Does Women on Weights Produce Changes in Self-Confidence and Mood Disturbance?

Zachery Worrell

Online Master of Agriculture and Life Sciences
Applied Nutrition and Physical Activity
Virginia Polytechnic Institute and State University

Angela Anderson, Ph.D. Department of Human Nutrition, Foods, and Exercise, Committee Chair

Jay Williams, Ph.D. Department of Human Nutrition, Foods, and Exercise

Alison Cross, M.S. Director of Recreational Sports

ABSTRACT

Depression and mood disturbances among college women are prevalent concerns, prompting the investigation of interventions to improve mental well-being. This study explores the efficacy of a structured resistance training program tailored for women in enhancing self-efficacy and reducing mood disturbances over a 4-week period. Participants were recruited voluntarily and underwent a 4-week Women on Weights program, consisting of twice-weekly sessions. Pre- and post-surveys, including Beck's Depression Inventory (BDI), Self-Efficacy for Exercise (SEE), and Abbreviated Profile of Mood States (POMS), were administered to assess changes in mental health outcomes. Statistical analyses were conducted using paired t-tests and unpaired t-tests. Results indicate a significant reduction in depression symptoms across all participants, as measured by the BDI. While the SEE Scale did not show significant changes, the POMS survey revealed significant improvements in the Esteem-Related Affect subscale, suggesting an enhancement in self-efficacy post-intervention. Additionally, a trending significance was observed in the POMS Depression subscale, indicating a potential impact on depression symptoms with a larger sample size. These findings highlight the potential of resistance training interventions to improve mental well-being among college women.

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INTRODUCTION

The 2nd edition of the Physical Activity Guidelines for Americans was released in 2018, reiterating that consistent physical activity is one of the most important things a person can do for their health regardless of age, sex, or current fitness level (U.S. Department of Health and Human Services, 2018). It is recommended that adults 18 years old and above, get at least 150 minutes of moderate-intensity aerobic exercise and/or 75 minutes of vigorous-exercise each week throughout multiple days with at least 2 days of resistance training each week. With these recommendations only 26% of males and 19% of females meet the minimum recommendations (U.S. Department of Health and Human Services, 2018). The guidelines even state benefits can be seen with a single session or inconsistent sessions for improving blood pressure, sleep, and for reducing anxiety symptoms while most reductions in depressive symptoms occur with habitual exercise.

Resistance training, strength training, and weightlifting are all used to describe the body's attempt at movement against an opposite force either by gravity or equipment (Fleck & Kraemer, 2014). Weight lifting initially relied on free weights such as barbells and dumbbells and even what the person had available to them such as discarded metal scraps and natural stones. Current advancements in technology, with the introduction of resistance machines in the late 20th century have revolutionized training methodologies (Fleck & Kraemer, 2014). The advancement of machines has provided a controlled environment for resistance exercises, allowing for safer and more isolated muscle targeting for the entire population (Kraemer & Ratamess, 2004). Over the years, there has been a shift towards integrating both free weights and resistance machines into training regimens, known as concurrent training, to maximize muscle hypertrophy and strength gains (Wilson et al., 2012). The development of pneumatic (gas) and hydraulic (liquid) resistance machines has further enhanced the diversity and effectiveness of resistance training programs especially among joint rehabilitation clients, older adults, and pregnant females (Haff & Triplett, 2016).

The historical development of collegiate recreational sports programs reflects a journey from informal student-led activities to structured university programs. This evolution, along with the growing recognition of recreation's role in enhancing the college experience, is evidenced by studies emphasizing its impact on student recruitment and retention (Kovac & Beck, 1997; Maas, 1999). Beginning with early intramural activities in the 19th century, recreational sports gradually transitioned to university-controlled programs by the early 20th century (Hyatt, 1977). The post-war era witnessed exponential growth, fueled by increased leisure time and government support, leading to the professionalization of recreational sports administration (Siedentop, 2022; Mueller & Reznik, 1979). Further developments, such as the introduction of Title IX and the shift towards more inclusive programming, marked significant milestones in the field's evolution (Colgate, 1978). Recent historical developments in collegiate recreational sports show its growing importance in co-curricular education, with National Intramural Recreational Sports Association (NIRSA) playing a pivotal role in advocating for competency and professionalism in the field (Lamke, 1990). Despite facing challenges such as legal liabilities and aging facilities, recreational sports programs continue to thrive, shaping the student experience and contributing to the broader goal of higher education (Keeling, 2005).

