

Original Research

The Effects of a 12-Week Faculty and Staff Exercise Program on Health-Related Variables in a University Setting

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ABSTRACT

International Journal of Exercise Science 8(1) : 49-56, 2015. The obesity epidemic has grown in the past decade due to physical inactivity (i.e., having a sedentary job) and an increase in caloric intake. This problem combined with the reluctance of many faculty and staff members exercising in the same environment as student's presents a unique challenge in an academic setting. The purpose of this study was to examine the effectiveness of a 12-week exercise program focused toward the faculty and staff in improving several health-related variables such as curl-ups, push-ups, sit-and-reach, and balance. Fifty-seven faculty and staff participated in the current study. Participants engaged in a variety of exercise classes taught by certified instructors three days a week for 12-weeks. Paired samples t-tests illustrated a significant ($p < 0.001$) decrease in body mass and significant ($p \leq 0.001$) improvements in curl-ups, push-ups, sit-and-reach, and balance. This data demonstrates that a 12-week faculty and staff exercise program has the potential to improve performance in several health-related variables such as curl-ups, push-ups, sit-and-reach, and balance. The ability of this program to improve health-related variables and possibly delay or prevent the development of overweight and/or obesity, sarcopenia, and other chronic diseases is encouraging.

KEY WORDS: Worksite exercise program, faculty and staff, health-related variables, sarcopenia, chronic diseases

INTRODUCTION

Many of the chronic diseases such as cardiovascular diseases, type-2 diabetes, some types of cancer, overweight and/or obesity, depression, etc., which we are faced with today are caused by an increase in sedentary behaviors and poor nutritional intake. Currently, only about 32% of the population is meeting physical activity recommendations set forth by the American

College of Sports Medicine (ACSM) and American Heart Association (AHA): moderate-intensity physical activity for 30-minutes per day for at least five days per week or vigorous-intensity physical activity for 20-minutes per day for at least three days per week (11). Furthermore, an increasing number of employees are not meeting these recommendations due to the nature of their jobs. A report done in 2006 found that 3.2 million workers were sitting

still while 2.6 million workers were standing still for the duration of their work day (14). Besides an increase in sedentary behaviors, or physical inactivity, poor nutritional intake characterized by high energy intake and over-consumption of saturated fat, cholesterol, sugar, and salt is a major culprit contributing to the number of individuals being diagnosed with chronic diseases (6).

Aside from these unhealthy behaviors (physical inactivity and poor nutritional intake), the majority of individuals in the workforce, more specifically at a university setting, are 25 years or older (14). This sets the stage for sarcopenia, which is defined as the degenerative loss of skeletal muscle mass (0.5-1% loss per year after the age of 25), quality, and strength associated with aging (1). This degenerative loss of muscle mass may negatively affect other health-related variables such as flexibility and balance (1). To combat sarcopenia ACSM recommendations for strength training include: 8-10 exercises, 1-3 sets, 8-12 repetitions at least twice a week (1).

Physical inactivity combined with poor nutritional intake over time will lead to the development of overweight and obesity with a subsequent increase in the prevalence of chronic diseases (14). Sedentary behaviors are one of the leading preventable causes of death in the United States, with an inverse linear dose-response relationship between volume of physical activity and mortality associated with chronic diseases (8). Regular physical activity participation has been shown to reduce the risk of chronic diseases (8). Maintaining a healthy diet, such as low saturated fat intake combined with high

fruit and vegetable intake, has been found to be important in the prevention of overweight and obesity, and ultimately the development of chronic diseases (15).

Maintaining energy balance (energy intake versus expenditure) is an increasing problem among workers. This increase in energy intake and subsequent decrease in expenditure can mostly be attributed to such things as the type of work (office work), inflexible work hours, and easy access to fast food and unhealthy snacks. Once again, these factors workers are faced with can lead to the development of chronic diseases. Furthermore, since most adults spend approximately half of their waking hours at the workplace, the worksite is believed to provide good opportunities for fostering the development of healthy behaviors. More specifically, worksite health promotion programs can be defined as employer initiatives directed at improving the health and well-being of workers (7).

