

Using experiential learning in undergraduate exercise science to provide university worksite wellness programs

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Abstract The workforce in the U.S. is aging, and “lifestyle diseases” are becoming more prevalent among workers of all ages. Individualized wellness interventions are promising prospects in improving the health status of employees. Universities provide a unique opportunity for their students to utilize their knowledge and skills to develop wellness programs for university employees. The purpose of this study was to determine the efficacy of providing an 8-week student-led wellness program on health and fitness outcomes. Twenty (3 male, 17 female; 40.4±9.2 years) full-time employees at two separate universities underwent an 8-week program consisting of a dietary consultation, individualized exercise program, and weekly nutrition and fitness education newsletters. Three-day food records, resting heart rate, resting blood pressure, waist circumference, waist-to-hip ratio, body mass, and body fat percentage were measured pre- and post-intervention. Fitness assessments for cardiorespiratory and muscular fitness, and flexibility were assessed with the YMCA 3-minute step test, the squat and push-up tests, and the sit-and-reach test, respectively. Total energy intake (TEI), carbohydrate, protein, and fat intakes (%TEI) were determined from the food records. There were no pre- vs. post-intervention differences in resting heart rate, resting blood pressure, waist-hip ratio or body mass. However, the body fat percentage (34.4±12.4 vs 33.4±12.0%), the YMCA 3-minute step test recovery heart rate (109.4±22.7 vs 101.3±18.1 bpm), the squat test performance (37.8±14.2 vs 43.05±12.5 reps), and the sit-and-reach test (34.1±16.6 vs 39.5±18.0 cm) improved pre- to post-intervention. TEI, carbohydrate, and fat intakes were similar, but protein intake significantly increased following the intervention (16.2±5.1 vs 21.9±9.2%TEI). In summary, an 8-week student-led individualized worksite wellness program significantly improved physical wellness by lowering body fat percentage and improving cardiorespiratory and muscular fitness. These results suggest that integrating student learning experiences into employee wellness programs is an effective and feasible method of improving employee wellness.

Keywords: Physical activity; worksite wellness; exercise science education; healthy lifestyle

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1. Introduction

According to the Centers for Disease Control, 6 in 10 adult Americans have at least one chronic disease and 4 in 10 have two or more [1]. Heart disease, stroke, cancer, diabetes, obesity and other chronic diseases are the leading cause of death and disability and present a considerable economic burden accounting for approximately 90% of the 4.3 trillion annual health care expenses in the U.S. [2, 3]. A major lifestyle contributor is lack of physical activity [4]. Given that Americans working fulltime spend approximately one third of their day at work [5] and that work is largely sedentary, worksite wellness programs present an opportunity to assist with decreasing costs associated with absenteeism and overall healthcare costs.

Currently approximately 46% of companies offer worksite health promotion programs in some capacity with larger companies (+500 employees) most likely to have a wellness program in place [6]. Although data is equivocal regarding short term employer cost benefits of worksite wellness programs [7], the majority of studies report improvement in job satisfaction, self-reported productivity, patient-outcomes, and worker safety (i.e. decreased injuries) [8,9]. However, programs vary in scope and method of implementation making outcome comparisons difficult. The extent of wellness programs is largely dependent on the size of the company with larger companies able to offer more comprehensive wellness programs [6]. Although all programs focus on modifiable lifestyle changes to reduce chronic disease, physical activity and nutrition program components are the most common [6]. Physical activity programs typically focus on aerobic fitness and neglect muscular fitness [10]. A recent

review of physical activity programs found that most wellness programs did not meet physical activity guidelines. Those with good fitness practices tend to be the most successful with improvements in fitness and body composition [11,12].

Despite the potential benefits of worksite wellness programs, lack of employee participation can be problematic. Studies investigating barriers to participating in worksite wellness programs have found that employees are more likely to participate if there are incentives, health risk appraisals, and biometric screening, and frequent communication from wellness staff [13,14]. Those with previously diagnosed chronic health conditions are more likely to participate in programs [15]. Identified barriers to participation include lack of time, motivation, location, lack of facilities, and confidentiality concerns [15].

Universities provide a unique setting to address both employer and employee worksite wellness program barriers while also supporting experiential learning. Universities have the resources and facilities to support physical activity for employees at low cost [16]. Further, universities have students who benefit from experiential learning [17]. Although data are limited, a few studies have shown that wellness programs developed and implemented by medical students [18] and dietetic students [19] have demonstrated improvement in health outcomes. However, there is little data on the effectiveness of exercise science undergraduate students for the development and implementation of individualized exercise programs. Therefore, the purpose of this study was to provide undergraduate exercise science students with the opportunity to apply classroom concepts of health and fitness screening and individualized exercise programs to a university wellness program and determine the effects on health and fitness outcomes.

