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Effects of Step Count Monitoring Smartphone Health App in Promoting Walking Behaviour among the Young Adults

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ABSTRACT

Objectives: Physical inactivity poses a significant global health threat, particularly among young adults, contributing to conditions like obesity, cardiovascular disease, and metabolic disorders. Mobile health apps such as Google Fit (GFSH) aim to combat this issue through features like step tracking, reminders, and feedback. This study evaluates GFSH's efficacy in promoting walking and reducing sedentary time among 18-26-year-olds, assessing both mental and physical outcomes and user engagement.

Methodology: The study utilized a five-week, two-time-point longitudinal design with 61 participants in each group: an intervention group using GFSH and a control group following general physical activity guidelines. Criteria included owning a compatible smartphone and being within the specified age range; participants with incompatible devices or app issues were excluded. Physical activity data, including daily steps and app interaction, were collected. The intervention followed the COM-B model, emphasizing goal setting, progress tracking, and inactivity alerts. Statistical analyses (ANOVA, Expectation Maximization) compared group differences.

Results: Among 136 participants (56.6% male, 43.4% female; mean age = 22.4 ± 2.31 years), both groups showed increased physical activity. The GFSH group saw greater step count improvement (+2436 steps vs. +1209 steps). While between-group differences were not significant ($P = 0.15$), within-group improvements were notable (GFSH: $P < 0.001$; Control: $P = 0.009$), suggesting positive impacts of the app.

Conclusion: GFSH shows promise in enhancing physical activity levels among young adults, yet further research with longer durations and enhanced engagement strategies is necessary to affirm sustained effects on sedentary behaviour and physical activity patterns.

Keywords: mHealth; physical activity; mobile phone app; intervention; health behaviour change; feasibility study

Introduction

Physical inactivity and sedentary lifestyles are among the major contributors to global health issues. Increasing rates of indolence have led to a rise in non-communicable diseases (NCDs) and deteriorating overall health [1]. In the United States, for example, one-third of adults are physically inactive, contributing significantly to obesity and chronic illnesses [2]. Inactive lifestyles lead to reduced quality of life, increased healthcare costs, and prolonged medical care needs. The World Health Organization (WHO) recommends adults aged 18–64 engage in at least 150–300 minutes of moderate-intensity, or 75–150 minutes of vigorous-intensity physical activity weekly. Yet, global adherence to these recommendations remains low. In Saudi Arabia, rapid urbanization has contributed to high levels of physical inactivity, with 58.5% of adults considered inactive—52.1% of men and 67.7% of women [3]. Additionally, 24.7% of adults in the Kingdom are classified as obese, underscoring a growing public health crisis [4]. These trends have contributed to the rise in NCDs such as cardiovascular disease, type 2 diabetes, and obesity—conditions that account for considerable morbidity and mortality in the region. Globally, physical inactivity is responsible for an estimated 5.2 million deaths annually, accounting for 6–10% of all major NCDs [5]. It also incurs significant economic costs—approximately €80.4 billion annually across 28 countries—and is linked to lower fitness levels, poor mental health, and increased healthcare burden. In the United States alone, healthcare costs related to inactivity are estimated at $117 billion per year, contributing to roughly 10% of premature deaths [6].

Amid these concerns, smartphone technology has emerged as a novel approach to addressing physical inactivity. Mobile health (mHealth) applications have shown potential to positively influence health behaviour, especially physical activity. These apps are widely accessible, cost-effective, and feature functionalities like GPS, accelerometers, and real-time feedback. For instance, the GFSH App allows users to track steps, calories burned, and time spent being active, providing an engaging and convenient tool to encourage movement. This is particularly relevant in targeting sedentary behaviour, a known risk factor for obesity, cardiovascular diseases, and type 2 diabetes [7]. Young adults aged 18–26 are especially vulnerable to sedentary lifestyles due to academic pressures, employment demands, and increased use of digital devices [8]. This phase of life, characterized by a marked decline in physical activity, presents a critical opportunity for behavioural intervention. Given the widespread smartphone usage in this demographic, mHealth apps like GFSH offer a promising solution.

