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ORIGINAL RESEARCH

Steps Measured by Pedometry and the Relationship to Adiposity in College Women

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***Background*:** The aim of this study was to investigate the relationship between steps per day and adiposity among college women. ***Methods*:** This study was cross-sectional and included women ages 18–25. Participants wore a pedometer for 7 consecutive days. Body composition was assessed using air-displacement plethysmography. Height, weight, and waist and hip circumferences were assessed. ***Results*:** The women took 10,119 ± 2836 steps per day. When divided into quartiles by steps, the top 2 quartiles of women in the study had significantly lower BMI, percent body fat, and waist and hip circumferences than the bottom quartile of women ($P \leq .05$). Percent body fat was different between the bottom 2 quartiles and the top 2 quartiles ($P \leq .05$). The odds of having a body fat of greater than 32% were reduced by 21.9% for every increase of 1,000 steps taken per day ($P \leq .05$). ***Conclusions*:** Steps per day are related to body composition in young adult women, but this relationship weakens with progressively higher step counts. A reasonable recommendation for steps in young adult women that is associated with the lowest BMIs and body fat seems to be between 10,000–12,000 steps per day.

***Keywords*:** body composition, physical activity, pedometer, obesity

The prevalence of obesity has dramatically increased in the United States and throughout the world over the past few decades.[1] Obesity poses a serious public health threat because of its association with numerous chronic health conditions.[2] The lack of positive long-term outcomes for obesity treatment indicates a need for better strategies to prevent excess weight gain.[3]

There are critical time periods during which the prevention of weight gain and the establishment of healthy habits is important, one of which is the transition from late adolescence to early adulthood.[4] Studies that have evaluated weight gain during college generally show weight gain at an elevated rate resulting in a rapid increase in the prevalence of overweight and obesity.[5–7]

Physical activity (PA) is an important, modifiable predictor of successful weight management.[8] The current obesity rates have been attributed partially to decreased energy expenditure related to sedentary living.[9] In addition, it has been shown that PA levels tend to decrease in the transition from high school to college[10] and that the habits established during these early years tend to track into later adulthood.[11] Therefore identifying and establishing appropriate PA recommendations for the prevention of excess adiposity during college is needed.

Pedometers provide an objective method for promoting and tracking PA.[12,13] Pedometers track PA by counting the number of steps taken during a given period of time (usually a day). Currently, there are a variety of recommendations for steps given by various agencies and professional organizations.[14] These recommendations vary from organization to organization and by age. Generally for adults the step recommendations range from 8000–10,000 steps per day to promote public health and to meet minimal activity guidelines.[15] Direct observation and computed estimates indicate that the step count that seems to meet minimal PA guidelines is between 7000–8000 steps per day.[15] Recommendations for children (boys: 13,000–15,000; girls: 11,000–12,000 steps per day) and adolescents (10,000–12,000 steps per day) are much higher than adults.[16] However, the recommendation of 7000–8000 steps is a minimum to meet current public health recommendations for adults (150 min of moderate-to-vigorous physical activity [MVPA] per week) and is likely too low for optimal weight management.

Despite the many studies that have been conducted evaluating step recommendations related to health fitness, very little research has been performed to evaluate step recommendations associated with healthy body weight and body fat. This is specifically true for college women. However, there are a few studies that indicate an inverse relationship between steps and BMI.[17–20] Two of these studies were supportive of a recommendation of 10,000 steps per day in middle-aged and elderly women, however these studies lacked sample sizes large enough to evaluate a cut-point beyond 10,000 steps per day.[18,19] Tudor-Locke et al did a secondary analysis from a large international cohort and concluded that a step range of 8000–12,000 steps per day was predictive of a healthy BMI (< 25) in women and that younger women (age 18–39 yrs) should get steps toward the higher end of this range.[21]

While these studies are helpful and provide evidence for step cut points, research in college women has been limited, and a step recommendation that is associated with a healthy body fat is lacking. In addition, while BMI is useful for public health and classifying disease risk, it lacks specificity in predicting body fat.[22–26] The lack of specificity leads to a propensity to misclassify individuals, especially in the intermediate BMI ranges. This is specifically true when evaluating PA, since high levels of activity may result in more lean body mass and less fat mass. As a result, using BMI may be less sensitive to the true impact of PA on adiposity.

