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Exercise Is Medicine on Campus®: A Pilot Study

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Abstract

The primary objective was to (a) test the effectiveness of an Exercise Is Medicine® on Campus (EIM-OC) program in a university setting and (b) compare the baseline levels of physical activity, mental health, and physical health with post-EIM-OC levels. Referred and consenting students ($n = 9$) participated in a 12-week program. At pre- and postprogram, participants completed measures of current health behaviors, obstacles to physical activity, health goals, physical activity history, biometric screening (resting heart rate, blood pressure (BP), waist-to-hip ratio, body composition percentage via bioelectrical impedance, cardiovascular and muscular endurance baseline, and flexibility), perceived stress, and self-compassion. All of the participants adhered to 100% of the program. Participants experienced a decrease in resting heart rate, body composition, and BP and an increase in sleep, physical activity, and self-compassion. The program will be implemented with a larger sample of referred students with the goal of reducing risk or prevalence of chronic disease.

Keywords

Behavior change, exercise, medicine, self-compassion

College students do not meet regular physical activity (PA) recommendations, which negatively impacts sleep, academics, and experience heightened levels of anxiety, and stress (Lau et al., 2013; Small et al., 2013). The current generation of college students has higher prevalence of mental disorders, attention disorders, chronic disease, sleep problems, and suicide ideation (Collins et al., 2018; Gallagher, 2011; Ogden et al., 2010; Twenge, 2017; Twenge et al., 2010; Weitzman, 2004). While regular PA positively impacts mental and emotional health, PA interventions require adequate adherence, standardization, validation, and fidelity to indicate long-term effectiveness (Plotnikoff et al., 2015; Small et al., 2013). Therefore, it is necessary to implement valid and reliable interventions that promote PA, mental health, and reduction in chronic disease.

One program that has shown initial effectiveness is the Exercise Is Medicine® on Campus (EIM-OC) program. EIM-OC is implemented on college campuses to promote the use of PA

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to prevent obesity and a number of chronic diseases (American College of Sports Medicine [ACSM], 2018). A recent review found that prescribing exercise as medicine can be effective in treating 26 different psychological and physiological diseases including depression, anxiety, diabetes, hypertension, coronary heart disease, and cancer, among others (Pedersen & Saltin, 2015). EIM-OC is a program that is implemented by the American College of Sports Medicine on university campuses, in workplaces, in pediatric and older adult clinics, and other clinical practices (ACSM, 2018). EIM-OC is beneficial in that it establishes PA as part of campus culture, encourages the prescription of PA alongside counseling services and student health services, and connects university campuses through a referral system of exercise prescription (ACSM, 2018). EIM-OC has been implemented internationally with varying degrees of rigor and levels of informational and behavioral intervention techniques (Lagally et al., 2019). The University of West Georgia (UWG) has obtained gold status for implementation of EIM-OC over the past 5 years. This project is the first to evaluate the effectiveness of the rigorous EIM-OC program at UWG.

The primary objective of the project was to (a) test the effectiveness of the validated EIM program at UWG and (b) evaluate the treatment effectiveness of the EIM-OC program by comparing the baseline levels of PA, mental health, and physical health with post-EIM-OC levels of PA, mental health, and physical health.

Materials and Methods

Participants

Participants included students who expressed interest in the EIM-OC) and met the inclusion criteria. In order to be eligible for the program, participants must have met two of the three criteria: (1) blood pressure (BP) over 140 and/or 90 (three consecutive measurements over 2 weeks taken by Wolf Wellness Lab personnel or physician), (2) body mass index (BMI) over 30, and/or (3) diagnosed chronic condition or currently taking medication for chronic condition (documentation required). A chronic condition included but was not limited to prediabetes, diabetes, high BP, anxiety, depression, arthritis, osteoporosis, and asthma. A total of nine students met the inclusion criteria and consented to participate in the program ($n = 4$ males, $n = 5$ females).

Measures

All of the measures and questionnaires were administered via paper-and-pencil assessment during the initial consult.

Medical history profile. This measure solicited self-reported gender, age, height, weight, BMI, and exercise preparticipation health screening.