Several studies have highlighted the effectiveness of such apps. For example, a pilot study by Walsh et al. (2016) showed that the Accupedo-Pro pedometer app significantly increased daily step counts in young adults—by approximately 2,300 steps per day compared to control groups [9]. Similarly, Pradal-Cano et al. (2020) reported that step-tracking apps had a positive effect on physical activity and sedentary behaviour in different populations [10]. Despite this, there is limited research on the statistical relationship between the GFSH App and walking behaviour in young adults, particularly within the Saudi Arabian context. Therefore, this study aims to assess the effectiveness of a step count monitoring smartphone health application (GFSH App) in promoting walking behaviour among young adults in Saudi Arabia. By investigating this intervention, the research hopes to provide insights into how mHealth technologies can support sustainable increases in physical activity and combat sedentary behaviour in this high-risk group. The objectives of this study are to deduce whether the GFSH App's step-tracking feature significantly increases daily step counts among young adults. To evaluate the impact of GFSH

App's inactivity alerts on reducing sedentary time. To assess how features such as setting goal, reminders, and progress tracking influence users' motivation and engagement with physical activity. To investigate the potential of the GFSH App as a sustainable digital intervention for long-term improvement in walking behaviour among young adults. The study aims to ascertain the efficiency of a step-count monitoring smartphone health application, GFSH App, in promoting walking behavior and reducing sedentary time among young adults aged 18–26 years, and to determine whether the app's behavioral features can support sustained physical activity and long-term lifestyle changes.

The literature reveals that physical activity is significant to young adults' well-being and health. According to the study by Anderson and Durstine (2019), the sedentary population can get more than 20 kinds of chronic diseases, such as cancer, diabetes, and coronary heart disease [11]. Recent evidence suggests that these patterns will probably continue into adulthood in cases where PA has been repeatedly established in childhood. According to Bailey et al. (2022), 40 percent of the students are physically inactive, while 12-34 percent of the population meets the PA guidelines [12]. Therefore, becoming a cause of obesity in the US, as observed at 40.3% between 2021 and 2023. In addition, according to Robinson et al. (2020), being overweight may also produce some adverse outcomes in the form of emotional and social conflicts, such as stigmatization, stagnation, and low educational achievement [13]. WHO (2024) indicates that only 20% of teenagers and youngsters engage in the required health-enhancing physical activity, which should be at minimum of 150 minutes of moderate activity or 75 minutes of vigorous activity every week [5]. This trend is especially notable in developed nations, where increased screen time and sedentary lifestyles have become more prevalent. Warren et al. (2010) found that 42% of youngster aged 18–29 spend over 10 hours of their daily routine in sedentary behaviours, contributing to a higher risk of chronic diseases, including cardiovascular diseases, obesity, and type 2 diabetes [14].

Inactivity has an assortment of effects on the human body and human life. Apart from bodily harm, it is directly related to mental health conditions such as depression, anxiety, and stress. Other behavioural health concerns include Physical inactivity among young adults under 25, which impairs their academic achievement and causes falling workplace efficiency, making it a massive social and economic concern [7]. Therefore, there is a great need for interventions in the physical activity of young adults to address these chronic health effects and enhance the life fitness of these young people.

Due to advanced mobile technology, many mHealth applications bring innovations and a new approach to supporting PA, notably walking [15]. Applications like Fitbit, Strava, and MyFitnessPal have become favoured because of their simplicity, availability, and real-time display of users' activity levels. These apps enable behavior modification by step counts, setting daily goals, providing GPA-fit feedback, and social connectedness to make users more active. A recent systematic review and meta-analysis by Muthusamy et al. (2024) further corroborates these findings, indicating that accumulated daily step counts, facilitated by tools like smartphone apps, are positively associated with improved physical fitness and reduced sedentary behavior across diverse populations [16]. According to a study conducted by

Mönninghoff et al. (2021), it was investigated that mHealth interventions help in increasing physical activity [17]. The author synthesized 27 studies that demonstrated that app users could improve their daily physical activity measured as the number of steps by 1700 steps, proving that fitness apps are a helpful tool in encouraging more walking. Batchelder, Devoto, and Washington (2024) found that participants whose daily step count was monitored through Fitbit for six weeks had an increase of twenty-five percent of their average step count, some of whom gained an additional 2,500 steps a day [18]. Besides promoting the number of steps, these Apps can also minimize sedentary time. Schroé et al. (2020) identified that mHealth interventions reduce sedentary behavior by 15% within eight weeks. This reduction was especially apparent among those who spent extended periods sitting during work or study [19]. These results are like those of Bell et al. (2022), who established that appealing fitness apps equipped with inactivity alerts, such as standing up after sitting for too long, significantly decreased sedentary time [20].

