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RESEARCH ARTICLE

STEP COUNT OF YOUNG ADULTS USING PHONE APP AND WEARABLE BAND

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Glossary of Abbreviations:
BMI: Body Mass Index
FB: Fitness Band
PA: Phone app
SPSS: Statistical Package for Social Sciences
GPS: Global Positioning System
ISBEC: Inter System Biomedica Ethics Committee.

ABSTRACT

Background: Physical activity helps maintain good health whereas sedentary behavior is associated with several life-style disorders. **Objective:** This study was therefore conducted to understand physical activity pattern of young adults and to compare the use of fitness band and phone app for counting steps. **Methods:** Step count of subjects was observed using a phone app (Runtastic pedometer) and fitness band (MI) pedometers. One hundred and fifteen subjects (60 young men and 55 young women) participated in this study. They were divided into two groups- fitness band and phone app group. Both groups recorded and reported their step count for three days. A questionnaire was used to examine activity level, to identify indicators of sedentary behavior and opinion of participants towards physical activity. **Results:** The mean step count of the fitness band group was 8221.92 ± 886.01 steps and phone app group was 8676.56 ± 995.11. There was no significant correlation between use of phone app, BMI and body weight. However, there was a significant correlation between use of fitness band and body weight. **Conclusion:** Use of fitness band and phone app pedometers increased awareness of physical activity and motivated subjects to increase their step count.

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INTRODUCTION

The importance of regular physical activity for maintaining good health is now well established. "A person who is fit is capable of living life to its fullest extent" (La Porte *et al* ., 1985). People who are both, physically and mentally fit are less prone to life-style diseases such as obesity, hypertension, diabetes etc. (Tudor-Locke *et al* ., 2004). Walking is the most common and easy physical activity as it requires no special skills or facilities. It is achievable by almost all age groups with little risk of injury. There are several benefits of walking. It prevents weight gain and brisk walking in fact helps to burn calories. Walking reduces stress, lowers blood pressure, strengthens heart, reduces depression, improves mood and therefore increases life-span (Bouchard, 2000). It also improves glucose tolerance in overweight subjects (Swartz, 2003). Modern life-styles have moved from being active to sedentary. Walking minimum 10000 steps per day can be taken as an indication of being active (Tudor-Locke and Basset, 2004).

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Further, to monitor walking today we have devices like pedometers and also phone apps. A pedometer is a device that counts the number of steps taken. The step counting function of the pedometer can motivate individuals to increase physical activity, especially when encouraged to record daily step count and set specific step-count goals (De Cocker *et al* ., 2009). Step count can be calculated using the latest technological devices like fitness bands (Fit-Bit one, Yamax Digiwalker SW-200, Nike fuel band). Pedometers provide instant feedback to individuals using goal-setting principles (e.g., 10,000 steps/day goal). Smart phone apps for fitness are also gaining importance today (S heath for android and health app by Apple). Studies on physical activity in young adults particularly those using pedometers or phone apps are few in India. This study is significant as it studied physical activity of young adults using two different self-monitoring pedometer devices.

MATERIALS AND METHODS

Study Design: This study was a cross sectional study. Sixty men and 55 women between 20-25 years of age were included in the study.

Selection of subjects: Subjects were selected using the snowball sampling technique. They were selected from colleges and work places in Mumbai. The subjects were divided into two groups phone app (n= 55) and fitness band (n=60).

Data Collection: Data was collected by administering a questionnaire. The questions included were for general information and physical activity information of the subjects. Participants were asked about how active they were during the day, about mode of travelling, any other physical activities they indulged in throughout the day and how motivated were they to be more active.

Anthropometric measurements: Anthropometric measurements were taken in duplicate for height and weight. Height was taken to the nearest to 0.1 cm and weight was taken to the nearest 100 gm using an electronic scale. BMI was calculated.

