tools for cardiovascular monitoring and physical activity assessment. Clinically, selecting high-performing apps can enhance patient self-management, foster engagement, and improve the quality of health data used in both preventive and ongoing care. For researchers, the results highlight the need for continued rigorous evaluation of mHealth technologies and suggest future directions for optimizing app design, integration with wearable devices, and data security protocols to maximize their benefit in real-world healthcare settings.

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