2. Materials and Methods

This study was an experimental, pre-post study design. Study participants were recruited from two separate universities (a regional university in the western United States and a land-grant regional university in the central United States.). Participants were recruited via email blasts at the beginning of spring semester 2022. After confirmation of study eligibility, participants were informed of study purpose, procedures, and risks and benefits prior to giving written informed consent. Participants then completed baseline outcome measurements. The number of participants were limited to 40 (20 at each university) due to the resources available. The research protocol was approved by each university's Institutional Review Boards.

2.1. Study Participants

Of the total university employees who started the study protocol, 20 (3 male and 17 female) participants were included in this study. The reasons for exclusion were not complying with the study protocol and/or incomplete assessments described in the following section. Their mean $\pm$ SD age, height, body mass, and body mass index were 40.4 $\pm$ 9.2 years, 1.67 $\pm$ 9.5 m, 82.8 $\pm$ 21.8 kg, 30.0 $\pm$ 8.8

kg/m² respectively. All met the inclusion criteria of ≥ 18 years old, full-time university employee, and no medical supervision required to exercise. A health history enrollment form, the physical activity readiness questionnaire (PAR-Q+) [20], and the American College of Sports Medicine (ACSM) Participation Screening Guidelines [21] were utilized to assess the readiness to exercise. Any individuals who were categorized as "Medical Clearance Recommended" or "Medical Clearance Required" per the ACSM preparticipation screening algorithm [21] and/or who had the presence of any injuries that prevented them from regular exercise participation were excluded from the study.

2.2. Procedures

Following pre-activity screening, participants met with their assigned exercise science student coach for baseline anthropometric and fitness assessments. All exercise science student coaches underwent a training on assessments described below as well as completing a semester-long course on health/fitness assessments and exercise prescriptions. Following measurement of height and weight, 60-second manual resting heart rate and resting blood pressure were recorded. Cardiovascular risk was assessed with waist and hip circumference measurements and body composition with air displacement plethysmography (BodPod 2007A software version 5.4.6, Cosmed, USA). Next, cardiorespiratory fitness was assessed by recording the 60-second-post-exercise pulse following the YMCA 3-minute step test (YMCA Fitness Testing and Assessment, 4th ed. Cited in [21]). Muscular fitness was then assessed with the push-up (upper body) (Canadian Society for Exercise Physiology cited in [21]) and squat tests (lower body) [22]. Following muscular fitness assessment, flexibility was assessed with the Canadian Trunk Forward Flexion sit-and-reach test (Canadian Society for Exercise Physiology cited in [21]). All tests were compared to normative values to determine fitness levels.

Following baseline fitness tests, participants completed a 3-day food record consisting of two weekdays and one weekend day. Each study participant received a 20-minute individualized meeting consultation with a Registered Dietitian (RD) following the software analysis of their food record. The personalized nutrition consults included comparisons to the USDA MyPlate recommendations, MyPlate handouts, and other handouts specific to each client's needs. Each participant was asked to identify three nutrition-related goals to achieve for the duration of the 8-week wellness program. The 3-day average total energy intake (TEI) and macro nutrient, carbohydrate, protein, and fat intakes (%TEI) were determined using Food Processor Nutrition Analysis Software, ESHA Research 2018, version 11.6.522.

Once baseline fitness and dietary intake were assessed, the exercise science students met with each study participant to prescribe an exercise program and design an 8-week exercise program tailored to each participant's fitness goals and results of the baseline fitness assessments. Programs were evaluated by faculty mentors prior to implementation. Each exercise program contained the following components: warm up, dynamic stretching,

base workout, cool down, static stretching. The intensity, duration, and the frequency of exercise sessions were individualized based on the needs and goals of the study participants. Meetings (in-person or virtual) were held weekly with exercise science student coaches to adjust exercise programs and address any concerns. Weekly newsletters containing information regarding exercise and nutrition were sent via email to each participant. Each newsletter contained information relevant to the participants wellness goals: aerobic fitness, weight loss, or muscle strength. The individualized exercise program and the newsletters were provided over an 8-week period.

At the end of the 8-week exercise program, all anthropometric, nutrition, and fitness assessments were repeated. Pre- and post-measurements were then compared.

2.3. Statistical Analysis

Statistics were run via pairwise comparison of pre-versus post-8-week intervention with the level of significance (α) of 0.05 (SPSS Statistics version 28, IBM, USA). Paired sample *t*-test was used to evaluate all variables that were normally distributed, except resting heart rate, push-up test, and squat test, for which the nonparametric Wilcoxon signed-rank test was used. The descriptive statistics were also determined.