Step counting: Subjects were asked to count their steps for three days using phone app and fitness band. The MI fitness band is a wrist band and it was the device selected and the Runtastic pedometer was the phone app chosen. The subjects were encouraged to walk 10000 steps per day during the study period. The 3-day step counts were obtained from subjects. Data analysis was done using SPSS version 21. The study was approved by ISBEC (ISBEC/NR-26/DD/JVJ/2016).

RESULTS

The subjects in the study were between 20-25 years of age, with the average age being 22.9 years. Out of the 115 subjects, 60 were men and 55 were women. They were divided in two groups- Fitness band (MI) (60) and phone app (55).

Anthropometry: The mean anthropometric measurements of subjects in the two groups are shown in Table 1. Subjects were classified as underweight, normal weight, overweight and obese using WHO (2004) classification for Asians. In the fitness band mean BMI was 23.39 ± 3.47 and it was 24.10 ± 3.96 kg/m^2. As per the classification, the maximum subjects of both groups (77%) had normal BMI. There were about 3% underweight, 27% overweight and 8% obese subjects.

Step Count: The step count of three days was obtained from both the groups. Table 2 shows the average step count of subjects. On comparing the two groups, it was observed that subjects using phone app reported significantly higher step count than subjects using fitness band. There was an increase in total steps walked by both the groups as each day passed. However, this increase was significantly more in the fitness band group than the phone app group. Comparisons of step count between males and females in fitness band and phone app groups are shown in Table 3. The step count in the fitness band group showed a significant difference between males and females (F = 5.416, p = 0.023). In the phone app group also males had a higher step count than females. However, this difference was not significant. The total step counts of both the groups were correlated with their body weight and BMI. Body weight was significantly correlated with the number of steps with fitness band (r = 0.346, p = 0.007). However, it was observed that BMI was not significantly correlated with the number of steps with fitness band (r =0.235, p = 0.070).

Table 1. Mean Anthropometric Measurements of Subjects in the Two Groups

Parameters	Height (cm)	Weight (kg)	BMI (kg/m^2)
All subjects (n=115)	165.66 ± 9.52	65.19 ± 13.31	23.65 ± 3.65
Fitness band (n=60)	165.93 ± 9.22	64.81 ± 13.71	23.39 ± 3.47
Phone app (n=55)	165.36 ± 9.90	65.98 ± 13.05	24.10 ± 3.96

Table 2. Mean Step Count of Subjects

Step count/ day	Fitness band (Mean ± SD)	Phone app (Mean ± SD)	t, p
Day 1	6951.96 ± 1126.24	8388.52 ± 1125.94	-6.303, 0.000
Day 2	8248.71 ± 989.15	8601.76 ± 1229.1	-2.605, 0.011
Day 3	9465.10 ± 750.36	9039.40 ± 990.21	-3.339, 0.001
Mean steps	8221.92 ± 886.01	8676.56 ± 995.11	-3.199, 0.002

Table 3. Step Count of Males and Females in the two Groups

	Male	Female	F, p
Fitness band	8478 ± 798 (n= 30)	7965 ± 907 (n=30)	5.416, .023
Phone app	8583 ± 1024 (n=30)	8788 ± 966 (n=25)	0.578, 0.450

Similarly, when number of steps with phone app were correlated with BMI and body weight, it was observed that it had no significant correlation with either (BMI r =0.85, p = 0.539; body weight r = -0.028, p = 0.838). Ease of using pedometer devices was asked to all subjects. Almost all (98.4%) subjects of the fitness band group reported that the use of band was easy. However, lesser percentage of subjects (83.3%) in the phone app group found it easy for counting steps. Exercise pattern of subjects was probed. In the fitness band group 45% subjects and 18% subjects in the phone app group did not perform any exercise. Only 13% subjects in the fitness band group and 7% in the phone app group chose walking as a daily exercise. Other exercises such as jogging, cardio, yoga and swimming were also reported by few subjects in both the groups. Walking pattern of subjects was enquired. When asked if they walked because of someone else's advice, 16% fitness band group subjects and 24.3% phone app subjects said yes. Walking can cause breathlessness for many people. Subjects of both groups were asked about being breathless while walking. One-fourth of fitness band and 1/5th of phone app subjects reported breathlessness while walking. Out of all the subjects, 43% told that they preferred walking as a mode of transport wherever possible. Climbing stairs is one of the best forms of exercise. It is a great way to burn calories and also strengthen the heart. In this study, 60% of fitness band subjects and 50% of phone app subjects chose an elevator instead of climbing stairs indicating sedentary behavior. People differ in their motivation for physical activity. It was observed that 96.7% subjects in the fitness band group were motivated at various levels of motivation. However, in the phone app group 17% were not motivated at all for any physical activity and the rest were motivated at various levels of motivation.