Maes and colleagues (9) incorporated half-hour intervention sessions three times per week for three years. The intervention consisted of physical exercise and health education. Physical exercise sessions were chosen by the participants and consisted of walking, step aerobics, and body weight exercises. Health education sessions focused on nutrition, alcohol and drug consumption, working conditions and stress, smoking behavior, headaches, and back pain. Results from Maes and colleagues (9) demonstrated that an intervention consisting of both physical exercise and health education has the potential to produce extensive and stable effects on health-related variables.

Shephard (13) implemented a similar design with half-hour exercise sessions that met three times per week over the course of a three month period. Sessions consisted of a variety of aerobic and dumbbell exercises. Results demonstrated small but favorable changes in body mass, skinfolds, aerobic power, muscle strength and flexibility, overall risk-taking behavior, systemic blood pressure, serum cholesterol, and cigarette smoking after implementing a worksite fitness and exercise program (13). Carter and colleagues (4) implemented a stability ball training program that was performed twice per week for 10-weeks. Results demonstrated improvements in muscular strength and endurance, which provided benefits for individuals who spent a considerable amount of time sitting throughout the day (4). Eddy and colleagues (5) found improvements in low-back flexibility, abdominal strength, upper-body strength, weight loss, and diastolic blood pressure after having participants complete a health and fitness program structured primarily around physical activity (5). According to Proper and colleagues (12) inconclusive evidence exists for the effect of physical activity programs at worksites on health-related variables. Inconsistent results largely due to variations in definition and assessment of the outcomes or to the compliance with the program led Proper and colleagues (12) to this conclusion.

Previous research has demonstrated that both short- and long-term duration worksite fitness programs can have positive effects on a multitude of health-related variables. To the best of our knowledge there are no studies that have examined the impact of a faculty and staff exercise

program that includes a variety of intensity-related (moderate- to high-intensity) classes. Therefore, the impact from participation in a variety of intensity-related classes on faculty and staff at a university setting is unknown. For that reason, it is necessary to examine the potential impact that participation in these classes may have on several health-related variables. The purpose of this research study was to examine the effectiveness of a 12-week exercise program designed for the faculty and staff at a large, public, American university with specific aims at improving body mass, muscular strength and endurance, flexibility, and balance. It was hypothesized that after the completion of a 12-week exercise program participants would have improvements in body weight, muscular strength and endurance, flexibility, and balance.

METHODS

Participants

Fifty-seven faculty and staff ($n = 51$ females, $n = 6$ males, average age 48 ± 10 years and weight 91.8 ± 24.3 kg, Table 1) participated in this 12-week exercise program. Participants were excluded if they did not receive clearance from their primary physician beforehand for such issues as orthopedic injuries, cardiovascular disorder, etc. Prior to participation faculty and staff were instructed on the benefits and risks of the exercise program and signed informed consent and medical history forms. This research study was approved by the University Institutional Review Board.

Protocol

Faculty and staff reported to the Exercise Physiology laboratory on day one and the last day of the exercise program to be assessed in body mass, balance, flexibility, muscular strength and endurance. Faculty and staff were measured for weight by using a balance beam scale (Health O Meter, Chicago, IL). During the assessment of balance on the Biodex Balance System (Biodex Medical Systems Inc., Shirley, NY), each participant completed a single-leg balance test. Participants were instructed to balance on their dominant leg with shoes on and eyes open for three sets of 20-seconds each. Flexibility was assessed by using the sit-and-reach test (2) (Figure Finder Flex-Tester, Novel Products Inc., Rockton, IL). Participants were instructed to remove their shoes and assume a sitting position with knees extended and feet and heels flat against the box. Next, participants extended their arms straight forward with hands placed on top of each other and fingers even. Finally, participants reached forward and held their final position for approximately two seconds. The most distant point reached with the finger tips was the score. The better of two trials was recorded (2). Muscular strength and endurance were assessed by utilizing the American College of Sports Medicine (ACSM) guidelines (2) for the push-up and one-minute curl-up tests. For the push-up test (2) males started in the standard "down" position (hands pointing forward and under the shoulders, back straight, head up, using the toes as the pivotal point) and females started in the modified "knee push-up" position (legs together, lower legs in contact with the mat with ankles plantar-flexed, back straight, hands shoulder width-apart, head up,