3. Results

Of all study participants, eight participants focused primarily on weight management, six on cardiorespiratory fitness, and six on muscular strength. There were no pre-vs. post-intervention differences in body mass (PRE: 82.8 ± 21.8 kg vs POST: 82.2 ± 21.7 kg, $t = 1.62$, $p = 0.06$), resting heart rate (PRE: 79.2 ± 13.8 bpm vs POST: 74.1 ± 12.3 bpm, $Z = 1.87$, $p = 0.06$), resting blood pressure (systolic PRE: 125.8 ± 11.7 mmHg vs POST: 122.7 ± 12.3 mmHg, $t = 1.68$, $p = 0.06$; diastolic PRE: 79.1 ± 5.8 mmHg vs POST: 76.2 ± 8.2 mmHg, $t = 1.49$, $p = 0.08$), waist circumference (PRE: 93.4 ± 20.8 cm vs POST: 93.0 ± 17.8 cm, $t = 0.21$, $p = 0.42$), and waist-to-hip ratio (PRE: 0.82 ± 0.11 vs POST: 0.82 ± 0.10 , $t = 0.07$, $p = 0.47$). However, there was a significant decrease in body fat percentage (PRE: 34.4 ± 12.5 % vs POST: 33.4 ± 12.0 %, $t = 3.04$, $p < 0.05$). The health outcome results are summarized in Figure 1.

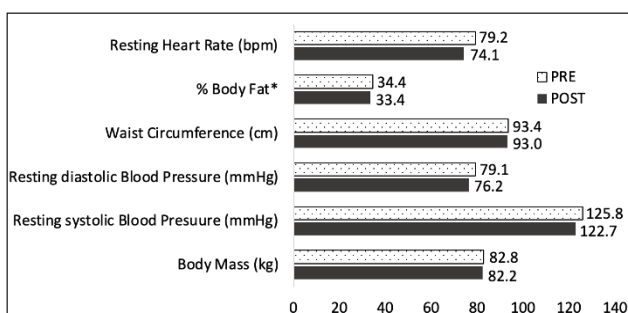


Figure 1. Health outcome changes following the 8-week wellness intervention. *denotes statistically significant results ($p < 0.05$).

Many fitness measures including the YMCA 3-minute step test recovery heart rate (PRE: 109.4 ± 22.7 bpm vs POST: 101.3 ± 18.1 bpm, $t = 2.63$, $p < 0.05$), the YMCA squat test performance (PRE: 37.8 ± 14.2 reps vs POST: 43.0 ± 12.5 reps; $Z = 1.98$, $p < 0.05$), and the sit-and-reach test (PRE: 34.1 ± 16.6 cm vs POST: 39.5 ± 18.0 cm, $Z = 2.86$, $p < 0.05$) improved following the wellness intervention (Figure 2).

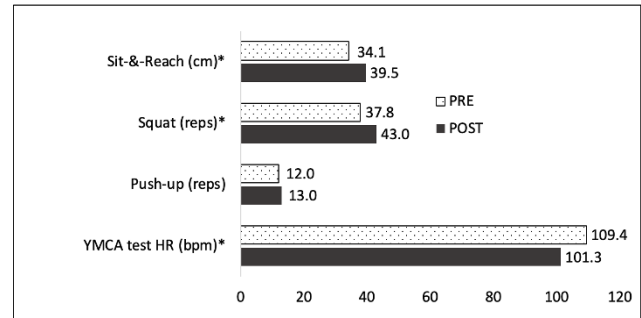


Figure 2. Fitness outcome changes following the 8-week wellness intervention. *denotes statistically significant results ($p < 0.05$).

While TEI, carbohydrate and fat intakes remained similar, protein intake significantly increased following the intervention (PRE: $16.2 \pm 5.1\%$ TEI vs POST: $21.9 \pm 9.2\%$ TEI, $t = 2.52$, $p < 0.05$; Figure 3).

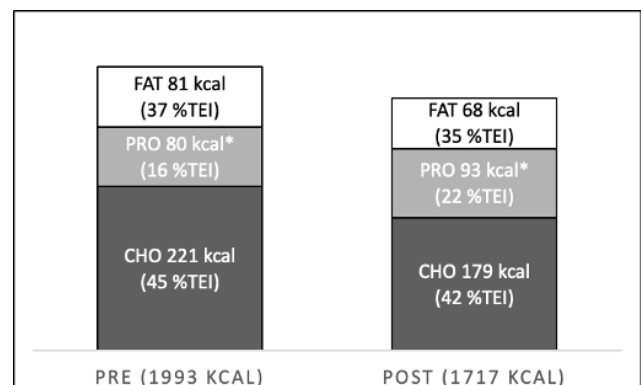


Figure 3. Change in the 3-day average dietary intake pre- vs. post-8-week wellness intervention. CHO = carbohydrate, PRO = protein, %TEI = percent of total energy intake. *The increase in PRO intake following the 8-week wellness intervention was statistically significant ($p < 0.05$).