Identifying the step counts, as measured by pedometry, that are associated with a healthy body weight and more favorable body composition can provide recommendations for PA levels

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that should be attained by college students. This study is specific to college-age women as this population is in a transitional time in life and, as a result, generally gain weight at a higher rate than the general adult population. This group is also typically more active and tends to have a lower prevalence of obesity than older adults[20,27–29] thus recommendations that apply to other populations may not fit well for this population. Therefore our purpose was to investigate the relationship between steps-per-day and adiposity among college women. In addition, we make an effort to identify an optimal step level that is associated with healthier body weight and lower body fat.

Methods and Procedures

Design

The study used a cross-sectional design.

Participants

Two hundred young adult women ages 18–26 years were recruited to participate in the study. Participants were recruited from the general student populations of 2 mountain west universities. Participant recruitment took place between October 2009 and December 2010. Participants were recruited by flyers, posters, e-mail, classroom visits, and information booths.

Before participation in the study, participants completed a health history questionnaire. Participants were excluded from the study if they were unable to perform PA at a moderate intensity, on a diet designed to lose weight, pregnant, had any known metabolic disease, or were taking medications that alter metabolism. This study was approved by the Institutional Review Board and participants provided informed consent.

Measurements

Measurements for the study included anthropometric measures (height, weight, circumferences), body composition and pedometer-determined steps. Anthropometric measurements and body composition were assessed with participants wearing a standardized 1-piece swimsuit and measurements were taken after participants attempted to go to the bathroom and void. No testing took place the first 3 weeks of any semester or the last week of the semester and participants were asked to maintain normal activity patterns.

Anthropometric Measurement. Body weight was measured using a calibrated digital scale accurate to ± 0.005 kg (Tanita Corporation, Japan; modified by Life Measurement, Inc., Concord, CA). Height was measured at baseline using a standard wall-mounted stadiometer accurate to ± 0.1 cm (Seca, Chino, CA). Waist and hip circumferences were measured in triplicate and the average of the 3 measurements was used for analysis. Waist circumference was assessed at the narrowest portion of the abdomen and hip circumference was assessed at the widest portion of the buttocks using a spring loaded Gulick measuring tape (Fitness Wholesale, Stow, OH).

Body Composition. Body composition was measured using the BOD POD Gold Standard, manufactured by Life Measurement, Inc. (Concord, CA). The BOD POD uses patented air displacement plethysmography for determining percent body fat and fat-free mass.[30–33] The BOD POD has been shown to be a valid measure of body composition.[34] The reliability has been rated at good to excellent.[35] Within-subject coefficients of variation for percent body fat have ranged from 1.7%–4.5% within a day and from 2.0%–2.3% between days ($P \leq .05$).[35,36] Thoracic lung volume was measured in duplicate and the average of the 2 measurements was used for data analysis.

Physical Activity. Steps were tracked using the Omron HJ-720ITC Pedometer (Omron Health Care, Bannockburn, IL).[37] Research has demonstrated that the absolute percent error for the Omron HJ-720ITC is 2.3 ± 2.8% across walking speeds ranging from 1.7–5.4 mph.[37] In addition, the pedometer has shown excellent reliability with a coefficient of variation of 1.4% for self-paced walking.[37] For a 1-week period (7 consecutive days) participants were instructed to wear the pedometer at all times except when bathing or swimming.[38] Seven consecutive days was chosen since this amount of time provides reasonable estimates of habitual PA.[38] Participants were also instructed to keep a log of any period of time in which they did not wear the pedometer. Tape was used to cover the digital display so that participants were blinded to their step results. Participants were instructed to wear the pedometer at the waistline near the front of the hipbone and directly midline with the thigh on the right side of their body. To be measured as a usable day, participants had to wear the pedometer for 80% of the time between 7:00 AM and 11:00 PM.[39] The pedometer records and calculates nonwear time in hourly increments. If participants had a day that was not usable, they were asked to repeat the day. Thus, all participants had at least 7 complete days of observation. Data were stored in memory and were downloaded after 7 days of monitoring.