The behaviour change approach that most mHealth apps employ in encouraging walking and other forms of physical activity is goal setting. Research shows that specific, measurable goals are crucial for enhancing motivation and helping individuals adhere to exercise routines [21]. Swann et al. (2020) concluded that individuals who set specific walking goals, for example 10,000 steps per day, were more likely to achieve their targets than those who set vague or no goals [22]. More so, results showed that the odds of achieving the daily step target by individuals who adopted the fitness apps with goal-setting features were 20% higher than other users. In addition, feedback should not be missing from a physical activity intervention. Kramer et al. (2020) noted that users who received feedback, such as notifications about their daily or weekly progress or prompts to start walking, were likelier to reach their walking goals [23]. The benefits of using apps such as Fitbit and Strava and receiving feedback on the screen instantly maintain high levels of physical activity, as you cannot help but stick to the desired steps or even increase the number of daily steps. This supports feedback mechanisms regarding how it increases user commitment to walking behavior. Most mHealth apps use setting goals to motivate users to walk and engage in physical activity. Effective research confirms that people achieve better exercise compliance and are more effective when establishing precise exercise targets. Research on mHealth apps, particularly GFSH App, is lacking in understanding its long-term effectiveness. Initially, fitness apps show results, but users often stop using them. It's unclear whether GFSH App will help users maintain increased activity levels and decreased sitting time over time. The effects of key features like creating exercise goals, sending alerts, and notifying users about inactivity on Saudi Arabian young adults' physical activity levels are not yet thoroughly investigated. The effectiveness of reminders for extended periods of inactivity is also not well-documented. Currently, there's insufficient data to determine if GFSH App improves walking habits or lowers inactivity levels.

Methodology

This study employed a two-arm, parallel-group, longitudinal quasi-experimental approach conducted throughout five weeks. This study has been approved by Research Ethics committee of Majmaah University with the approval number MUREC-Oct 12/CON|-2023/30-

6 (H-01-R-088). The data has been collected from 12 October 2023 to 12 October 2024. Study participants has been grouped into an experimental and control group. Data has been collected at the base line and after a five-weeks of intervention using the GFSH App. The primary outcome measure was daily step count, while secondary outcome included app interaction metrics and a time spent sedentary, inferred from inactivity alerts. The experimental group was instructed about the COM-B model for behaviour change and included goal setting, progress tracking, and inactivity prompts. The control group received only general physical activity recommendations. An analysis determined that a number of 158 individuals were required to achieve 95% confidence in detecting changes in step count. A total of 158 participants were assessed for eligibility for inclusion in the study. Participants were recruited through announcements, and flyers within the campus community over a defined recruitment period. All participants were screened to ensure they met the inclusion criteria, which required owning a compatible smartphone (Android or iOS) capable of supporting the GFSH App. Participants were excluded if they did not meet the study requirements (n = 6), were using old generation smartphones (n = 3), or were using Windows-based phones (n = 7) or were unable to install or operate the app due to technical issues. Attrition occurred in cases where participants experienced device malfunctions or became unreachable during the study. This resulted in a total of 142 eligible participants who were subsequently randomized into either the experimental group (n = 71) or the control group (n = 71). In the experimental group, 2 participants did not receive the intervention due to smartphone malfunction, resulting in 69 participants receiving the full intervention. In the control group, 4 participants did not receive the intervention due to malfunction in the application, leaving 67 participants who completed the intervention. Therefore, data from a total of 136 participants (experimental: n = 69; control: n = 67) were included in the final analysis. Recruitment and retention details are illustrated in Figure 1.