4. Discussion

The present study investigated the effectiveness of an 8-week student-led worksite wellness program consisting of an individualized exercise program, an initial RD consult, and weekly physical activity and nutrition newsletters. This study was unique in that it utilized exercise science undergraduate students under the guidance of faculty mentors to provide individualized exercise training programs and weekly interactions with participants. This allowed the small universities to provide cost effective wellness programs while providing experiential learning for exercise science students. Participants in this 8-week program showed improvements in resting heart rate and percent body fat, as well as improved muscular fitness demonstrated by an increase in the average number of push-ups and squats completed by participants.

Worksite wellness programs have traditionally shown improvements in various health parameters and are often utilized in an effort to decrease employer health care costs [23]. This was demonstrated in a study by Levy & Thorndike [24] who provided a 10-week fitness and nutrition program where participants met with a RD and exercise specialist weekly. In addition to finding decreased body weight, waist circumference, percentage body fat, blood pressure (BP), and heart rate (HR), they showed quarterly health expenditures were \$236/quarter lower for participant's vs non-participants.

Several university worksite wellness studies have shown reductions in body weight, BMI, waist circumference, and blood pressure [25]. Gottesman et al. [26] had RD's provide nutrition and physical activity education at baseline, 12 weeks into the program, and again after 26 weeks. Radler et al. [25] and Touger-Decker et al. [27] also used RD's to provide nutrition and exercise education at baseline and after 12 weeks. While these studies showed similar results to the current study, our study consisted primarily of an individualized exercise program with only one RD consult supported by weekly newsletters. Furthermore, these studies were completed at large universities with the resources to provide broad employee wellness programs led by health professionals. A meta-analysis by Mulchandani et al. [28] showed the same results but did not specify if the studies were conducted at large or small universities.

The students acquired valuable insight into the challenges of helping participants achieve lifestyle changes. A project by Deinhart et al. [29] paired students from the Department of Kinesiology's physical activity behavioral interventions class with university employees meeting eight times over the ten-week program. While this study did not look at specific health parameters, their findings showed an increase in the average number of days employees were active. Participants also showed an increase in confidence in their ability to sustain their improved physical activity. This is one of few studies which showed that utilizing students in a hands-on learning environment can assist in increasing physical activity of sedentary participants in an academic worksite setting.

Although a Registered Dietitian Nutritionist provided nutritional education in many of these studies, the studies reviewed above did not discuss their nutritional findings. In the current study, RDs reviewed the results of 3-day food records individually with each study participant and directed nutrition goal setting at the beginning of the project. Nutrition and exercise education was provided in the form of weekly newsletters which were written by students and faculty. When looking at results including nutrition education, it is important to look at changes in nutritional intake which may have an effect on the health parameters measured. The changes in dietary intake along with the improved physical activity may have assisted in producing the decreases in waist circumference, and body fat percentage seen in this study. The decrease in waist circumference and body fat percentages may lead to decreased risk for cardiovascular and/or metabolic diseases.

The small number of participants was a limitation of this study. Students who provided the assessments and

exercise prescriptions for this study were volunteers and not connected to a specific grant or classroom experience. Due to student time and scheduling constraints, the number of participants was limited to provide a quality experience for students and study participants. Having a wellness program project integrated into a specific class where students are required to participate or obtaining a research grant where students would be compensated for their time would possibly increase the number of student coaches available and therefore, increase the number of available slots for participants.

Exercise science students provided the physical activity counseling while RDs who were faculty provided the nutrition counseling. It would be beneficial in the future to have nutrition students take part in the nutrition counseling portion of the wellness program to provide practical application experience to students in other disciplines.

5. Conclusion

In this study, participants who completed an 8-week student-led employee wellness program consisting of an individualized exercise program designed by undergraduate exercise science students combined with one RD consult and weekly health newsletters improved their resting heart rate, decreased their percent body fat, and improved both upper and lower body muscular fitness. These results demonstrate that utilizing students in the implementation of a worksite wellness program can assist in improving the health of university employees while also providing a unique experiential learning experience for students.

Students providing wellness education and individualized support to participants may provide a way in which small universities, who do not have large budgets for a worksite wellness project, can provide wellness services for their employees while providing students with applicable employment skills. Course instructors who want to implement experiential learning, students who want practical experience in real-life settings, and employers who want to decrease health care spending by improving the health of their employees would all benefit from this model.

Statement of Competing Interests

The authors have no competing interests.

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