Self-Compassion Scale–Short Form (SCS-SF-12). The SCS-SF (Raes et al., 2011) was a 12-item short form of the Self-Compassion Scale that measured one's level of self-compassion. Self-compassion is comprised of three dyads: self-kindness versus self-criticism, common humanity versus isolation, and mindfulness versus overidentification (Neff, 2003). Self-kindness measured an extension of warm, loving-kindness toward oneself during difficulty, rather than criticism or judgment. Common humanity viewed difficulty as part of being human that everyone experiences rather than something only that individual experienced. Lastly, mindfulness required awareness and perspective throughout difficulty rather than ruminating on or overidentifying with said difficulty (Neff, 2003). These three dyads comprised the overall self-compassion score that was determined based on the 12-item questionnaire. Participants completed the 12-items on a 5-point scale ranging from (1) *almost never* to (5) *almost always*. Confirmatory factor analysis indicated a single higher order factor explained the intercorrelation between the six subscales of the self-compassion long-form (nonnormed fit index = .96, comparative fit index = .97), high internal consistency ($\alpha = .86$), and strong retest reliability over 5 months (.71; $r = .98$; Raes et al., 2011).

Perceived Stress Scale (PSS). The PSS (Cohen & Williamson, 1988) was used to assess perceptions of stress over the past month. The PSS contained 10 items that measured perceived stress over the past month. Scores had good internal consistency, with Cronbach's α typically in the mid-to-upper .80 range. Test–retest reliability ranged from $r = .55$ (6 weeks) to $r = .85$ (2 days; Lee, 2012). Validity evidence was supported by positive associations with anxiety and depression (Lee, 2012).

Godin Leisure-Time Exercise Questionnaire (GLTEQ). The GLTEQ measured the weekly (typical week) frequency of strenuous, moderate, and mild exercise (Godin & Shephard, 1985). Total exercise was the sum of the frequency of strenuous activity × nine METs, moderate activity × five METs, and mild activity × three METs. It had good 1-month test−retest reliability ($r = .64$) and had significant associations with maximum oxygen intake (VO2 max), body fat, and muscular endurance (Gionet & Godin, 1989; Godin & Shephard, 1985).

Biometric screening

BMI. BMI was calculated by dividing weight (kg) by height (m) squared. Direct measures of height and weight were obtained with a stadiometer and digital scale, respectively.

Body composition (BC). BC was determined using bioelectrical impedance analysis (BIA). BIA estimates of BC had strong correlations with the dual-energy X-ray absorptiometry (DXA) method ($r = .82$–.95; Boneva-Asiova & Boyanov, 2008).

Muscular endurance tests. A dynamic muscular endurance test measured the maximum number of push-ups, squats, and curl ups completed in 60 s trials (Isear et al., 1997; Parfrey et al., 2008). The push-up test began in the standard "down" position, raising the body by straightening the elbows and returning to the down position, with a straight back. The curl-up test required two pieces of masking tape placed 12-cm apart, with the participant lying on their back and arms at their sides. With their middle finger at the 0-cm mark, participants curled up so that the middle finger reached the 10-cm mark on the mat. They then lowered back down so that their shoulders and head touched the mat and fingers return to the 10-cm mark. The push-up, sit-up, and repeated squat tests had high test–retest reliability (intraclass correlation = .93–.95, intraclass correlation = .83–.93, $r = .95$, respectively; Alaranta et al., 1994; Ryman et al., 2009).

Fitbit Charge3. Fitbit Charge (Fitbit Inc., San Francisco, CA, USA) is a commercially available wireless activity-tracking wristband that was used to measure sleep and PA levels. The Fitbit Charge device was a reliable and valid device to monitor PA and sleep among an adult population (de Zambotti et al., 2016). Participants were asked to wear the device on the wrist of their nondominant hand and "a finger's width above the wrist bone, and not too tight" (Fitbit Inc.). For accurate sleep and PA data, participants wore the device for at least 4 consecutive days (Troiano et al., 2008).

Adverse events and participant satisfaction. Questions were created to receive feedback from participants regarding reports of adverse events and participant satisfaction (e.g., Did they enjoy the EIM-OC program? Did it encourage them to be more active than usual? Did they experience an event that negatively impacted participation? If so, provide details.).

Procedure

Upon institutional review board approval, students who were referred to EIM-OC from Counseling and Health Services or had heard about EIM-OC on campus email EIM-OC@westga.edu. Interested students attended an initial 30-min consultation in the Wolf Wellness Lab to determine eligibility for the program. During the initial consult, participants completed the informed consent for EIM-OC and for the research study, was screened for eligibility, and completed a medical history profile, as well as the Perceived Stress Scale and Self-Compassion Scale. Medical clearance for exercise required for participation was determined by Wolf Wellness Lab personnel based on ACSM exercise preparticipation screening guidelines. Wolf Wellness Lab personnel, American Council on Exercise (ACE) Personal Trainer certified and EIM-OC certified, determined eligibility and asked for physician

Table 1. Exercise Plan and Instructional Meetings.