Aerobic steps were calculated by the manufacturer as 60 steps per minute for a minimum of 10 minutes. This is distinguished from moderate PA, which is more commonly defined as 100 steps per min.[40] Thus aerobic steps indicate continuous movement over a period of time but may or may not be classified as moderate intensity activity.

Procedures

Once participants were screened and eligibility for participation in the study was determined, anthropometric measurements and body composition were assessed. Participants were then issued a pedometer and were instructed to wear the pedometer at all times during the assessment week except when showering or swimming. Following the assessment week, participants returned the pedometer and the data were downloaded and checked for completeness.

Data Analysis

Data were checked for outliers and normalcy before analysis. Descriptive statistics (mean, standard deviation, etc.) were reported for all variables of interest. Bivariate relationships were analyzed using a Pearson correlation. Regression analysis was used to evaluate the relationship between continuous variables. Analysis of variance was used to detect differences between step quartiles for all variables of interest. Logistic regression was used to assess the odds of having excess body fat given the number of steps accumulated daily. Appropriate controls (age, menstrual cycle, and temperature) were added to the statistical models to account for any potentially confounding influence on the relationships. Potential colinearity between independent variable was assessed using variance inflation factors. The statistical software package PC-SAS (version 9.1, SAS Institute, Inc., Cary, NC) was used for all statistical analyses. The level of significance was set at 0.05.

Results

Characteristics for the participants in the study are presented in Table 1. Two hundred women were initially recruited to participate in the study, but only 186 women had complete data and were included in the analysis. In addition to the 200 women recruited to participate in the study, 6 women were excluded from the study for taking medication that altered metabolism. Participants were taken from the general population of both universities and represent 70 different majors. The population was primarily Caucasian (90%) with the remaining women including Asian, African-American, Hispanic, and other. Using body mass index (BMI), 5% of the women were underweight (< 18.5 kg m^{-2}), 77% were normal weight (18.5–24.9 kg m^{-2}), 15% were classified as overweight (25–29.9 kg m^{-2}) and 3% were classified as obese (> 30.0 kg m^{-2}). While only 3% of women were classified as obese by BMI, 19% of the women had a body fat percentage classified as "Obese" (> 32%).[41]

There was no difference in BMI, percent body fat, circumferences (waist or hip) or steps between women in different years of school (see Table 1). However, age was associated with these variables. As they got older, women in the study tended to have a higher BMI ($\beta = 0.29$, $P = .0277$), percent body fat ($\beta = 0.66$, $P = .0191$), waist ($\beta = 0.68$, $P = .0143$) and hip ($\beta = 0.74$, $P = .0122$) circumference and they tended to take fewer steps ($\beta = -237.3$, $P = .0477$).

Participants wore the pedometers 16.8 ± 0.36 hours per day over the 7 days. On average, women in the study accumulated more than 10,000 steps per day (see Table 1), although the most frequent number of steps accumulated per day was between 9,000 and 10,000 steps (see Figure 1). Two percent of the women were classified "sedentary," 14% "low active," 39% "somewhat active," 27% "active," and 18% were classified as "highly active."[15] Thirty-two percent of the step counts were a result of aerobic steps.

There was a significant relationship between total steps per day and body fat and hip circumference, but not between waist circumference, waist-to-hip ratio, or BMI (see Table 2). The Pearson correlations were not significant when analyzing the relationship between aerobic steps and any anthropometric or

Table 1 Descriptive Data for All Participants by Year in College

	1st year n = 46		2nd year n = 66		3rd year n = 45		4th year n = 29		Total			
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	*F*	*P*
Age (yrs)	18.8	0.4	20.0	1.2	21.1	1.2	22.5	1.5	20.3	1.7	76.90	< 0.0001
Body mass index (kg·m^{-2})	22.2	2.6	22.5	3.4	22.6	2.6	22.6	3.4	22.5	3.0	0.14	0.9368
Waist circumference (cm)	71.6	5.6	72.6	6.0	73.0	5.7	74.3	8.6	72.7	6.3	1.10	0.3500
Hip circumference (cm)	96.0	6.7	97.4	6.3	98.4	6.4	98.2	8.0	97.4	6.7	1.10	0.2508
Waist-to-hip ratio	0.75	0.04	0.74	0.04	0.74	0.03	0.76	0.05	0.75	0.04	0.79	0.4983
Body fat (%)	25.7	6.6	26.2	6.4	26.2	5.8	26.1	7.2	26.1	6.4	0.06	0.9827
Steps per day	10,803	3187	9883	2480	10,032	2813	9757	2984	10,119	2836	1.22	0.3029
Aerobic steps per day	3554	2277	2992	1965	3267	2076	2099	2099	3246	2099	0.67	0.5709