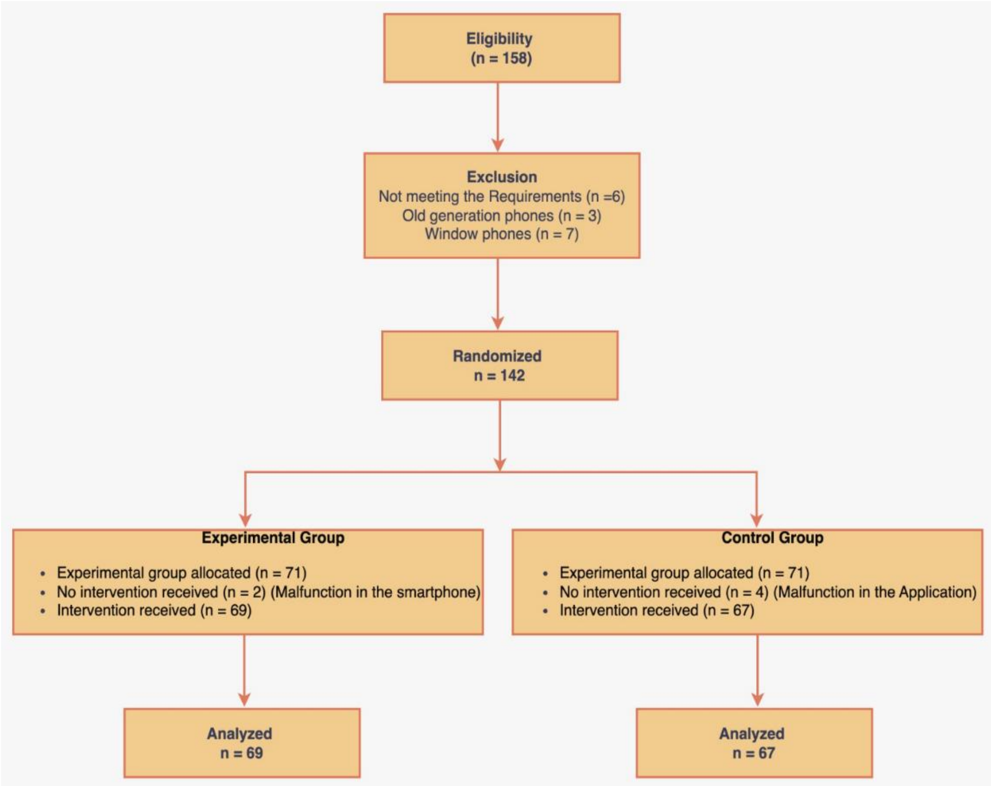

Figure 1. Detailed flowchart of the inclusion and exclusion criteria

The study measured physical activity through GFSH App, which logs user step counts and notifies users when they spend too much time sitting down. This fitness app was selected because it works quickly on many devices, helps users track steps, and gets alerts about inactive times over days. The GFSH App helps users achieve their fitness targets with immediate performance updates to encourage them to adopt active walking habits and spend less time inactive. At the initial meeting, all participating individuals provided demographic information, including age, gender, and other relevant personal characteristics. This data helped describe the study population and ensured balanced group allocation during the randomization process. The intervention design was followed by the COM-B framework (Capability, Opportunity, Motivation, and Behavior), which propose that behaviour change is driven by an interplay of three factors: capability, opportunity, and motivation [24]. This study's intervention followed the COM-B model to identify how experimental tactics could improve participants' abilities and desire to engage in physical activity. Our design used specific behaviour change techniques like setting goals, tracking progress, and receiving support from others.

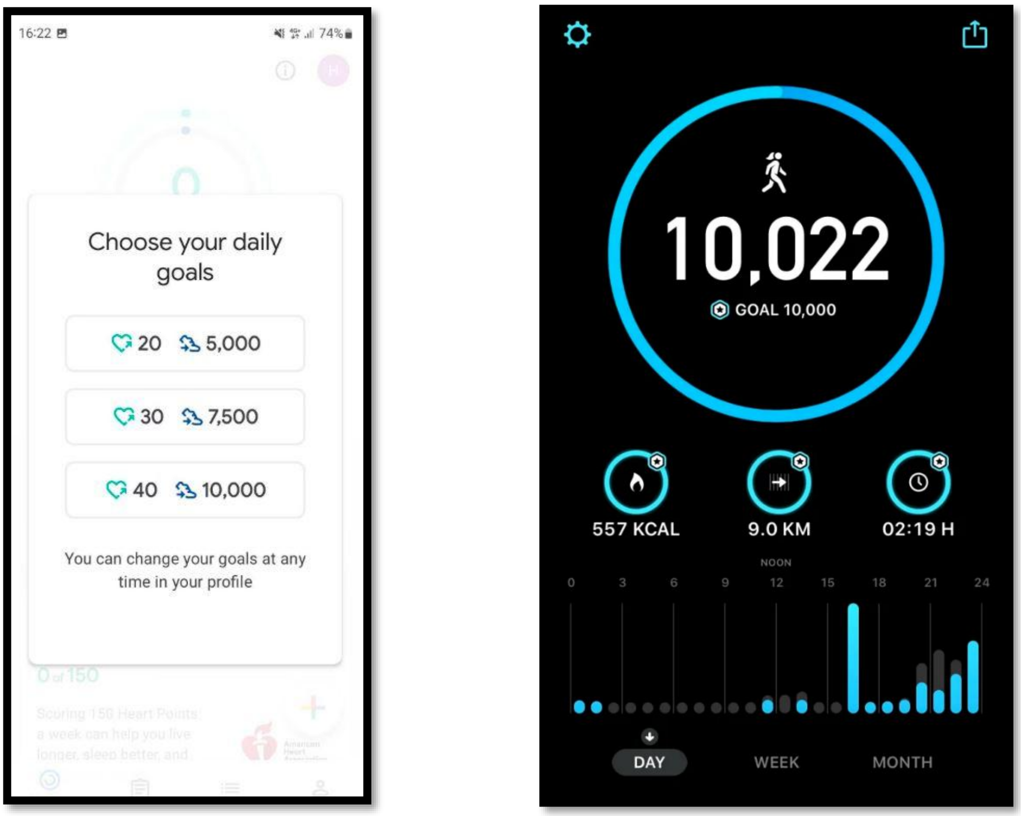

Figure 1. GFSH App and detailed App screenshots

The study required all participants to download GFSH App after they joined so researchers could assess their initial physical activity patterns for one week. Both groups kept using their regular smartphones throughout this phase, while the study team only helped with the basic app setup. The study reviewed each participant's GFSH App records on the final day of Week 1 to assess their daily steps and activity levels. The control participants were educated about standard physical activity guidelines; however, the intervention group were taught how to properly use GFSH App tracking tools.