Session 1: Initial consult and preassessment	Preprogram assessments included the perceived stress scale, self-compassion scale, resting heart rate, waist-to-hip ratio, body composition, cardiovascular and muscular endurance, and flexibility
Session 2: How to determine exercise intensity	Recommendation of personalized exercise intensity range using the target HR, rating of perceived exertion, or talk test method. Sampling of how to determine proper intensity during exercise and how to adjust intensity accordingly
Session 3: Weight room machine orientation	Orientation of weight room etiquette and safety procedures. Orientation of adjustment, use, and purpose of selected machines and equipment (e.g., leg press, lat pull-down, seated row, chest press)
Session 4: Free weights exercise technique	Orientation of free weights and bodyweight exercise technique for selected basic exercises. Form and proper execution will be emphasized (e.g., push-ups, dumbbell rows, squats, plank)
Session 5: How to determine beginning weights	Beginning load for recommended exercises will be determined with the participant. Education of self-monitoring methods will be encouraged
Session 6: Exercise progression: when and how?	Recommendations on when and by how much to progress from initial exercise recommendations will be reviewed. Modifications and alternatives to initial exercise recommendations will be given
Session 7: Compound and functional movement techniques	Alternative exercises and stretches to incorporate compound movements and functional movements into the program will be introduced. Form and proper execution will be emphasized (e.g., kettlebell swing, squat with shoulder press, hanging leg raise)
Session 8: Postassessment	Postprogram assessments included the Perceived Stress Scale, Self-Compassion Scale, resting heart rate, waist-to-hip ratio, body composition, cardiovascular and muscular endurance, and flexibility

approval if needed. Measures of BP and body mass index were also conducted at the initial consult. Following the initial consult, participants attended a follow-up appointment in which they participated in an interview assessing current health behaviors, obstacles to adherence, health goals, and PA history. Biometric screening was assessed for each participant, including resting heart rate (RHR), waist-to-hip ratio, BC percentage via bioelectrical impedance, cardiovascular and muscular endurance baseline, and flexibility.

Following the initial consult and biometric screening appointment, consenting participants had the option to participate in six biweekly exercise plan and instruction meetings that lasted approximately 30 min in length. Consenting participants were provided a Fitbit Charge3 device to wear for the duration of the EIM-OC program as a way to track sleep and PA behavior. The recommended exercise plan was created, reviewed, and provided to participants by research staff that are certified ACE Personal Trainers in the Wolf Wellness Lab. Trainers provided instruction on proper exercise form and observed participant execution of each exercise to help improve any poor form. A description of the six sessions can be found in Table 1. In between sessions, participants were provided a weekly exercise plan tailored to their goals and needs. Participants were made aware that they could withdraw from the research study at any point, even if they wished to remain part of the EIM-OC program.

Following the 12-week exercise plan, participants completed postmeasures of Perceived Stress Scale, Self-Compassion Scale, RHR, waist-to-hip ratio, BC percentage via bioelectrical impedance, cardiovascular and muscular endurance baseline, and flexibility. Participants also returned the Fitbit Charge 3 device. Participants also had the opportunity to provide anonymous feedback regarding the EIM-OC program, drawbacks to participation, and methods to improve the program. Upon completion of the EIM-OC program, participants had the option to purchase additional personal training or physiological assessments for a monetary fee, which was not included in the research study.

Table 2. Pre-EIM Program Assessment Information.

Participant Number	Referral Source	BP	RHR	BMI	BC	Waist/Hip	HR/RPE	Endurance
Participant 1	University website	147/89	105	43.50	44.00	50/51	191/8	36; 25; 19
Participant 2	Counseling	132/82	90	34.40	37.00	42/44	—	30; 22; 24
Participant 3	Health services	155/87	80	39.50	34.20	50/49.5	179/7	25; 11; 15
Participant 4	Health services	135/84	91	43.00	44.30	46.5/51	168/8	28; 24; 18
Participant 5	Health services	117/80	67	44.30	44.70	41/54	168/4	35; 5; 40
Participant 6	Health services	122/70	66	34.90	39.40	43.5/46	109/3	25; 15; 28
Participant 7	Health services	133/97	83	53.50	49.90	54/61.5	113/4	25; 1; 1
Participant 8	Health services	159/113	106	49.80	47.70	52/56.5	137/4	0; 30; 20
Participant 9	Counseling	101/76	80	31.80	34.30	38/41.5	138/4	29; 15; 25

Note. BP = systolic/diastolic blood pressure; RHR = resting heart rate; BMI = body mass index; BC = body composition; waist/hip = waist and hip measurements in inches; HR/RPE = heart rate and rating of perceived exertion on a cardiorespiratory endurance test; endurance = squats, push-ups, curl ups in 1 min each; EIM = Exercise is Medicine.

