# Effectiveness of m-Health to Promote Physical Activity in Healthy College Students: A randomized controlled trial.

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## Introduction

Promotion of healthy lifestyle behaviors among college students is a priority in line with the World Health Organization (WHO) strategies to improve the health through engaging in physical activity (PA). Mobile health (m Health) involves public health initiatives that are increasingly being used as a part of public health intervention; including promoting physical activity.

Mobile health apps have ability to deliver behavioral interventions that are embedded into individuals' daily routines, that are highly personalized to individuals' behaviors, health conditions, and daily routines, and have the potential to reach diverse population. With several studies highlighted an m-Health app intervention as a main channel in which included interventions which demonstrated its effectiveness in health-related changes, there is little attention to measuring the effect of an m-Health app intervention program designed to improve PA and specific lifestyle behaviors.

To the best of our knowledge, relatively few randomized controlled trials (RCTs) of m-health apps as a healthy lifestyle intervention in itself that focuses on education and self-monitoring of diet and physical activity specifically for healthy college students. Therefore, the objectives of the current Randomized Controlled Trial are to determine the efficacy of a 12-week mobile health (*m-Health*) intervention with the goal of increasing daily step counts on physical activity, improve body mass index (BMI), and body fat mass among college students.

## Methodology

### Intervention Group

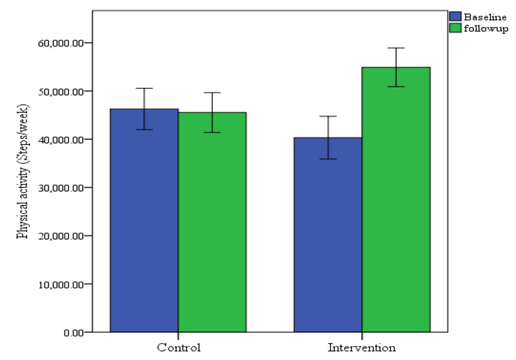
The intervention group received PA goals in terms of 10,000 steps/ day. They received information about the benefits of exercise and instructions how to use the app. The researcher also demonstrated the usability features of the mobile phone app to the intervention group (using standardized instructions) and encouraged this group to use the app to monitor their steps and obtain feedback, in order to achieve their target goals . By the end of each week (week 2 to week 12), the participants in intervention group contacted via SMS/ e-mail asked to share their step counts data with the researcher.

**Measures:** Pedometer app: feedback and tracking of step counts, calories expended, and step- count history. It was assessed across the 4 time points. Time was coded on a continuous scale, with **0** at baseline, and **4, 8**, and **12-**weekfollow- up assessments.

**Weight Status :**Objectively measured height, weight, and BMI, and body fat percentage was obtained at the end of 12-week of intervention using TANITA scale.

## Results I

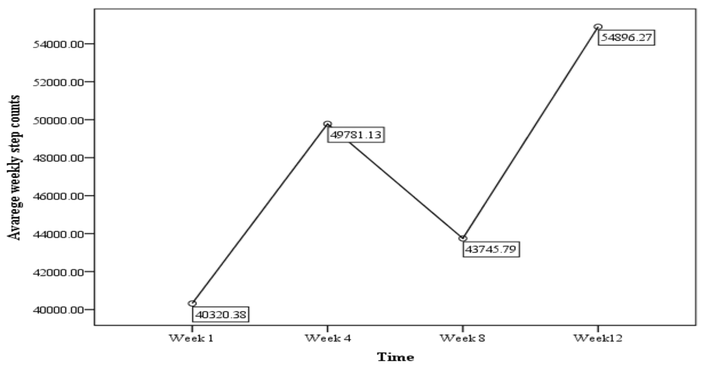
**Figure1 Average steps/week at baseline (week 1) and follow-up (week 12).**




- The mean difference is significant at the 0.05 level.
- A significant increase in weekly step counts from baseline (week 1) to follow-up (week 12) among intervention group (Mean differences =-14575.89, *p*=0.00).
- No significant difference between the baseline (week1) and follow-up (week12) step counts among control group (Mean differences = 730.48, *p*=0.09)
- Follow-up (week 12) revealed that the participants in the intervention group had a significantly higher increase in step counts (Mean=54896.27) than those in the control group (Mean= 45530.12) ($t_{112}$= 3.255, *p*=0.00.