The World Health Organization estimates that more than 350 million people suffer from depression worldwide (Karmakar & Behera, 2017). BlackDeer et al. (2023) report more than 40 million Americans live with an anxiety disorder with 75% of these occurring before college graduation. Beiter et al. (2015) claim the increasing pressure on students to obtain a college degree as the key to success at the same time they are transitioning into college life, has increased the levels of depression, anxiety, and stress amongst college students. An article by Hunt & Eisenberg (2010) state that 50% of diseases diagnosed in young adults are mental disorders, with 17% of students, sampled among 26 universities, screening positive for depression. Beginning at the age of 13 (Girgus & Yang, 2015) and into college, women experience depression at twice the rate of males according to the American Psychiatric Association (2013) and Beiter et al. (2015). With BlackDeer et al. (2023) determining that depression is one of the main factors leading to poor academic performance and college dropout rates. Females seek treatment at a higher rate than males for depression but more often disclose unhealthy coping habits (Mahmoud et al., 2015).

LITERATURE REVIEW

Physical activity guidelines and the importance of strength training

As of 2016 only 26% of males and 19% of females meet the physical activity recommendations weekly, defined as 150 minutes of moderate-intensity exercise or 75 minutes of vigorous-intensity activity per week and 2 days a week of muscle strengthening activities (Piercy et al., 2018). This is concerning, especially when we know that "Physical activity reduces mortality, prevents various cancers, musculoskeletal and cerebrovascular diseases, improves metabolism, and is beneficial for mental health…Physical activity controls hypertension, diabetes, and dyslipidemia, thereby preventing cerebrovascular disease. It also improves obesity and insulin resistance, contributors to metabolic syndrome" (Yang., 2019). Yang continues pointing out that physical activity also shows a positive impact on the physical aspect of well-being (osteoporosis, arthritis, muscle pain, back pain, fibromyalgia, plantar fasciitis) as well as the mental aspect of well-being (depression, anxiety, stress, sleep, memory, concentration). Strong evidence also points to a direct correlation between physical exertion (endurance and resistance training) with reductions in both cardiovascular disease and blood pressure, depression, along with positive body composition modifications (Weggemans et al., 2018). A direct correlation also exists that links physical exertion to a reduction of risk for diabetes and an increase in the body's insulin sensitivity (Weggemans et al., 2018). The evidence keeps mounting as Weggemans et al. also showed how physical exertion can reduce the risk of a premature death, breast cancer, and colorectal cancer (Weggemans et al., 2018). For the elderly who participate in physical exertion exercises, the authors showed a reduction in skeletal fractures as well as a slower rate of cognitive decline usually associated with dementia (Weggemans et al., 2018).

The documented evidence on the relationship between weight lifting and the physical and mental health of females is well established (Piercy et al., 2018; Stein & Motta, 1992). In the physical realm, weight lifting leads to better overall fitness, increased metabolism, decreased obesity, decreased susceptibility to type 2 diabetes, and even aids the body from the impacts of illness (Piercy et al., 2018; Salvatore & Marecek, 2010). Weight-bearing exercise that pushes a person outside their normal daily activities are increasingly important for postmenopausal females, whose bone mineral density decreases at a faster rate than males as they age, to prevent or slow down the rate of osteoporosis (Salvatore & Marecek, 2010). To curb the onset of osteoporosis in postmenopausal females the goal should be to increase bone mass premenopausal as the younger skeletal system is more responsive to mechanical stressors with exercise having the greatest long-term impact on females 20-35 years old (Gleeson et al., 1990).

Weight lifting also has a direct impact on mental health and well-being as well, with exercise bouts as little as 10 minutes having a positive correlation on mood with the highest correlation among females (Rocheleau et al., 2004). The American Psychiatric Association (2013) states that body size and shape differences in females alter their self-evaluation with an increased susceptibility of females to disordered eating patterns, who are at a two-fold higher risk for depression when compared to males (Nolen-Hoeksema & Girgus, 1994). Weight training, even shorter consistent bouts, has shown to improve body image (Williams et al., 2020) and improve mood (Rocheleau et al., 2004).

Depression is a large cause of mortality and morbidity across the globe and may have an additive impact on chronic diseases (Gebrie 2020). Compliance with pharmaceutical medications is low, sometimes as low as 20% within the first 3 weeks of prescription (Lawlor, 2001). Repeated bouts of resistance training have shown improvements in self-esteem (Melnick

& Mookerjee, 1991) and emotional well-being for females (Tucker & Maxwell, 1992). Tucker & Maxwell (1992) even suggest that resistance training may be superior to cardiovascular training when looking at improvements in all facets of psychological health including depression. Doyne et al. (1987) was one of the first studies done on strength training in a clinical setting and they were able to show statistically significant decreases in clinical depression symptoms for moderate to severely depressed women ages 18-35 when following a strength training protocol. Doyne et al. (1987) used an 8-week period consisting of 4 exercise bouts each week under supervision. Post intervention they conducted follow-ups and found that depression symptoms remained low for participants in the study for up to 1 year after completion of the program. Tsutsumi et al. (1998) also found that in older adults, a moderate intensity program group reported a greater psychological benefit than the higher intensity group; something that needs further research to determine if this is related to self-efficacy in the program, if it was less physically demanding, or another factor.