The control group obtained foundational guidance about daily physical activity recommendations for thirty minutes of walking and its health impact. Research participants in the control group walked 30 minutes at their discretion without getting instructions on using the GFSH App. The app automatically tracked users' daily step counts throughout the study period while they used their phones as usual. The Participating individuals in the experimental group received guidance on using GFSH App to monitor and enhance their daily physical activity. Based on evidence suggesting that step-based goals such as 10,000 steps per day are associated with enhanced metabolic and cardiovascular health outcomes (Tudor-Locke et al., 2011), participants were encouraged to work toward this benchmark. The intervention included training on setting individualized walking goals, tracking daily progress through the app, and enabling inactivity alerts to reduce prolonged sedentary periods. These features were implemented in line with behavior change strategies derived from the COM-B model to enhance capability, opportunity, and motivation for sustained physical activity. The intervention team guided users to use the app's built-in alerts that warn about extended periods of sitting, so people would take walking breaks. Study participants attended subsequent meetings 5 weeks after the initial test to share their daily walking numbers and physical activity data. The study analysed how often users in the intervention group used the GFSH App features like setting goals, tracking progress, and getting inactivity alerts to see if they followed the program correctly. The study team explained the information thoroughly to all participants before comprehensively analysing all the information collected.

An analysis of variance with time and group dimensions measured participant step count differences across the study period. We applied unique statistical analysis methods to measure the distinct achievements of these groups during specific time intervals. The Expectation Maximization method estimated missing data values by assuming rational random patterns in data absence. ANOVA conditions have been verified by running the Shapiro-Wilk test for standard data and Levene's test for equal variance.

Results

The total number of participants included in the study is 136, which includes 59 females and 77 males in the 18-26 age range (mean 22.4, SD 2.31). A total of 6 participants were removed from the experiment due to some technical issues such as device incompatibility in the phone or with GFSH App or consistent app malfunctions, including inaccurate step tracking or app crashes. Moreover, the details of the participants are mentioned in the Table1 and figure below.

Table 1: Participants' demographic data

Group	**N**	**Males**	**Males (%)**	**Females**	**Females (%)**	**Mean Age**	**SD**
Control Group	67	38	56.7%	29	43.3%	20.30	1.73
Experimental Group	69	39	56.5%	30	43.5%	20.79	2.36
Total	136	77	56.6%	59	43.4%	**22.4**	**2.31**

An independent sample T-test was conducted prior to starting the experiment at the baseline to compare step counts between the control and experimental group. The outcomes of the test (t= 0.85, p=0.401) indicates no statistically significant difference between the two groups at the baseline. This is important to show true comparison between the groups, and it confirms that random assignment was effective as both groups started the experiment on equal roles.