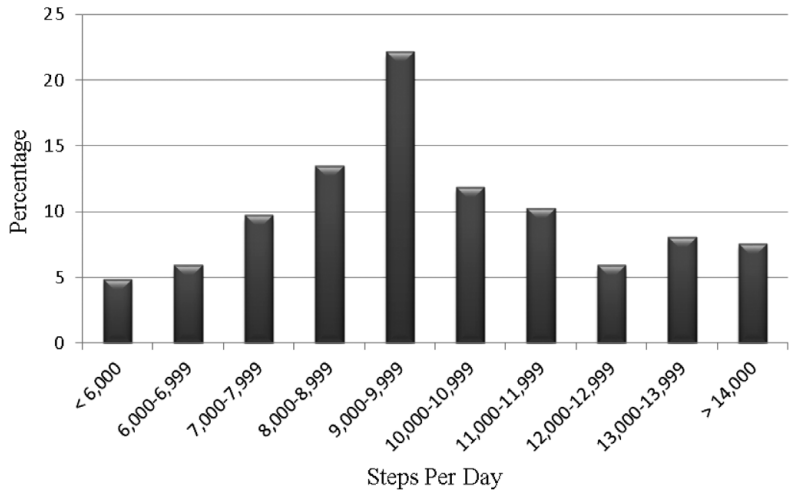

Figure 1 — Pedometer-determined steps taken per day in college women.

body composition outcome. Regression analysis demonstrated that every increase of 1000 steps per day was associated with a 2.4% (0.52 body fat percentage point) lower percent body fat (F = 10.52, P = .0014). Age, average daily temperature and menstrual cycle had a statistically negligible impact on this relationship and multicolinearity was not evident with variance inflation factors below 1.01.

When divided into quartiles by steps-per-day, women in the lowest quartile for steps had significantly higher waist and hip circumferences and BMI than women in the top 2 quartiles for steps (see Table 3, $P \leq .05$). Women in the bottom 2 quartiles for steps had a higher percent body fat than women in the top 2 quartiles for steps (see Table 3, $P \leq .05$). There were no significant differences for any anthropometric or body composition variables between the women in the top quartiles for steps (see Table 3). Similarly, when grouped in quartiles by percent body fat, women in the lowest 3 quartiles took an average of 1500 ± 2827 more steps per day than the women in the highest quartile (see Table 4).

Figure 2 shows the probability of having a body fat of greater than 32% by the number of steps taken per day. The odds of having a body fat of greater than 32% were reduced by 21.9% for every increase of 1000 steps taken per day ($P \leq .05$). The probability of having a body fat of 32% or greater was 35% for women who accumulated only 6000 steps per day. The probability was reduced to 17%, 11%, and 7% for women who accumulated 10,000, 12,000, and 14,000 steps per day, respectively. The logistic regression was not significant when evaluating the odds of being overweight (as determined by BMI) by steps-per-day. The odds of being overweight by BMI were reduced by 65% (95% CI: 0.15–0.84) and the odds of having a body fat of greater than 32% were reduced by 80% (95% CI: 0.08–0.53) for women who accumulated more than 10,000 steps per day compared with those who did not.

Table 2 Correlations for Pedometer-Determined Physical Activity and Anthropometric or Body Composition Variables

	Total steps	Aerobic steps
Body mass index (kg·m^{-2})	–0.12	–0.09
Waist (cm)	–0.13	–0.08
Hip (cm)	–0.22[a]	–0.14
Waist-to-hip ratio	0.11	0.06
Body fat (%)	–0.23[a]	–0.09

[a] $P \leq .05$.