using the knees as the pivotal point). Participants were instructed to raise their body by straightening the elbows and returning to the "down" position until their chin touched the mat (their stomach should not touch the mat). The maximal number of push-ups performed consecutively without rest was counted as the score. The test was terminated when participant's strained forcibly or were unable to maintain correct technique within two repetitions. For the curl-up test (2) participants were instructed to assume a supine position on a mat with knees at 90 degrees. Arms were to be placed at the side, palms facing down with their middle fingers touching a piece of masking tape on the mat. A second piece of masking tape was placed 10 cm apart below the first piece of masking tape. Shoes remained on during the test. Next, participants performed slow, controlled curl-ups while lifting their shoulder blades off the mat (elevation of the trunk to 30 degrees). Once their middle fingers touched the second piece of masking tape (10 cm apart) they returned to the starting position for the next repetition. Participants performed as many curl-ups as possible without pausing for one-minute. Once again, the test was terminated for the same reasons as the push-up test.

Participants of the 12-week exercise program met three times per week (Monday, Wednesday, Friday), for one-hour exercise sessions (6am group, 12pm group). The one-hour exercise sessions consisted of a 10-minute warm-up, 45-minute exercise class, and five-minute cool-down. The exercise program consisted of a variety of cardiovascular and strength training classes targeting all major muscle groups and ranging from moderate- to

high-intensity exercise. More specifically, exercise classes included boot camp, whole-body weight training, dance fitness, and walking and/or running. Participants had the choice of which classes they would attend. For example majority of the participants participated in boot camp on Monday, running on Wednesday, and whole-body weight training on Friday. All classes were supervised by exercise physiology students that were certified trainers and certified in CPR/First Aid. All classes followed a periodized/overload training format in which classes started at a lower-intensity and progressively increased to a higher-intensity. Exercise variables that were altered to elicit a new training stimulus and to avoid an overtraining effect included: exercises, sets, repetitions, rest intervals, and intensity.

Resting blood pressure, body mass, resting heart rate, post-exercise heart rate, recovery heart rate (after a five-minute cool-down), and ratings of perceived exertion (RPE) were assessed on a weekly-basis for all participants. These measurements were assessed so that each participant's progress and exercise intensity could be monitored. Resting blood pressure was assessed with a stethoscope. All participants were taught how to take their own heart rate at the radial site (2). Heart rate was used to assess each participant's target heart rate and was explained to all participant's that health-benefits were more likely to occur if they consistently exercised within this range (1). Target heart rate was calculated using the following formula: $220 - \text{age} = \text{max heart rate}$; $\text{max heart rate} - \text{resting heart rate} \times .60-.85$ (target heart rate intensity range) + resting heart rate (1). Finally, RPE was

assessed with the Borg Scale of six (no exertion at all) to 20 (maximal exertion) (3).

Statistical Analysis

All data were analyzed with SPSS version 17.0 (SPSS Incorporated, Chicago, IL) with an a-priori α level of ≤ 0.05 . Males and females physical characteristics (age, weight) were compared using independent samples t-tests. Body mass, curl-ups, push-ups, sit-and-reach, and balance results were assessed prior to (pre) and after (post) the 12-week exercise program using paired samples t-tests. NOTE: Gender differences were analyzed and females were significantly different than males in all health-related variables. Due to the low sample size, males were left out of the final paired samples t-tests analysis so it could be observed how females improved from pre- to post-testing.

Table 1. Physical characteristics for age and weight.