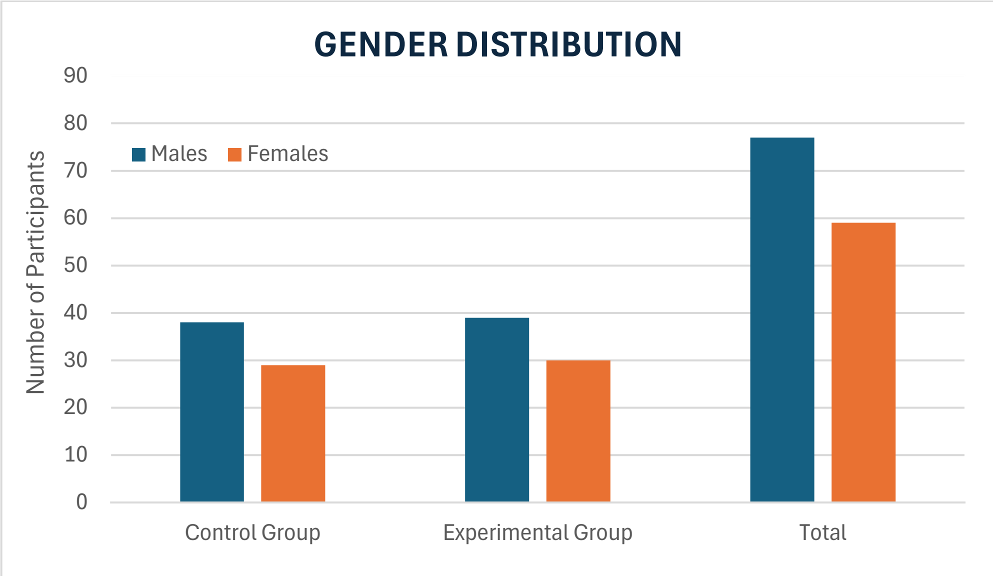

Figure 3*: *Gender Distribution in the Survey

Table 2. Independent Samples T-Test for Baseline Step Count between Groups

Group	Baseline Steps		Post Intervention		t-value	df	p-value
	Mean	SD	Mean	SD			
Control Group	4850	1,140	6059		-	-	-
Experimental Group	4900	1,310	7336		0.85	43	0.401

A mixed-design ANOVA was employed in this study to evaluate whether the intervention produced significant differences in physical activity over the five weeks. This statistical approach was appropriate because it allowed for the simultaneous analysis of important factors: time (Whether activity changed over time) and group (Whether that change was different between groups). By doing so, it assessed whether step counts changed over time across all participants and whether the pattern of change differed between the experimental and control groups. Most importantly, it tested the interaction effect, whether the experimental group experienced a different trajectory of physical activity improvement in comparison to the control group. The analysis showed a substantial effect of time ($F(1,43) = 24.32$, $p < 0.001$, $\eta^2 = 0.36$), indicating that step counts increased significantly over the research duration for all participants. A considerable interlinkage between time and groups was observed ($F(1,43) = 5.52$, $p = 0.023$, $\eta^2 = 0.11$), suggesting that the change in step counts over time differed between the control and experimental groups. Results revealed no significant difference for groups ($F(1,43) = 0.43$, $p = 0.52$), indicating that overall step counts between groups were not significantly different by week 5. This suggests that the app's behavioral features can support sustained physical activity if consistently used for long-term period.

Table 3: ANOVA Results Summary

Effect	F	p-value	η²	Interpretation
Time	24.32	<0.001	0.36	Significant increase over time
Group	0.43	0.52	–	No significant group difference
Time × Group	5.52	0.023	0.11	Significant interaction

Time itself produced apparent changes in step counts across the 5-week study period, and both groups responded to these changes (F (1, 43) = 24.32, P < 0.001, $\eta^2 = 0.36$). The data shows that time-improved step counts in both groups despite receiving different treatments. The analysis shows no significant difference between groups when measuring physical activity at week 5 (F (1, 43) = 0.43, P = 0.52). The Experimental group stepping more often, showed that they produced results that differed significantly from their original data indicating that using smartphone health apps is beneficial for physical health and can reduce the risk of sedentary lifestyle.

Step count data showed that the intervention group received a more significant step count improvement during the study period (2436 steps) over the Control group's 1209-step increase. The step count improvement by the test group against the control failed to achieve statistical proof (t (43) = 1.47, P = 0.15).

Table 4. Between-group analysis of change in step count.

Analysis Type	Comparison	Test Statistic	p-value	Interpretation
Between-Group (Change)	Experimental (+2436 steps) vs Control (+1209 steps)	t (43) = 1.47	0.15	No statistically significant difference in improvement between groups

Within-Group Differences:

Daily step count numbers increased significantly for both groups from start to finish line measurements. In both groups, we noted significant step count increases over the test period, as demonstrated by the Control group's result (t (22) = -2.86, P = 0.009) and the intervention group's result (t (21) = - 4.35, P < 0.001).

Table 5. Within-group analysis of change in step count.

Analysis Type	Comparison	Test Statistic	p-value	Interpretation
Within-Group (Control)	Baseline vs Week 5	t(22) = -2.86	0.009	Significant increase in step count over time
Within-Group (Intervention)	Baseline vs Week 5	t(21) = -4.35	< 0.001	Significant increase in step count over time

The study observed an overall increase in the levels of physical activity in both groups over the five-week period, with the experimental group showing a substantial mean improvement in daily step counts. However, the difference between the groups did not reach statically significance. The treatment had no proven effectiveness in pushing participants towards more physical activity than the control group. This outcome suggests that while both exposure to physical activity monitoring and the structured use of GFSH App features may contribute to increased movement, the short period of the research might have reduced the power to identify statistically significant effects. However, our results also reveal the corroboration that step-count monitoring approach can improve physical activity in long run if followed consistently. Nevertheless, trends observed in the intervention group support existing literature indicating that app-based interventions can encourage healthier activity patterns.

