Analysis According to Gender and Body Mass Index of the Number of Steps Taken by Sedentary Workers as Measured by a Pedometer

SUNGHYOUN CHO, PT, MS1, BYOUNG-DON OH, PhD2, BYUNG-JUN CHO, PhD3)*

1) Department of Rehabilitation Science, Graduate School of Daegu University
2) Department of Physical Education, Chungnam National University
3) Department of Emergency Medical Technology, Kangwon National University: Kuydong Samcheok City, Kangwondo 245-711, South Korea. TEL: +82 33-540-3340

Abstract. [Purpose] The purpose of this study was to determine according to gender and body mass index the number of steps taken by the sedentary workers as measured by a pedometer. [Subjects] Thirty-six sedentary workers in their twenties in Ulsan city were enrolled in for this study and their step counts were investigated. [Methods] Step counts at the workplace between 9 am and 6 pm everyday for 2 weeks were measured by a pedometer. Data were analyzed using SPSS 20.0 to compare step count according to gender and BMI on different days of the week. [Results] Females showed a higher step count than males on every day of the week except Fridays and Sundays. The step count was higher among the low weight group than overweight group on every day of the week. [Conclusion] Future studies should examine ways of helping sedentary workers to increase their step count. Also, more effort should be made to find practical ways of improving the number of steps taken in the workplace to keep workers in good health, as additional benefit would accrue, such as improved work efficiency.

Key words: Pedometer, Step count, Sedentary worker

INTRODUCTION

Physical inactivity is one of the major factors behind the increase in the death rate related to cardiovascular diseases since the introduction of modern work styles1). In addition, due to sedentary lifestyles, physical inactivity has become a major risk factor of death regardless of sex2). A well-modulated workout helps to relieve stress and keep muscles strong. Also, aerobic exercise helps cardiopulmonary functions to function smoothly and prevents aging, providing enough energy for everyday activities3). Walking is the most fundamental exercise of all physical activities4). Specifically, compared with some vigorous exercises, walking has been recommended as an optimal and practical type of exercise regardless of age, time, and location with less risk of hurt during exercise and high exercise effects5, 6). In particular, one large-scaled study of 73,500 postmenopausal women showed that brisk walking for about 30 minutes prevented cardiovascular related diseases6). The pedometer has recently been used to monitor walking. It has given people a direct motivation to continue as they can measure and see directly how many steps they have taken7). The pedometer has been strongly recommended as a useful tool for everyone as its cost is low and it has high reliability and validity8). Also, it can be of great use in regular exercise9) as it serves as a monitor and provides instant feedback10). Sedentary workers are expected to have higher risk of diseases related to inactivity as they might neglect walking due to their working style.

One day (step/day), which is measured and recorded by a pedometer, provides a basis for providing feedback and establishing walking goals in a walking program. Using step count a day, whether the goal has been achieved can be verified and feedback is available. Thus, it is a minimal way of implementing a strategy to increase step count11). Precise understanding and analysis of individuals’ condition and walking patterns in everyday activity. In addition, in the analysis of walking pattern in which a pedometer is used, it is necessary to discriminate between different walking patterns, such as during the week and over the weekend, as the walking patterns are different, except for small groups of people and age ranges12). A number of studies in which a pedometer was used have focused on every day activities within a day in all ranges of age groups, but there is a lack of research about sedentary workers. Therefore, the purpose of this study was to analyze the step counts of inactive sedentary workers in their twenties on different days of the week according to gender and degree of obesity by using a pedometer focusing on different days of the week and the weekend.

SUBJECTS AND METHODS

The participants of this study were enrolled from office workers in their twenties in U city. Thirty-six participants
18 males and 18 females, voluntarily participated in this study. They were instructed to keep a journal of step count for 2 weeks and were given a pretest explanation of the method and direction of the experiment. All of the subjects participated in this study without dropouts till the end of the study.

BMI (body mass index) is used to determine obesity and is the body mass divided by the square of the subject’s height\(^{13}\) (Table 1).

A pedometer and a journal of step count were provided to each participant in the pretest session with instructions on how to keep the journal and how to use the pedometer. The subjects were instructed to record their step count during average work hours, or between 9 am to 6 pm, on different days of the week.

Participants’ journal-keeping status and pedometer use were checked every day by phone and text message. The participants’ journals were collected after 2 weeks and their average step counts were calculated.

The pedometer used to measure sedentary workers’ step count objectively was a MP-500 (YAMASA Co, Tokyo, Japan) pedometer, and the step counts over 2 weeks were recorded daily. The pedometer was worn at the joint of the right thighbone and pelvis, or the anterior superior iliac spine (ASIS) point where belt line of the waist and the center-line of the legs meet vertically\(^{14}\).

Individual participants’ step counts at the workplace between 9 am to 6 pm were recorded in daily journals which were collected for further analysis. The criteria of classification were low weight (BMI < 18.5 Kg/m\(^2\)), standard weight (18.5–24.9 Kg/m\(^2\)), and overweight (25.0–29.9 Kg/m\(^2\)) (Table 1).