## Results II

**Figure 2 Step counts mean of intervention participants during weeks 1, 4, 8, and 12.**




Based on estimated marginal means.
*. The mean difference is significant at the 0.05 level.
b. Adjustment for multiple comparisons: Bonferroni.

**Table 1Anthropometric variables for intervention group pre-to-post intervention**

| Variables | | N | Mean Differences (SD) | *P*-Value |
|---|---|---|---|---|
| Body weight (Kg) | Pre | 56 | 0.42 (1.23) | 0.01* |
| | Post | 56 | | |
| Fat (%) | Pre | 56 | -0.87 (4.88) | 0.19 |
| | Post | 56 | | |
| BMI (Kg/m$^2$) | Pre | 56 | 0.05 (0.80) | 0.64 |
| | Post | 56 | | |

The mean difference is significant at the 0.05 level)

## Methodology

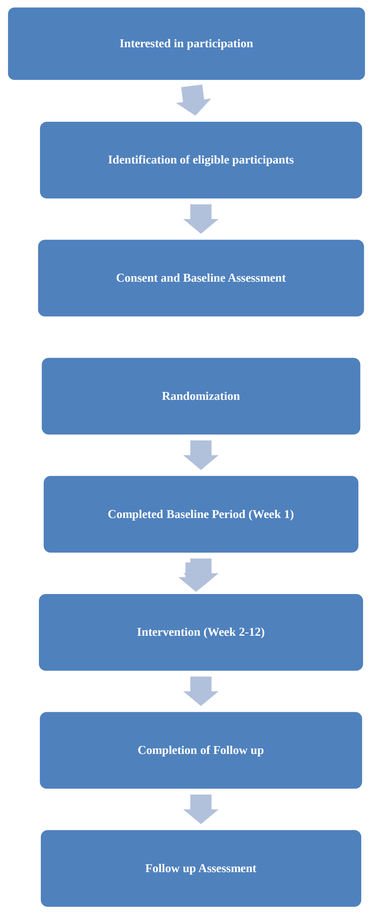
### Design and Setting

The study design was a 12 week- RCT, recruiting 130 students from Texas A&M University/ College Station campus. Following the screening visit, eligible participants were randomly assigned to the intervention (m-Health intervention app) group and control group in an equal ratio of 1:1.

### Use of Evidence –Based Strategies

One of the most common applied theoretical model for understanding PA and other healthy related behaviors is Social Cognitive Theory (SCT) It is necessary for developing and designing intervention established toward the initiation of PA and healthy behaviors or attitudes in the general population. In our research study the m-Health apps allow the participants to track their daily step counts In addition, the automatic feedback (e.g.; means of weekly step counts is an opportunity for self-evaluation and assessment.

**Participant flow through recruitment process**




### Physical Activity: Pacer Pedometer App

**Commercially Available App**

We used one of the most popular publicly available Smartphone applications (apps) for improving the PA (Step counts). Pacer has goal setting functionality, self-monitoring of step counts, calories expended, and automatic performance feedback through graphic display of step-count history.

**Control Group**

Participants in the control group were provided with information related to daily recommended PA levels (i.e.; 30 minutes daily), and information highlighting the benefits of walking regularly, without being observed or requiring interaction with the researcher. The control group members did not use the pacer app after the first week of assessment phase (Baseline Assessment) until week 11, until they contacted for week 12 follow-up assessment, and did not receive any other intervention action.

## Discussion & Conclusions

The use of pedometer based an m-Health app was found to increase the PA over a 12 week period, when compared with data from the control group. The intervention group achieved a significant increase of approximately 36 % in activity levels. Participants in intervention group achieved a significant increase in their step counts (p=0.00); with daily average increases of approximately 2082 steps/day. Moreover, the increase in PA (step counts) seen in the intervention group was maintained during 12 weeks of intervention . This substantial change is clinically meaningful and, if continued, is expected to result in numerous health benefits, including decreased the risk of obesity, Type 2 diabetes mellitus, and cardiovascular diseases . Although, the weight loss was not a target of increase in daily step counts the intervention group significantly decrease their body weight (p<0.05). Significant and clinically meaningful improvements are harder to achieve during relatively short period of intervention (12 weeks). Therefore, longer than 12 weeks of intervention is required to allow positive physiological changes to occur. In conclusion the *m-Health* appeared to be feasible and acceptable and can significantly increase physical activity in a college student sample. In future adaptations of this study, it may be of interest to include objective measures of fitness, such as maximal oxygen uptake or heart rate.

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