	Females ($n = 51$)	Males ($n = 6$)
Age (years)	48.33 \pm 8.80	47.64 \pm 11.54
Weight (kg)	94.95 \pm 27.14	90.64 \pm 21.19

RESULTS

Independent samples t-tests revealed no significant differences in males and females physical characteristics for age and weight (Table 1). Paired samples t-tests illustrated a significant ($p < 0.001$) decrease in body mass (91.88 \pm 24.14 kg pre; 90.45 \pm 23.06 kg post) (Figure 1) and significant ($p \leq 0.001$) improvements in curl-ups (32.8 \pm 11.4 pre; 45.7 \pm 13.7 post), push-ups (16.3 \pm 11.6 pre; 27.0 \pm 11.5 post) (Figure 2), sit-and-reach (23.7 \pm 10.8 cm pre; 27.5 \pm 11.6 cm post) (Figure 3), and balance (2.2 \pm 0.7 pre; 1.7 \pm 0.5 post) (Figure 4).

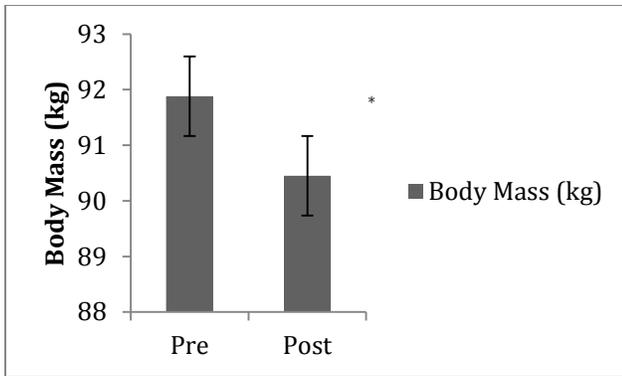


Figure 1. Average body mass (kg) from pre- to post-testing. *significantly different from pre-testing ($p < 0.05$ for all).

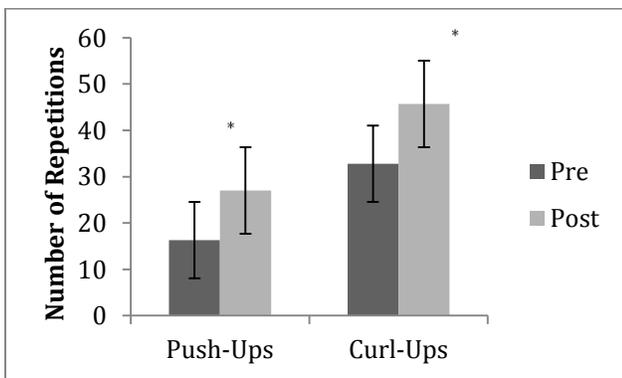


Figure 2. Average push-ups and curl-ups from pre- to post-testing. *significantly different from pre-testing ($p < 0.05$ for all).

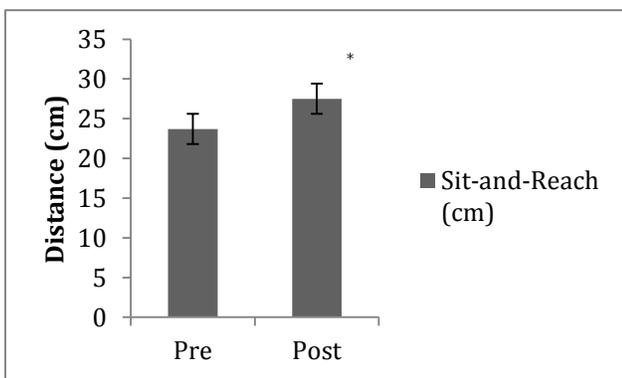


Figure 3. Average sit-and-reach (cm) from pre- to post-testing. *significantly different from pre-testing ($p < 0.05$ for all).

DISCUSSION

This study examined the effectiveness of a 12-week exercise program designed for the

faculty and staff at a large, public, American university with specific aims at improving body mass, muscular strength and endurance, flexibility, and balance. Today's workers are faced with increased opportunities for sedentary behaviors, physical inactivity, and poor nutritional intake due to the type of work (office work), inflexible work hours, and easy access to fast food and unhealthy snacks. However, it is possible to develop healthy behaviors and ultimately improve the health and well-being of workers if proper worksite health promotion programs are implemented.