Table 3. Post-EIM Program Assessment Information.

Participant Number	Referral Source	BP	RHR	BMI	BC	Waist/Hip	HR/RPE	Endurance
Participant 1	University website	134/92	97	43.40	43.90	50/50	157/6	34; 24; 26
Participant 2	Counseling	109/83	79	34.80	37.00	42/44	—	34; 18; 33
Participant 3	Health services	137/89	69	39.70	35.80	50/49	144/4	37; 29; 25
Participant 4	Health services	109/83	70	42.00	43.90	44/51	170/3	38; 21; 11
Participant 5	Health services	113/69	66	44	45.2	40/52	122/5	57; 17; 47
Participant 6	Health services	110/72	64	36.2	40.5	45.5/46	115/3	27; 26; 38
Participant 7	Health services	125/82	78	49.5	49	47/57	134/3	37; 9; 36
Participant 8	Health services	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Participant 9	Counseling	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Note. BP = systolic/diastolic blood pressure; RHR = resting heart rate; BMI = body mass index; BC = body composition; waist/hip = waist and hip measurements in inches; HR/RPE = heart rate and rating of perceived exertion on a cardiorespiratory endurance test; endurance = squats, push-ups, curl ups in 1 min each; EIM = Exercise is Medicine; n/a = not applicable.

Data Analysis

Descriptive statistics examined means, standard deviation, and ranges for demographic variables and outcome variables (PSS < SCS-12, GLTEQ, Fitbit PA, biometric screening results). Paired sample *t* tests were used to examine differences in pre- and postprogram variables (i.e., PSS, SCS-12, GLTEQ, Fitbit PA, biometric screening results). Participant adherence to the EIM-OC program was also assessed with means and frequencies.

Results

Participants included nine individuals. All nine participants completed 100% of the exercise program sessions. When asked about obstacles to regular PA, participants responded with main reasons including a lack of motivation, accountability, knowledge, and medical concerns. In regard to setting various goals for the program, participants desired to lose weight, improve strength, improve cardiorespiratory endurance, and improve mental health. Lastly, when asked about preferred modes of exercise, participants responded with walking, weight lifting, and group fitness classes; and two participants had no interest in exercise at all.

Preprogram participant demographic and referral information can be seen in Table 2, and postprogram information can be seen in Table 3. The change in outcome variables from pre-to-post was calculated based on the seven participants who completed both the pre- and postprogram measures. Two participants declined to complete postprogram assessments, providing seven participants with pre- and postdata. From pre- to post-program, 100% of the participants experienced a decrease in BP and RHR and 100% of the participants experienced a reduction or maintenance in BC ($n = 7$). Furthermore, all of the participants experienced a reduction in rating of perceived exertion on the cardiorespiratory endurance test from pre- to postprogram. Lastly, 75% of the participants experienced an increase in muscular endurance from pre- to postprogram.

Participants accumulated an average of 9,092 steps per day while participating in the EIM-OC program. Furthermore, all participants scored as more physically active from preprogram ($M = 17.00$) to postprogram ($M = 39.00$ units) based on the GLTEQ. Participants reported an average of 8.78 hr each night of sleep while in the EIM-OC program. There was a significant increase in self-compassion from preprogram ($M = 2.83$) to postprogram ($M = 3.13$; $p = .02$). There was not a significant change in perceived stress from pre- to postprogram.

When asked for feedback about the program, two participants provided responses. Quote 1: "I know how to work out properly and what not to eat, but I would really love to know how certain foods would affect my health. I think that it would be beneficial if a nutritionist was brought in." Quote 2: "This program really helped me stay motivated to work out and get healthy. EIM-OC served as an accountability partner because I would always want to have something to show when going in each week."

Discussion

The purpose of this pilot study was to test the initial effectiveness of the EIM-OC program and evaluate the effectiveness of the EIM-OC program by comparing the baseline levels of PA, mental health, and physical health with post-EIM-OC levels of PA, mental health, and physical health. Overall, the EIM-OC program was effective in improving PA, self-compassion, and measures of physical health. The results of the study are discussed in regard to previous research, limitations of the present study, and aims for future research.