DISCUSSION

Overweight and obesity has increased in all age groups. Along with diet, physical activity patterns have changed from being active to sedentary. It is therefore necessary to make a conscious effort for it. In recent years, accelerometers, pedometers and phone apps are regularly used to count steps (Sallis *et al* ., 2000). Both pedometers and phone apps are useful but have their own drawbacks. Pedometers are small, light-weight, worn on the belt or wrist.

They count steps but cannot determine the intensity of the activity. Phone apps have moved beyond traditional pedometer functions. They have added features like automatic feedback, counting calories, graphic displays etc. However, a major concern is the jerky movements which get calculated as a step. Thus phone app step counts may not be very reliable. In this study, step count has been different in the two groups. A possible reason for difference in the step count using different devices could be the device placement or jerky movements while walking. Phone app might show a slight difference in steps count (Glynn *et al* ., 2014). Using a fitness band may help people as is seen in the correlation with body weight. The fitness band is worn on the wrist for 24 hours. It tracks 24 hours' activity seven days a weekend therefore, helps understand the activity. The band has a display screen which displays step count. Band also counts energy used and distance walked. The fitness band has other interesting features for example setting a goal of step count. The device helps a person reach their goal by giving alerts on the wrist band screen. The history feature of the band stores step count helps to self-monitor physical activity. The band also has features like sleep tracking, heart rate sensor, gesture activity screen, time date and temperature, long lasting battery life and is also waterproof (Appelboom *et al* ., 2014).

This study took only a three day score of step counts and thus average step count may be low. This can also be the reason for no significant correlation with BMI. It is therefore suggested that fitness band should be used for a longer duration. The phone-app had no significant correlation with body weight or BMI. The phone app has other disadvantages like walking at slow speed can cause an error in counting steps. Walking on or travelling in a vehicle with jerky movements are also counted as steps. Unlike fitness band phone app does not display until opened. It is not comfortable for a person using phone app to open it and check for step count, calories spent and duration etc. Some phone app use GPS to accurately count steps. When the signal of the phone is weekend due to tall buildings, low range area or when a person is indoor, can cause error in counting steps. The phone app running all day in the background causes the battery to drain. If the phone switches off those steps may not be counted. There are times when people put down their phone on a desk or leave it in a bag. It is a disadvantage as the app does not count those movements. Also, it is not always convenient to carry the phone always (Van der Weegen *et al* ., 2013). Overall it was observed that although the step count of phone app and fitness band groups was slightly different, all subjects did not achieve the recommended goal of 10,000 steps per day. In this study, step count had increased in the three day use Thus, it can be said that monitoring the step count using fitness band and phone app were successful in increasing the physical activity of subjects. It was also observed that using a step count device helped subjects to set a walking goal. Some other positive changes reported by the subjects were less use of elevator and more use of stairs, walking to nearby places instead of using a vehicle etc.

Conclusion

The present study suggests that sedentary behavior of people should be changed to being active. The use of fitness band to increase physical activity is suggested over the phone app pedometer. The suggestion of fitness band is justified as it is worn on the wrist 24 hours, helps to count steps and track physical activity without any interruption. Also, it has a display screen and activity alert features which encourage the user to increase daily step count and stay active all day long.

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Conflict of Interest: None

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