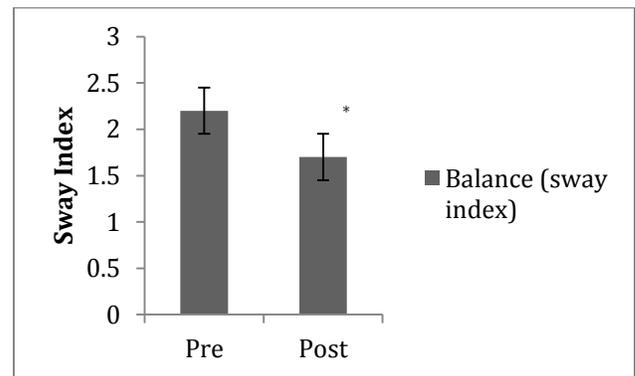


Figure 4. Average balance (sway index) from pre- to post-testing. *significantly different from pre-testing ($p < 0.05$ for all).

Results from this study demonstrated that after a 12-week faculty and staff exercise program body mass, muscular strength and endurance, flexibility, and balance significantly improved from pre- to post-testing for females. Males did see improvements from pre- to post-testing but these improvements were not significant. These outcomes were expected as previous research has indicated that worksite health promotion programs have the ability to improve health-related variables (4, 5, 9, 13). However, limited evidence exists for the effect of physical activity programs

incorporating a variety of intensity-related classes at large, public, American universities on health-related variables. This current study provides evidence that a well-designed 12-week exercise program can improve health-related variables for faculty and staff in a university setting. More importantly, the casual impact of a 12-week exercise program and its influence on faculty and staff is now known.

Caloric expenditure is one of the many reasons why individuals participate in physical activity (10). Since majority of workers either sit or stand still for a large portion of the working day they are not achieving a sufficient caloric expenditure (14). With this being known, workers are possibly more at risk for being overweight and/or obese and therefore increasing their risk for developing chronic diseases (14). Results from this study demonstrated that after a 12-week exercise program participant's had a significant decrease in body weight (91.88 ± 24.14 kg *pre*; 90.45 ± 23.06 kg *post*). When relating this 12-week exercise program to a chronic time frame such as 30-minutes of exercise three times per week for one year one would expect greater weight loss.

Limitations of the current study included exercise equipment, majority of the participants being female, and no control group. Due to the number of participants ($n = 57$) there was a limited number of exercise equipment in terms of resistance bands, medicine balls, dumbbells, etc. Also, since majority of the participants were female ($n = 51$) our findings cannot be generalized towards males with no causal impact being known. Diet was not assessed nor controlled for. Participants did have

the opportunity to attend health and nutritional seminars, however attendance was not recorded. Finally, our study only included a treatment group with no control group. Future research should include a sufficient amount of exercise equipment for all participants, a greater number of male participants (larger sample size) so findings can be inferred to them, controlling for diet or at least providing nutritional information, and a control group in order to know if the improvements in this study were due to the 12-week exercise program or some other external factor(s). NOTE: Compliance was assessed with the current study; however, it was not included in the data analysis. Future research should also focus on monitoring compliance as this is an important factor involved in changing one's health behaviors (1, 11).

A 12-week exercise program for faculty and staff at a large, public, American university is capable of promoting healthy behaviors due to increased opportunities for participation in physical activities. More specifically, improvements were seen in body mass, muscular strength and endurance, flexibility, and balance which all have important implications in the efforts to combat the development of overweight and obesity, sarcopenia, and ultimately debilitating chronic diseases. While further research is needed, the ability of this program to improve health-related variables in faculty and staff at a university setting is encouraging.

Findings from the current study demonstrate that a 12-week exercise program for faculty and staff at a university setting is encouraging at improving several health-related variables, more so for

females than males. Careful attention must be directed towards the development of appropriate exercise classes and programs, follow proper progression guidelines, and provide modifications for all exercises as this will possibly increase the adherence and participation within exercise programs at the worksite (1, 6).

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