Table 3 Evaluation of Anthropometric and Body Composition Variables, by Total Step Quartiles

	Q1 (n = 47)		Q2 (n = 46)		Q3 (n = 46)		Q4 (n = 47)	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age (yrs)	20.7	1.8	20.2	1.4	20.3	1.5	20.2	1.8
Body mass index (kg·m^{-2})[a]	23.3	3.4	22.7	3.3	21.9	2.6	22.0	2.5
Waist (cm)[a]	74.7	7.8	72.4	5.9	71.2	5.3	72.2	5.5
Hip (cm)[a]	99.7	6.6	97.4	6.8	96.7	6.9	95.9	6.0
Waist to hip ratio	0.75	0.04	0.74	0.03	0.74	0.04	0.75	0.04
Body fat (%)[b]	28.2	6.7	26.8	6.8	24.6	5.4	24.6	6.0
Steps per day[c]	6908	1276	9165	394	10,527	567	13,862	2079
Aerobic steps per day[c]	1351	933	2717	1118	3377	1395	5529	2104

[a] Q1 is statistically different from Q3 and Q4 ($P \leq .05$).

[b] Q1 and Q2 are statistically different from Q3 and Q4 ($P \leq .05$).

[c] All quartiles are statistically different ($P \leq .05$).

Table 4 Evaluation of Anthropometric and Body Composition Variables, by Body Fat Quartiles

	Q1 (n = 46)		Q2 (n = 46)		Q3 (n = 47)		Q4 (n = 47)	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age (yrs)[a]	20.2	1.5	20.3	1.6	20.0	1.3	20.9	2.0
Body mass index (kg·m^{-2})[a]	20.0	1.3	21.2	1.8	22.9	1.9	25.7	3.1
Waist (cm)[b]	67.6	3.0	69.7	3.7	73.9	4.7	79.4	5.8
Hip (cm)[b]	92.4	3.5	94.0	5.0	99.0	5.3	104.2	5.5
Waist-to-hip ratio[a]	0.73	0.03	0.74	0.03	0.75	0.04	0.76	0.04
Body fat (%)[b]	17.9	2.9	23.8	1,3	28.0	1.1	34.2	3.1
Steps per day[a]	10,514	2499	10,624	2868	10,385	2917	9007	2800
Aerobic steps per day[a]	3280	1928	3451	2182	3659	2210	2619	1965

[a] Q1, Q2, Q3 is statistically different from Q4 ($P \leq .05$).

[b] All Quartiles statistically different ($P \leq .05$).

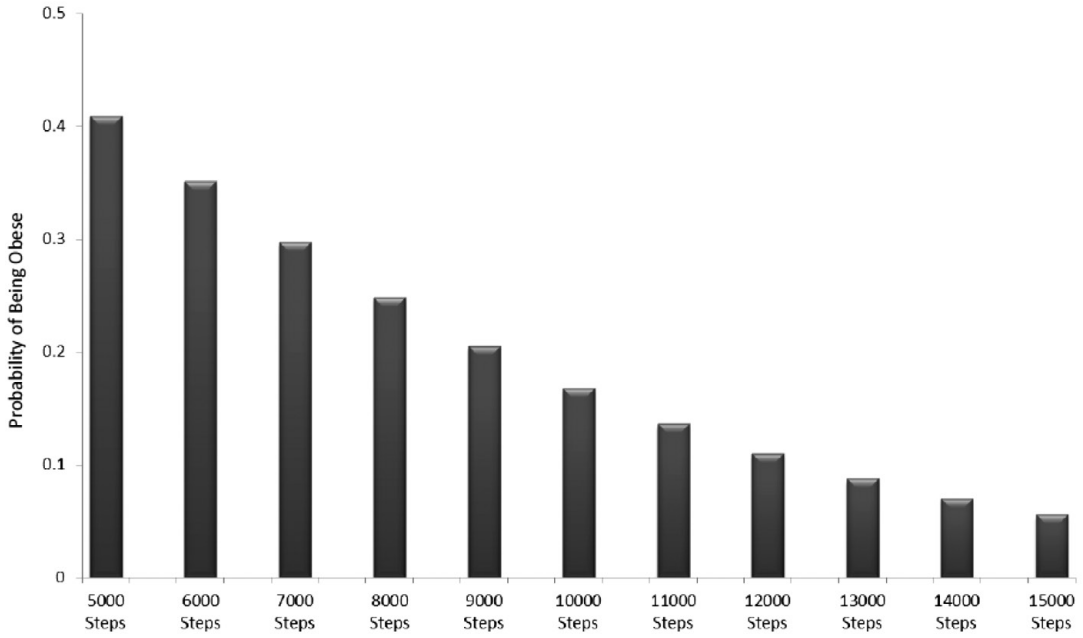

Figure 2 — Probability of being obese (> 32% body fat) by pedometer-determined step levels in college women. *Note.* The logistic regression that was used for this figure: y = 0.247 × (steps ÷ 1000) + 0.868 (P = .0029).