Barriers to females in the weight room

With all the physical and/or mental health benefits tied to weight lifting, observational studies find that fitness centers are typically underrepresented with females in the weight training or resistance training areas (Brace-Govan, 2004). At Virginia Tech, McComas Hall is the location of recreational sports, including the fitness center. In agreement with Brace-Govan et al. (2004), Virginia Tech, with a student population of 43% female-identifying students in 2022 (*Facts about Virginia Tech, n.d.)*, reported only 34% unique female student swipes into McComas Hall (*Virginia Tech University DataCommons: Recreational Sports,* 2023), which equates to less than half of the female student population both on and off campus. In a Haines et al. (2008) study, they found that in the free weights section of the gym there were 27 men using the same piece of equipment for every 1 female present.

Salvatore and Marecek (2010) identified several main trends that might help explain the gender differences of the weight room floor. These include a feeling of being judged and evaluated by others in the gym, comparing one's body to others in the fitness area, and looking like they are novices or are making mistakes in the weight room in full view of people who appear to know what they are doing. Hall and Noonan (2023) identified five themes linking resistance training and mental health these included self-acceptance, personal growth, flow state, social affiliation, and autonomy. Hall and Noonan (2023) identified other quantitative studies who cite lack of time, lack of knowledge, and muscle soreness as barriers to resistance training for women. Hall and Noonan (2023) also identified the barriers of gender stereotypes/norms and females overhearing inappropriate conversations/comments by males that made females feel unsafe or uncomfortable in the space. These barriers should be addressed directly to the perpetrators by facility supervisors.

External messaging by fitness centers may play a role as well. Poor management practices can in turn potentially make females feel inadequate. Turnock (2021) gave an example of a sign located within the weight room that read: "*If you are too weak to return your weights, please contact the fitness staff and the girls will be happy to assist you.*" This messaging may be fueling the three themes Salvatore and Marecek (2010) mentioned by giving the impression that females are being judged, they are inept, or just generally that females do not belong in the space.

Salvatore and Marecek (2010) went further and offered several recommendations. One recommendation suggested was creating a private Women's Only weight room as Gold's Gym has done, but this could drive the misconception that women are not welcome or do not belong in a weight room by reaffirming gender coding and potentially perpetuating gender avoidance of the traditional weight room floor (Turnock, 2021). In addition, with the cost of equipment and space availability, this is a limiting factor and not feasible for most fitness organizations. However, a recent study for Newsweek conducted by Redfield and Wilton Strategies, interviewed 1,500 gym goers and 57% of Gen Z (ages 18-26) support the idea of a Women's Only weight room, while only 15% of Gen X (ages 44-59) support this idea (Rehfeldt, 2024). Another recommendation Salvatore and Marecek (2010) provide, is in lieu of continuing to highlight research studies and information on only the physical health benefits of weight lifting (or the negative effects of being sedentary), focus should be placed instead on breaking down the mental barriers to females feeling of belonging in all spaces of the weight room, with the physical benefits as an added bonus. These efforts can include creating communities of experienced weight lifters to assist the novice weight lifters, and creating a culture and community of females who feel empowered to stand up to toxic commentary or exclusion from areas of the weight room. This approach would not only create a better weight room atmosphere for females but for all people regardless of gender or skill levels, equipping them to succeed where the entire population benefits from resistance training.

Creating an inclusive weight lifting community increases continued adherence to exercise, which has been shown extensively within the CrossFit community where they have created a space for a sense of belonging to occur (Coyne & Woodruff, 2020). Coyne and Woodruff (2020) even reported participants mentioning that CrossFit has "provided them with opportunities to socialize, meet new people, build friendships, and be part of a supportive and positive community," further highlighting the importance of a welcoming and safe place for physical activity for everyone. Combining the suggestions of Salvatore and Marecek (2010) of creating a ‘community’ of veteran and novice gym-goers to support and teach each other, while also adding in the element of a private or semi-private space, Virginia Tech has a unique opportunity to do both with their Women on Weights program (*Small Group Training,* n.d.).

Weight lifting for women

Although policies that are inclusive to women are a start, Kruger et al. (2006) reports that only 17.5% of women routinely engage in resistance training or endurance training more than 2 days per week. Both resistance and endurance training have been shown to improve health benefits. Trujillo (1983) evaluated 3 groups of women based on intervention type for 1 semester, divided into an inactive, running, or weight training group. The authors found a reduction of self-esteem in the inactive group, while both the running and weight training groups saw an increase. Moreso, the weight training group saw a very significant increase in self-esteem. Nicole Golden (n.d.) broke it down into 5 key reasons all women should weight lift: Development of good movement patterns, improved self-confidence, increases in resting metabolic rate, decreased risk of metabolic syndrome, and improvements in bone mineral density.

College women have also responded with “increased feelings of vigor, physical self-concept, self-esteem, and self-efficacy, as well as decreased total mood disturbances” when adhering to a weight training regimen (Tsutsumi et al., 1998). Allison Aubrey (2024) with NPR, mentioned a study of 400,000 women with only 20% participating in regular exercise but all 20% had a reduction in cardiovascular mortality rates of 30% (Ji et al., 2024). Even women who did brisk walking five or more times a week would see their rates of premature death drop by 24% which was higher than the rates for men at 18% for the same activity (Ji et al, 2024).