The EIM-OC program reduced BP, BC, and RHR, as well as systolic blood pressure (SBP) and diastolic blood pressure (DBP) from biweekly training and information sessions and self-directed exercise. The reduction in RHR, SBP, and DBP resulted from an average of 9,092 steps per day per participant. Although the significance of results are difficult to determine due to such a small sample size, the individual impact and overall trend of strength and aerobic training on BC, RHR, SBP, and DPB is consistent with previous research (Cornelissen et al., 2010; Garber et al., 2011; Ross & Janssen, 2001). Furthermore, participants reported high, weekly active minutes in terms of the GLTEQ. Participants reported meeting the recommended levels of leisure-time in previous studies (Lund et al., 2010; Roehrs et al., 1996). The results from this pilot study further support the reciprocal relationship between adequate sleep and PA, and the impact of both on health (Chennaoui et al., 2015). Further implementation and research with a larger sample size is needed to substantiate these results.

While there was not a significant change in perceived stress, participants did report a significant improvement in self-compassion following the program. Previous health behavior research has found self-compassion training to effectively improve self-regulation of health behavior, but little research has examined the impact of exercise on self-compassion (Biber & Ellis, 2017). While continued research is needed to examine the impact of PA on self-compassion, it is possible that participants experienced improvements in self-compassion through goal accomplishment, adherence to the program, improvements in self-efficacy associated with regular exercise, and social support (Iskender, 2009; Magnus et al., 2010; Neff et al., 2005).

These results also indicated the integral role that various stakeholders across the university can have in wellness and health promotion. This program enabled the Counseling Services staff to refer clients to participate in the program. While this was beneficial, it is crucial to broaden the scope of the program's reach. For example, personal trainers could be recruited from the Campus Recreation Center to aid in implementation of the program. Although the Wolf Wellness Lab had a weight room, a partnership with the Campus Recreation Center could allow for more participants to engage in exercise sessions given the resources and staffing available. This would also help in terms of advertising the program. Students who are consistently in the Campus Recreation Center may be more likely to see messaging or campaigns advertising EIM-OC. This could also increase the reach of the program via word-of-mouth to individuals who do not regularly visit the Campus Recreation Center from roommates or classmates. Lastly, students who participate in EIM-OC through may become more comfortable to exercise in the Campus Recreation Center through EIM-OC, promoting self-efficacy and participation in such services.

Participants attended all of the exercise sessions and engaged in self-directed exercise throughout the 12-week program. Participants also expressed enjoyment in the program and did not experience adverse effects or injury. These results emphasize the importance of trained EIM-OC staff and student workers who can provide competent and empathetic personal training, assessments, and evaluation. While further participants and a wider scope is needed to understand the full effectiveness of certified ACE and EIM-OC staff, the results support the university lab's mission of providing education, health services, student leadership, and advocacy (Biber et al., 2018; Maiorana et al., 2018).

This study was designed as a pilot study to evaluate an EIM-OC program prior to dissemination across the university campus. The main limitation of the study was the sample size. Only nine participants participated in the program. All of the participants experienced improvements in physical health, sleep, and self-compassion. However, in order to determine statistical significance, a larger sample size is required in future evaluation. While the university Wolf Wellness Lab has only been in operation for one year, the structure and the mission of the lab has provided competent training to students and health and wellness access to faculty, students, and community members (Biber et al., 2018). The results of this pilot study will be used to further implementation across campus in the coming fall 2019 semester. Furthermore, this study was a single-group design. There was not a control group to compare with nor was it a randomized controlled trial (RCT). Future implementation could consider using a two-group RCT design to better understand the true impact of the program.

Overall, this study indicated positive physiological, behavioral, and psychological results from a 12-week EIM-OC program with students with or at risk for chronic disease. While adherence tends to be an issue with exercise programs, participants in this study had high adherence and no adverse experiences, indicating strong initial support for further implementation (Weinstock, 2010). With improved marketing and advertising and a full year of implementation for the research study, a larger sample of students will be able to participate in the EIM-OC program, providing a large-scale evaluation. This program has helped connect the university's Wolf Wellness Lab, student health services, and counseling services through a network of exercise prescription and holistic health care. Future implementation of the EIM-OC program could also be implemented through assistance of the campus recreation center. The recreation center could provide the expertise of certified personal trainers, referrals, exercise equipment, and a safe place to provide exercise prescription. Continued implementation and evaluation can further create a culture of holistic health including psychological, physical, and behavioral health promotion.

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