Discussion

Findings from this study show that the women, on average, took more than 10,000 steps per day, which is considered to be "active."[15] This level of activity is not uncommon among college students. For example, Behrens et al[29] showed that in a sample of 237 college women, the average steps was 11,473 ± 2978, while Mestek et al[20] reported 8610 ± 2252 steps per day in a sample of 40 college women. When results from these studies are looked at together, they suggest that the PA of young adult women of college age is higher than older adult women in the U.S.[15] This higher level of activity is interesting when considering that the rate of weight gain during this time in life is usually higher than the general adult population of women.[7,42] There is, however, variation in the rate of weight gain seen in the various studies in college-age women; one of the reasons for this may be related to variation in PA levels.[10,43]

Despite the generally high level of activity in these women, 22% did not average 8000 steps per day and 12% did not get 7000 steps per day, which has been proposed to be an adequate range of steps to indicate meeting minimum activity guidelines.[14] In addition, 55% of the women did not get 10,000 steps per day, a common recommendation for steps. Those women who did not average 10,000 steps per day were at increased odds of having excess body fat. In addition, there was a 22% reduction in the odds of being obese by body fat for every 1000 steps taken per day.

Mestek et al previously examined the relationship between steps and body composition in young adult women.[20] Their study found a significant inverse relationship between steps and percent body fat and BMI in 40 college women. Our study generally supports these findings; however, there are some important differences and additions that help to better understand this relationship. Because of the larger sample size we were able to evaluate the relationship between steps and adiposity beyond just simple correlations, which made it possible to evaluate potential step levels that are best related to lower body fat and BMIs and to observe the weakening of the relationship between steps and percent body fat and BMI at progressively higher levels of steps.

In addition, while we also observed a negative simple linear relationship between steps and percent body fat, similar to Mestek et al, the same was not true for BMI. The evaluation of the relationship between steps and BMI was aided by dividing the participants into groups based on steps-per-day, revealing that participants who got the lowest level of steps tended to have the highest BMIs, while there was no relationship observed in those in the top 75% of the sample. The weakening of the relationship between steps and adiposity with progressively higher steps per day may explain why the relationship between steps and percent body fat was weaker in our study compared with Mestek et al and why the linear relationship between steps and BMI was not significant. This is because, while there was a wide range of activity in our study, in general, the women were more active than was observed in the previous investigation.

It makes sense that habitually accumulating more steps is better for body composition and BMI, but it seems that there are diminishing returns as step counts increase. This makes it difficult to define a set step recommendation that is best related to a healthy body composition and weight. Based on a large diverse sample, Tudor-Locke et al recommended that the step level that is related to a healthy BMI in women is between 8000–12,000 steps daily, with recommendations for women in the 18–39 age group to accumulate steps toward the higher end of this range.[21] Our study supports this but is more specific to women in college, which is a transitional period in life and is related to a higher rate of weight gain. Our findings suggest that a good recommendation for college women seems to be to accumulate more than 70,000 steps per week, if we assume the results of our study are causal. However, our study does not support any added benefit beyond this level, which is somewhat contrary to what was suggested by Tudor-Locke et al. This level of steps is associated with the lowest adiposity.

Currently 10,000 steps per day is higher than the minimal number of steps needed to meet PA recommendations for health fitness.[14] This recommendation is between 7000–8000 steps per

day. This recommendation is roughly similar to 150–210 minutes of MVPA per week. However, if we assume 5000 steps is basal and 50 minutes of moderate activity is 5000 steps (100 steps per minute is moderate activity), then 10,000 steps is between 45–60 minutes of moderate activity.[14] This amount of activity is in agreement with recommendations for the amount of activity that is required to prevent weight gain, which may be why it is associated with the lowest weight and body fat in this study.[45,46]

It is important to note that our study supports a recommendation of 70,000 steps per week, which turns out to be 10,000 steps every day if a person accumulates 10,000 steps each day. It is common to have some days where steps are low. Thus it may be helpful to give either a weekly recommendation or a recommendation that is higher (eg, 11,000 steps per day) to make up for low PA days.