Oftentimes the myth of 'not wanting to get bulky' (Golden, n.d.) deters females from a resistance training program but Chilibeck et al. (1997) found that females who trained primarily multi-joint exercises had significant strength increases within 8 weeks without changes in upper leg girth.

Self-efficacy in Exercise

Albert Bandura is seen by many as the father of self-efficacy in research, defining self-efficacy as a person's belief in their abilities to perform a specific task (Bandura & Wessels, 1994). People who have a higher self-efficacy tend to choose and succeed in difficult tasks and believe they will succeed even in the midst of failures (Bandura & Wessells, 1994). In contrast, those with lower self-efficacy believe they cannot succeed and failures cause what little belief they had in themselves to vanish leaving them easily susceptible to stress and depression (Bandura & Wessells, 1994). Some studies even propose that depression can negatively impact exercise self-efficacy creating a self-feeding cyclical cycle (Clum et al., 2014). However, it is known that physical activity can reduce depression susceptibility and symptoms (Choi et al., 2015). Sabo et al. (2019) even stated "Perceived self-efficacy is an essential behavior in the causal mechanisms that influence the health promotion achieved through lifestyle modifications" and that "middle-aged adults who possess high levels of self-efficacy are more inclined to engage in physical activity in spite of many barriers and may be more enthusiastic about physical activity than their peers with low self-efficacy." Bandura & Wessells (1994) offered 3 methods for someone to increase their self-efficacy: mastering the experiences or skills, vicarious experiences observed in others, and social persuasion from trusted sources that believe in the abilities of the patient and express those beliefs.

Keller et al. (1999) showed a strong link between physical activity behaviors and the Social Cognitive Theory (SCT) when using the SCT as a guide to understanding a person's behaviors surrounding physical activity. Bandura's (1986) SCT operates within the bounds of human behavior stemming from 3 different types of influence the personal, behavioral, and social factors. Dubovi & Sheu (2022) even state that "of the core SCT factors, self-efficacy and outcome expectations operate as two primary determinants of whether a person will adopt a health-promoting behavior." Dubovi & Sheu (2022) even go on to state that with improvements in an individual's self-efficacy, this acts as the conduit to which SCT based health interventions produce the desired changes in behaviors. Colangelo & Weissbrod's (2019) study supported the link between women's self-efficacy and exercise behaviors using a sample of 357 females and assessing their exercise habits over 3 months. They found that women with higher levels of both intrinsic and extrinsic motivation, perceived social support for exercise, and self-efficacy for exercise, were more likely to report exercising regularly. Specifically, that there is a shift in perceived social support and self-efficacy when the women participated in exercise, implying that social support and self-efficacy should be targets to improve exercise adherence.

Conclusion

Given the prevalence of depression and mood disturbances among college women, coupled with the documented benefits of physical activity mentioned previously, it is imperative to explore the potential of weightlifting interventions in improving mental well-being. Addressing the barriers to women's participation in weightlifting, such as feelings of judgment and inadequate support, could foster a more inclusive and supportive environment conducive to positive outcomes. We hypothesize that a structured weightlifting intervention tailored for women will lead to improvements in self-efficacy and reductions in mood disturbances and depression over the course of the 4-week program. By providing a supportive and inclusive environment, we anticipate that participants will experience enhanced self-efficacy in exercise, leading to positive changes in both physical and mental health outcomes. Our aims are to evaluate the impact of a 4-week, twice-weekly weightlifting intervention on self-efficacy, assess changes in mood disturbance levels before and after the intervention, focusing on factors such as depression among college women. By addressing these specific aims, we aim to contribute to the existing literature on the psychological benefits of weightlifting for women and provide insights into the design of effective interventions to promote mental well-being among college-aged females.

METHODS AND MATERIALS

Women on Weights

Recreational Sports at Virginia Tech encompasses the fitness facilities, group exercise, personal training, outdoor recreation, and intramurals. However, there is a noticeable gap in female utilization of the weight room at McComas Gym at Virginia Tech when compared to the usage in Division 1 athletics in the Athlete's Olympic Strength and Conditioning facility. Virginia Tech is a certified Exercise is Medicine (EIM-OC) where students are referred to Rec Sports while battling disordered eating, poor body image, over-exercising, depression, and anxiety amongst others. While Virginia Tech has a population of 57% male, and 43% female (*Facts about Virginia Tech*, n.d.), the participation in the EIM-OC program is 15% male and 85% female. When meeting with the students in the EIM-OC program the majority report higher levels of anxiety around McComas because they are unsure what they should be doing. Partnering most EIM-OC students with a personal trainer has shown great success, at no cost to the students in the program but trainers are limited. Increasing the usage of females in the weight room eventually spawned a program in 2017 for Women on Weights. Originally a 2-day-a-week, 6-week program housed in War Memorial in a private weight room led by 2 female trainers. In 2018, the program switched to a 2-day-a-week, 4-week model to make the price more accessible for everyone who wished to participate. Groups are limited to 12 individuals for the entirety of the 4 weeks, creating a very close cohort. Starting in 2019 utilizing Women on Weights for the EIM-OC population, when appropriate, has allowed more students access to knowledge and guided experience within a weight room. With the closure of War Memorial, this program has been held at the Rec Sports Field House with a similar setup.