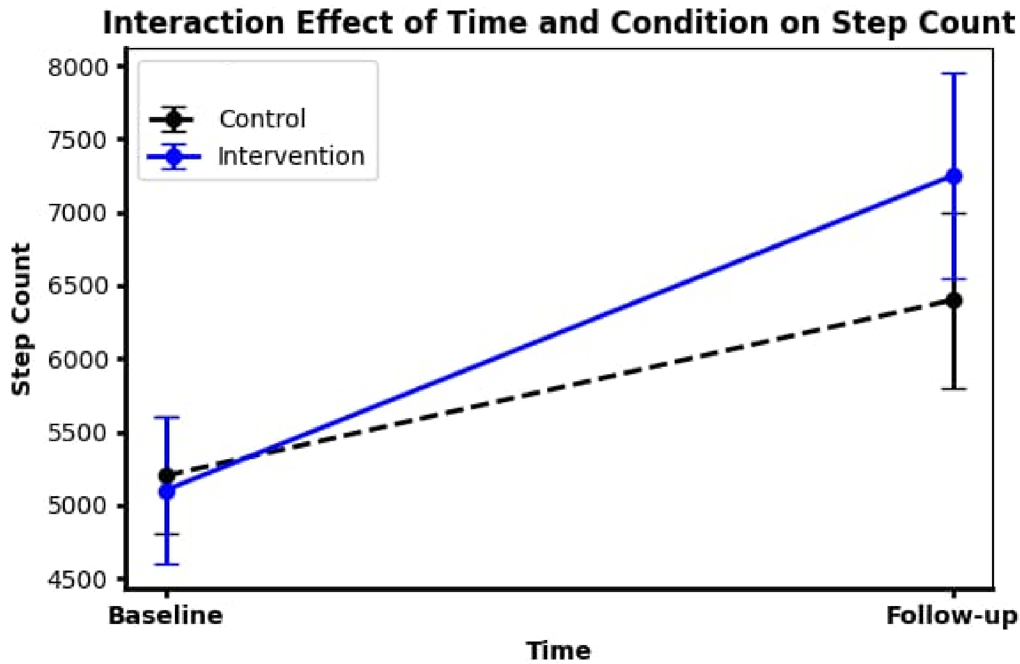

Figure 4: Interaction Effect of time and condition on Step Count

Discussion

This study tested the potential of GFSH App to inspire young adults to be more active and reduce prolonged periods of sitting. It demonstrates the effectiveness of advanced GFSH App features in helping users increase their step count compared to basic tracking in the control group. The study discusses about stated goals, compare them with other studies, and suggest new directions for public health and research, highlighting the promising potential of GFSH App. This study aimed to determine the impact of step-tracking tools in GFSH App on users' daily step counts. The study found that participants from both groups significantly increased their physical activity by taking more steps over the five weeks. The experimental group added 2436 steps, while the control group reached 1209. This study underscores the positive impact of step-tracking devices in encouraging users to move more, even with minimal staff support, providing a source of encouragement and motivation for the audience.

The rise in step counts between groups could not produce a meaningful difference (t (43) = 1.47, P = 0.15). The intervention triggered better movement results, but basic tracking proved to be as effective as step-tracking alone in improving performance. Various research studies showed similar results to this study. According to Laranjo et al.'s (2020) study, step-tracking improved activity by 1700 steps, but extra rewards and social networking features delivered more substantial outcomes [25]. This research shows that tracking steps offers a starting point to get healthier, but additional treatments will make it work better. However, our results also provide the affirmation that step-count monitoring approach can enhance physical activity of young adults in the long run. The 1480-step gain by the control group falls within the expected range of the Hawthorne effect because participants changed their behaviour when they were aware of being monitored. Basic step tracking on their devices helped participants better track their activities, which modified their habits without special intervention tools. Other research teams, such as Gowin et al. (2018), demonstrated that device accessories like step trackers can enhance minor physical activity [26].

The study does not track actual sedentary behaviour but shows reduced total steps, indicating that participants in the experimental group spent less time being still. The experimental group members received GFSH App inactivity reminders that prompted them to take brief walking breaks during their day. In a research, Nicholas et al. (2021) found that participants decreased their inactive time by 15% after using inactivity notifications, like this study's design [27]. Based on available evidence [28], prolonged sitting has negative effects on cardio-metabolic health; thus, it is essential to reduce it. The rise in the step count and reminders and motivational functions in mHealth apps suggests an option to the sitting problems in extended periods. It is possible to show that step count rises due to reduced screen time through upgrading to direct sedentary time measuring devices.