### RESULTS

Table 2 showed the results of sedentary workers’ step count during weekdays according to gender. Females had higher step counts than males on every day of the week except Fridays and Sundays. Both males and females had higher step counts over the weekends and males had the highest step count on Sundays, while female did on Saturdays. In addition, there was a statistically significant difference between the step counts of males and females on Thursdays using the independent t-test (p<0.01).

Table 3 provides the results of analysis of sedentary workers’ step counts during days of the week for the different BMI groupings (Table 3). The step count of the low weight group was higher on every day of the week than that of the overweight group. Specifically, the step count of the standard weight group was lower than that of the overweight group on Tuesdays and Thursdays and the highest step counts of the standard weight group was reported on Sundays. There were statistically significant differences between the step counts of the different BMI groupings on both Mondays and Sundays using the ANOVA (p<0.05).

### DISCUSSION

Pedometers have been used in a variety of physical programs, especially for low-active adolescent girls\(^{15}\), sedentary workers\(^{16}\), and overweight adults\(^{17}\). They is because they

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**Table 1.** Characteristics of the subjects

|          | Low Weight | Standard Weight | Overweight | Total |
|----------|------------|-----------------|------------|-------|
| Male     | 5          | 8               | 5          | 18    |
| Female   | 5          | 8               | 5          | 18    |

Criteria of classification: low weight (BMI < 18.5 Kg/m\(^2\)), standard weight (18.5–24.9 Kg/m\(^2\)), overweight (25.0–29.9 Kg/m\(^2\))

**Table 2.** Step counts on different days of the week of males and females (M±SD) (Unit: count)

|          | Male Group | Female Group   |
|----------|------------|----------------|
| Monday   | 3966.83±1753.26 | 4649.50±1802.24 |
| Tuesday  | 4103.08±1454.35 | 4952.33±1809.26 |
| Wednesday| 4084.16±1401.48 | 5151.50±2259.12 |
| Thursday | 3759.25±1270.14 | 5538.00±1523.45** |
| Friday   | 5416.50±2682.12 | 4590.91±1969.92 |
| Saturday | 6568.83±3603.25 | 8253.25±3164.63 |
| Sunday   | 6988.41±4173.23 | 6149.58±3464.78 |

*: p<0.05, **: p<0.01, M±SD: Mean ± standard deviation

**Table 3.** Step counts on different days of the week of groups with different degrees of obesity (M±SD)

|          | Low Weight Group | Standard Weight Group | Overweight Group |
|----------|------------------|-----------------------|------------------|
| Monday   | 5161.62±1658.71  | 4478.72±1582.10       | 2567.40±1368.21* |
| Tuesday  | 5271.37±2098.42  | 3968.54±1367.93       | 4654.40±1298.64 |
| Wednesday| 5303.37±1874.35  | 4543.90±2101.67       | 3683.62±1381.25 |
| Thursday | 4924.50±1728.63  | 4485.09±1906.61       | 4567.00±1011.26 |
| Friday   | 6162.50±2727.60  | 4724.09±2258.14       | 3764.80±1044.15 |
| Saturday | 8523.25±2759.53  | 8038.84±3841.26       | 4252.00±1122.51 |
| Sunday   | 6263.50±2763.70  | 8274.63±4250.98       | 3305.40±1394.48* |

*: p<0.05, M±SD: Mean ± standard deviation
can present concrete goals for physical activity during the day, and individuals are able to easily check their physical activities on their own. Also, it has been reported that a long-term pedometer-determined ambulatory activity helped to decrease risk factors\(^\text{19}\). Therefore, this study was conducted to see if there were any differences in the number of steps taken by sedentary workers in their twenties based on sex and their degrees of obesity.

Against the expectation that males’ step counts would be higher than females’ step counts on each day of the week according to sex showed that females’ step counts were higher than males’, except on Fridays and Sundays. This might be attributable to females’ working habit of moving more frequently than males during work hours. Comparing step counts between weekdays and weekends, we found that both males and females showed higher step counts during weekends than weekdays. The target step count in walking programs for adults is generally 10,000 steps a day\(^\text{10, 19}\). This study counted daily steps of weekdays only during work hours, which led to lower step counts than the average adult’s step count. Thus, the 10,000 step count may have been achieved if activities during rest hours at the workplace when participants didn’t wear a pedometer were included.

As predicted, step counts on each day of the week differed among different degrees of obesity. It was highest for the low weight group, and lower for the standard weight, and overweight groups in rank-order. In particular, the difference in step counts between the low weight and overweight groups was approximately double during the weekend, compared with that of during weekdays. In addition, the step counts during the weekend of the low weight and standard weight groups were 2,000 to 4,000 step counts greater than those of weekdays. This indicates that the average physical activity during the weekend was higher in the low weight and standard weight groups than in the overweight group.

The sedentary workers’ lower than average step count on each day of the week indicates low physical activity, which may lead to a variety of health problems such as obesity. Thus, future study should cover interventions to help sedentary workers’ to increase their physical activity. Also, more effort should be made seeking practical ways to improve physical activity at the workplace to keep workers in good health. This would eventually bring additional benefits, such as improved work efficiency.

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