Participants and Recruitment

Participants were recruited on a voluntary basis to partake in a 4-week study conducted during the Spring semester of 2024, spanning from January 23 to February 15. Prior to program commencement, each participant completed a PAR-Q assessment and consented to the study. Additionally, participants were required to fill out pre- and post-surveys via Google Forms with embedded assessments including the Beck's Depression Inventory, Self-Efficacy for Exercise, and Profile of Mood States, all managed and stored in Google Sheets. All participants identified as female and disclosed their academic standing and ethnicity (Table 1). As an incentive for participation, the study was offered free of charge to the first 12 sign-ups, which typically carried an $80 value outside of the study's framework. Moreover, participants were extended a $10 discount coupon for future participation in Women on Weights sessions throughout the remainder of the Spring 2024 semester, as a gesture of gratitude for their voluntary involvement. The Institutional Review Board (IRB) at Virginia Tech deemed this study exempt from human research protocols.

Table 1. Participant demographics

Age	Average: 23.5 years						
Academic Standing	Freshman 1 (8.33%)	Sophomore 2 (16.67%)	Junior 2 (16.67%)	Senior 2 (16.67%)	Masters 2 (16.67%)	Doctoral 2 (16.67%)	Alumni 1 (8.33%)
Ethnicity	Asian 4 (33.33%)	Multiple 1 (8.33%)	Unknown 1 (8.33%)	White 6 (50%)			
Gender	Women 12 (100%)						
College	Business 1 (8.33%)	CALS 5 (41.67%)	CNRE 1 (8.33%)	Engineering 2 (16.67%)	Science 1 (8.33%)	Unknown 1 (8.33%)	Vet Med 1 (8.33%)
International Student		Yes 4 (33.33%)		No 7 (58.33%)		Unknown 1 (8.33%)	
First Generation		Yes 0 (0%)		No 11 (91.67%)		Unknown 1 (8.33%)	

College of Agriculture and Life Sciences (CALS), College of Natural Resources and Environment (CNRE). The Unknown includes the alumni where information was not available.

Women on Weights Programming

The participant programming adhered to an Upper/Lower split routine, with lower body exercises conducted on Tuesdays and upper body exercises on Thursdays, across the 8 sessions (Figure 1). Special emphasis was placed on imparting comprehensive movement knowledge, with sufficient time allocated for addressing queries and providing feedback on technique during each session. The objective of every session was to familiarize participants with a diverse range of equipment, fostering confidence to independently utilize various gym equipment in a structured manner post-program. This approach aimed to empower participants to organize and replicate their workout routines autonomously within a typical gym environment.

Legs #1

Warm up:

- Rowing 300 meters
- Core activation x3: bird dogs, dead bugs, plank 30 sec

Workout:

- Squats 4x10

Ss w

- Bb calf raises 4x20
- Single leg rdl 2x10 each
- Heel elevated goblet 3x12

Ss w

- Walking lunges down and back
- Single leg squats 2x10 each

Upper body #1

Warm up 20 pushups, 12 retraction each arm
- [ ] Bench press 4x6-10
- [ ] Lat pulldowns 4x8-10
Ss w
- [ ] Plate curls 4x15-20
- [ ] Arnold press 3x12
Ss w
- [ ] Lat raise dropset 3x10
- [ ] Chest flys 2x12
Triset w
- [ ] Skull crushers 2x12
Triset w
- [ ] Dips 2xfailure

Legs #2

Warmup:
Dynamics
Squat, lunges, donkey kicks

Circuit 1: AMRAP 10min

- BB rdl x8
- Reverse lunges x16
- Box jumps x5-10

Circuit 2: AMRAP 10min

- Db hip thrust x12

Ss

- Hip thrust hold x20sec
- Side lunges x12
- Wall sit x30sec

Upper body #2

Warmup: lying single arm lat pullovers 2x15

- [ ] Barbell rows 4x8-12
- [ ] Seated shoulder press 4x6-8

Ss w

- [ ] Alt bicep curls 4x16
- [ ] Alt db chest press 3x12-16

Ss w

- [ ] Close grip db press 3x10-12
- [ ] Reverse flys 3x12-15

Legs #3

Warmup: glute activation (kickbacks, banded walks, fire hydrants)