By the nature of GFSH App features, the counts of steps alongside the use of decline alerts and the visibility of progress accomplished have outweighed physical activity in the experimental group. As noted by Martin & Guerrero (2020) concerning Bandura's social cognitive theory [29], the targets require setting and result monitoring as a key factor that causes fundamental behaviour change. Experimental group participants utilized the app functions to set individual step targets and to receive information about their progress and the outcomes of current movements. Presumably, users did not lose motivation during the 5-week study period because these features allowed them to obtain higher steps. Scientific evidence proves the high effectiveness of goal setting to increase physically active behaviour. Swann et al. found that in 2020, users of goal setting mHealth apps had a higher amount of physical activity than individuals without such features [22]. According to Samiha et al. (2020), participants could follow their step goals with better precision by 25% due to issues of real-time feedback [30]. This research shows how watching progress enables the users to stay engaged.

It can be argued that the lack of sophisticated tools available to the control group is the reason for their higher step counts when compared to the experimental group. The identification of step count represents one of the most essential features of meditation-based interventions; hence, while the perceived movement insight assisted the participants in the control group, the absence of additional augmented features resulted in the impossibility of turning this increased awareness of their body's movement into sustainable changes in behaviour [31]. This draws attention to the fact that motivational features added to mHealth apps help enhance the applications' ability to improve users' lives.

Studies by Yoshimura et al. (2022) confirmed that step-tracking apps help participants walk 1700 steps extra daily [32], which equals the 1480-step gain made by the control group. In comparison to previous studies, the experimental group's 2400 steps again demonstrate the added benefits of setting targets and receiving feedback through the app. In their research [33], Vetrovsky et al. (2022) revealed that combining financial rewards with physical activity programs produced step count increases averaging 2500 steps. Extrinsic elements combined with mHealth apps show better results than mHealth apps used by themselves. Research from Martynas Petkevičius (2024) demonstrated that mixing multiple platforms [34], including social comparisons with gamification and goal setting, yields superior mHealth results.

Maintaining physical activity gains long-term, poses one of the most significant barriers in promotional efforts as participants of the experimental group gained new abilities. Nonetheless, researchers are uncertain if these results will continue to show effect after the 5-week trial ends [35]. In a study by Lin et al. (2020), found that most mHealth app users stop using it after 3 months [36]. GFSH App and similar interventions succeed or fail because users remain determined and use app features consistently.

Future programs should include social networking functions alongside positive rewards and game mechanics to help people maintain good habits. Gui et al. (2022) showed that adding group fitness goals and social competition improved how well people stayed active in exercise programs long after the study ended [37]. After adding badges and leader boards to the app, Amagai et al. (2021) detected that user stayed engaged 40% longer after associating reward systems with achieving their goals [38]. This study shows that GFSH App works successfully and imposes a significant health difference in improving physical activity among individuals. However, its ongoing success depends on adding features that keep people actively engaged. To make this digital tool most effective for improving public health, more research is needed to evaluate the approach for providing and keeping the GFSH App effective long-term.

The findings of this analysis face multiple restrictions that need to be recognized. The research design's main problem results from participants giving inaccurate data because they reported taking more steps than they took. Scientists must track physical activity using motion-sensor devices to measure actual movement behaviour rather than just counting steps [39]. Because the study did not track how much participants sat during the day, it cannot prove how much their inactivity decreased. Measuring sedentary time instead of just steps would strengthen research findings showing that physical activity reduces inactive moments [19]. With just 136 participants, our analysis did not have enough statistical power to show actual group differences between the groups. Moreover, another research must support these findings and analyse whether they show patterns in different population groups. The five-week research period is too short to show how participants maintain their changes after the study ends.

Conclusion

Findings of this study align with previous mHealth research showing that smartphone apps can effectively promote physical activity. The GFSH App intervention demonstrated promise, with users achieving nearly double the step count improvement compared to those receiving standard guidelines. This supports existing evidence that goal-setting and real-time feedback - key behaviour change techniques in our app - significantly enhance physical activity outcomes. While both groups increased activity levels, the experimental group's greater improvement suggests app-based interventions may offer advantages over traditional advice alone. This study suggests that step count monitoring through a smartphone health app could encourage healthcare providers in Saudi Arabia to promote walking behavior by integrating physical activity-focused social events within academic settings. However, as noted in existing studies, long-term engagement remains a challenge that future app designs should address through features like social connectivity or personalized coaching. These results indicate that health apps like GFSH App could become valuable tools in public health strategies to combat physical inactivity, particularly among technology-engaged young adults. Further development should focus on sustaining user engagement beyond short-term interventions.

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