It is also important to point out that cut points may differ depending on which measure of adiposity is used. The results of our study emphasize the importance of measuring body fat and other indicators of adiposity in addition to BMI. If BMI or waist circumference were used to index adiposity, the results of our study would indicate that a cut point of 8500 steps per day would be most appropriate. On the other hand, if percent body fat or hip circumference were used, then a cut point of 9800 steps would be most appropriate. One reason for this observation might be because physical activity tends to increase lean tissue, which adds to BMI but reduces adiposity.

Determining a set cut point based on steps that is related to a healthy body weight is difficult to establish because body composition and weight are a product of a number of interacting factors in addition to PA. Any PA recommendation for weight management is met with unavoidable expectations. The impact of PA on body weight can be overcome with increased caloric consumption. This is demonstrated in the fact that there is little added benefit to increasing levels of steps beyond 10,000 per day, and suggests that there is compensation taking place, either in other aspects of energy expenditure or in energy consumption. Thus, any step recommendation should be interpreted with the understanding that more goes into energy balance than just PA.

What was surprising about the results from the study was that aerobic steps did not predict adiposity very well. The reason for this is not entirely clear but may be partly a result of how the aerobic step data were calculated. Aerobic steps were manufacturer-defined as accumulating 60 steps per minute for a minimum of 10 minutes. If steps fell below the 60-step cut point during the 10-minute period, none of the steps were counted as aerobic. This is accurate if someone is doing continuous activity but may miss some of the more intermittent activities that add to energy expenditure. Because of this definition of aerobic steps, it is likely that MVPA was underestimated in some individuals, especially those individuals whose activity is more intermittent in nature. In addition, 60 steps per minute is roughly the equivalent of walking at 1.12 mile per hour.[44] This intensity of walking is well below what would be considered moderate intensity activity, which more recent research has supported to be 100 steps per minute.[40,44]

There are limitations to the study that should be kept in mind when interpreting the results. The study was cross-sectional and thus the direction of the relationship between steps and body composition cannot be determined. The women recruited for the study were taken from a specific region of the country (mountain west), which can limit the generalizability of the results. However it should be pointed out that the women in the study represented 35 different states in the United States, as well as 6 different countries. It is also possible that PA patterns change with the normal progression of the semester, with individuals being more active at the beginning and less active at the end of the semester. To help account for this, no assessments were done the first 3 weeks or the last week of each semester. In addition, statistical analysis did not find any influence of month on PA patterns. Finally, the women included in the study were not randomly sampled and, while there was a large amount of variation in percent body fat, the women in the study tended to have lower BMIs.

Despite these limitations, there are some strengths to the study. First, step data were collected objectively using a pedometer that stores data in memory. This eliminated any self-reporting and step-tracking problems as well as minimized testing reactivity. This also allowed us to verify wear time and monitor compliance, which previous research had not been able to do. In addition, body composition and circumferences were assessed along with body weight, allowing for a better explanation of the impact of steps on adiposity in a large sample of college women.

Conclusions

Findings from our study demonstrated that young adult women are generally more active than the general population. A recommendation of 70,000 steps per week seems reasonable for women in this age range, as it is the minimum number of steps associated with the most favorable body composition. The recommendation of 70,000 steps per week could be used by colleges and universities to promote healthy weight in women. However research that is prospective is needed to determine if this recommendation is sufficient to prevent weight gain. In addition, a comprehensive look at changes in metabolism and energy consumption with increasing levels of steps may help to better describe the impact of steps on body composition.

The findings of the study could be used in health promotion efforts on campuses. Pedometers are relatively cheap and are an easy way for women to track activity. Efforts related to improving step counts to 70,000 steps per week or more and maintaining this level of activity throughout the college experience may help to prevent the weight gain that is generally seen in this population.

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