- [ ] Sumo deadlift or conventional 4x6-10
- [ ] Single leg squat to bench 2x10 each
- [ ] BB hip thrusts 4x20,16,16,20 (hold till failure on last set)
- [ ] Bulgarians 3x12
- [ ] Reverse lunge to knee drive 2x20 each leg
- [ ] Box jumps 3x30sec

Upper body #3

- Cable row 3x8-10
- Wide grip lag pulldown 3x8
- Seated shoulder press 3x8
- Bicep curl complex 3x6-8
- Tricep pushdowns 3x10-15
- Lateral raises 3x12
- DB bench chest 3x10

Legs #4

- [ ] BB RDL 4x10-12
- [ ] single leg squat 3x10
ss w
- [ ] BB calf raises 3x20
- [ ] bulgarians 3x12
ss w
- [ ] jumping bulgarians 3x8
- [ ] plate clean to overhead 3x15
- [ ] reverse step up spring jumps 2x15-20
each side

Upper body #4

20 min EMOM (every minute on the minute)

- close grip chest press 15
- Upright press 15
- Lateral raise 15
- Plank 40sec

AMRAP 8min

- Pull-ups or pulldowns x4 or 12
- Single arm bent over rows x8 each
- Hammer curls x16

5 min AMRAP (as many rounds as possible) reps builds by 2 each round

- Sit-ups
- Push ups

Figure 1. *Each week consisted of Tuesday (Legs) and Thursday (Upper Body) resistance training sessions. Corresponding numbers denote which week in the intervention.*

Survey Data Collection

Participants were required to submit the Google Form prior to attending the first session. The Google Form included the Beck's Depression Inventory, Profile of Mood States, and Self-Efficacy for Exercise questionnaires. Following the conclusion of the eight-session Women on Weights program, a follow-up survey identical to the initial one was dispatched. Participants were instructed to complete this follow-up survey within 24 hours of their final session, ensuring timely data collection.

POMS Survey

The Profile of Mood State Questionnaire, or POMS for short, is a validated test containing descriptive words and statements about feelings. Published in 1971 by Mcnair, Lorr and Droppleman and made popular in the sports realm by Morgan in the late 70s (Snow & LeUnes, 1994). Used to measure a participant's current moods (Petito et al., 2016) and allows for the study of mood changes over time (Dingley, 2020). When taking the survey, the participant reads a series of words/statements and select a value between 0 (Not At All) and 4 (Extremely) that describes how they are feeling at that moment (Dingley, 2020). Using the values from the 65 words and statements the researcher can calculate 5 different negative mood states (Tension, Anger, Fatigue, Depression, Confusion) and 1 positive mood state (Vigor) (Grove & Prapavessis, 1992; Nässi et al., 2017). Schacham (1983) narrowed this to 40 and created an additional positive subscale of Esteem-Related Affect, an abbreviated POMS, with success still able to glean similar data points, with Bourgeois et al. (2010) stating the abbreviated POMS was an improvement. The highest impact in calculation shifts from previously untrained participants was done by Grove and Prapavessis (1992). In the original POMS each calculation is found by adding the scores from the 65 choices into categories: *(*not present on abbreviated POMS)*

- Tension = tense + shaky* + on edge + panicky* + relaxed* + uneasy + restless + nervous + anxious
- Anger = anger + peeved* + grouchy + spiteful* + annoyed + resentful + bitter + ready to fight* + rebellious* + deceived* + furious + bad* + tempered*
- Fatigue = worn out + listless* + fatigued + exhausted + sluggish* + weary + bushed
- Depression = unhappy + sorry for things done* + sad + blue* + hopeless + unworthy* + discouraged + lonely* + miserable + gloomy* + desperate* + helpless + worthless + terrified* + guilty*

- Confusion = confused + unable to concentrate + muddled* + bewildered + efficient* + forgetful + uncertain about things
- Vigor = lively + active + energetic + cheerful* + alert* + full of pep + carefree* + vigorous
- Esteem-Related Affect = proud + ashamed + competent + confident + satisfied + embarrassed

From this to create an overall measure of mood, Tension, Anger, Fatigue, Depression, and Confusion are added together before subtracting Vigor, or if using the abbreviated POMS you would add Vigor and Esteem-Related Affect before subtracting (Grove & Prapavessis, 1992).

Beck's Depression Index

The Beck's Depression Inventory (BDI), originally introduced in 1961 and revised in 1971, has become a gold standard questionnaire for determining the severity of depression in clinically diagnosed patients and for indicating depression in the general population (Beck et al, 1988), used in over 7,000 studies as of 2020 (Gebrie 2020). Not only is the BDI validated but it is also very inexpensive and typically a self-reporting questionnaire that is very quick (5-10 minutes) (Gebrie 2020). BDI "is a 21-item multiple choice self-report inventory" (Upton 2020) developed by Aaron T. Beck through personal observations, as a way to ascertain the severity of a patient's depression based primarily on the main symptoms of depression (Richter et al., 1998). The BDI 21-item inventory includes (Sartorius & Ban, 1986, pp.124):

> (1) mood, (2) pessimism, (3) sense of failure, (4) lack of satisfaction, (5) guilt feelings, (6) sense of punishment, (7) self-dislike, (8) self-accusation, (9) suicidal wishes, (10) crying, (11) irritability, (12) social withdrawal, (13) indecisiveness, (14) distortion of

body image, (15) work inhibition, (16) sleep disturbance, (17) fatigability, (18) loss of appetite, (19) weight loss, (20) somatic preoccupation, and (21) loss of libido.

Each multiple choice is graded on a 4-point scale from 0-3 (no symptoms to severe symptoms) and a score is found by adding ratings for all 21 choices with the lowest overall score being a 0 and the highest overall score being a 63 (Jackson-Koku 2016). The higher the overall score the higher the severity of symptoms with anything 20 and above in non-clinical patients indicating depression (Jackson-Koku 2016). If previously diagnosed with depression the scoring system differs with scores of 0-13 being minimal depression, 14-19 mild, 20-28 moderate, and 29-63 severe (Beck et al., 1996).

Self-Efficacy Scale

Bandura's Self-Efficacy for Exercise scale, developed within the framework of SCT (Bandura, 1986), is an instrument within health psychology, providing researchers with a comprehensive measure of individuals' self-efficacy for exercise when presented with obstacles. Molded and adjusted over time, the SEE scale targets various dimensions of exercise self-efficacy, including beliefs in one's ability to overcome barriers, manage discomfort, and sustain motivation during exercise. Bandura's scale aims to understand exercise behavior with the hope of developing ways of increasing the self-efficacy and removing barriers to exercise behaviors for everyone (Bandura, 1999; McAuley, 1998).

Bandura's Self-Efficacy for Exercise Questionnaire was developed in collaboration with Stanford University (Wilcox et al., 2005). Consisting of 14 items where individuals rank their confidence levels in overcoming common barriers such as time constraints or fatigue, this questionnaire has been used to assess individuals' exercise habits when presented with scenarios. Resnick and Jenkins (2000) demonstrated the scale's reliability, reporting a coefficient of 0.92 in a sample of 187 adults, further affirming the usefulness and reliability. The SEE scale's usefulness also extends to clinical settings, as demonstrated by studies such as Everett et al. (2009), which showed SEEs effectiveness in measuring exercise beliefs in chronic diseases, specifically cardiac rehabilitation. These findings show the significance of Bandura's self-efficacy framework and its application in promoting long-term belief in physical activity for individuals.

Data Analysis

The abbreviated POMS survey data was input into an Excel spreadsheet and assessed according to established scoring guidelines as outlined by Grove and Prapavessis (1992). Adjectives extracted from the abbreviated POMS survey were categorized into distinct groups encompassing Tension, Anger, Fatigue, Depression, Esteem-related Affect, Vigour, and Confusion. Additionally, the total mood disturbance was computed based on these groupings, following the methodology described by Grove and Prapavessis (1992). Subsequently, statistical analysis was conducted employing GraphPad Prism (GraphPad Software, La Jolla, CA) utilizing a paired t-test methodology.

The BDI survey data was input into an Excel spreadsheet and assessed according to established scoring guidelines as outlined by Beck et al (1988). Summation of the 21 questions were placed into a total score category. With rankings following within 6 categories. 1-10 “These ups and downs are considered normal,” 11-16 “Mild mood disturbance,” 17-20 “Borderline clinical depression,” 21-30 “Moderate depression,” 31-40 “Severe depression,” over 40 “Extreme depression.” Statistical analysis was conducted employing GraphPad Software (GraphPad Software, La Jolla, CA), utilizing a paired t-test methodology.

The SEE survey data was inputted into an Excel spreadsheet and assessed according to established scoring guidelines as outlined by Resnick & Jenkins (2000). Summation of the 9 questions were placed into a total score category. With higher overall scores correlating to higher self-efficacy for exercise. A positive difference in pre vs post testing indicates a shift increasing the self-efficacy for exercise. Statistical analysis was conducted employing GraphPad Software (GraphPad Software, La Jolla, CA), utilizing a paired t-test methodology.

RESULTS

Survey Results

Survey results per each participant for the Beck's Depression Inventory are shown in Table 2 for pre- and post-intervention. Mean changes pre- and post-intervention are shown in Figure 2, showing a significant decrease in depression after the Women on Weights program ($p < 0.01$). Figure 3 shows the mean difference in BDI's Depression rates pre and post when doing an unpaired t-test based on academic level demographics (Table 1) of undergraduates and graduates/alumni.

Table 2: Beck's Depression Inventory.

		Beck's Depression Inventory Questionnaire Number																					
	Participant Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Sum
Pre	21	1	0	1	1	0	0	1	0	0	0	1	0	1	3	0	0	1	1	0	1	2	**14**
	22	0	1	1	1	1	0	1	1	0	1	0	0	1	1	0	1	1	0	0	0	0	**11**
	23	0	0	2	0	1	1	2	1	1	0	0	1	1	0	1	0	1	1	0	1	0	**14**
	24	0	0	1	0	1	0	0	0	0	0	0	0	1	1	1	0	2	0	0	1	0	**8**
	25	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	2	**5**
	26	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	1	**5**
	27	0	1	2	0	3	0	1	1	0	0	2	1	1	2	0	1	1	0	0	1	3	**20**
	28	0	0	0	1	1	1	0	0	0	0	1	1	0	1	1	1	1	0	0	1	0	**10**
	29	0	0	0	0	0	0	0	1	0	1	1	0	1	1	1	0	1	0	0	0	1	**8**
	30	1	1	0	1	1	0	1	0	0	2	0	0	3	0	1	1	1	0	0	0	0	**13**
	31	0	0	0	0	1	1	1	2	0	0	0	0	0	1	0	0	1	1	0	0	0	**8**
	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Post	21	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	**3**
	22	1	1	0	1	0	0	1	1	0	1	1	0	1	1	0	1	1	0	0	0	1	**12**
	23	0	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**
	24	1	0	1	0	1	0	0	0	0	1	0	0	0	1	1	0	1	0	0	0	0	**7**
	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
	26	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	**4**
	27	0	0	2	0	1	0	1	1	0	0	1	1	1	1	1	1	1	0	0	1	1	**14**
	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	**3**
	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	**3**
	30	0	1	0	1	0	0	1	0	0	0	1	0	1	0	1	0	1	0	0	0	0	**7**
	31	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	**3**
	32	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**

Pre and post data per participant per questionnaire number.

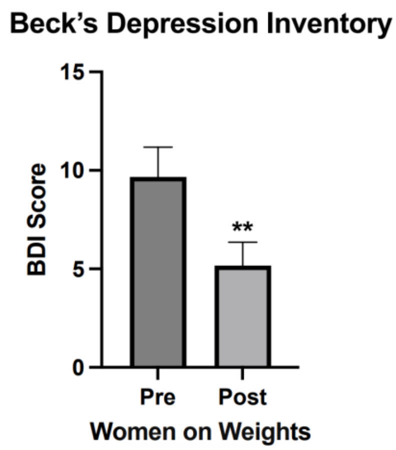

Figure 2: *Mean changes in BDI pre- and post-intervention for all participants.*

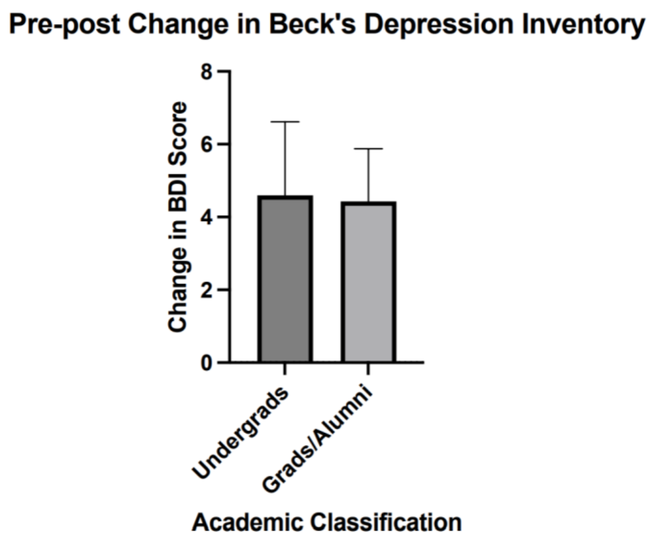

Figure 3: *Mean changes between pre- and post-intervention in BDI score based on classification of participants.*

Survey results per participant for the Self-Efficacy for Exercise Scale are shown in Table 3 for pre- and post-intervention. Each question asks "how confident are you right now that you could exercise three times per week for 20 minutes if:" followed by a statement. Higher values indicate higher self-efficacy for completing exercise under the given conditions. A paired t-test of the data was conducted in Figure 4. Graphical representation of the pre and post SEE scores are show in Figure 4. A higher score indicates higher self-efficacy for exercise. Figure 5 shows the mean difference in SEE scores pre and post when doing an unpaired t-test based on academic level demographics (Table 1) of undergraduates and graduates/alumni. Showing a decrease in self-efficacy for undergraduates and an increase for graduates/alumni.

Table 3: Self-Efficacy for Exercise.

		"How confident are you right now that you could exercise three times per week for 20 minutes if:"									
	Participant Number	The weather was bothering you	You were bored by the program or activity	You felt pain when exercising	You had to exercise alone	You did not enjoy it	You were too busy with other activities	You felt tired	You felt stressed	You felt depressed	Sum
Pre	21	7	3	3	3	1	7	7	9	9	**49**
	22	2	7	4	6	7	4	4	7	7	**48**
	23	0	0	0	0	0	0	0	0	0	**0**
	24	2	4	0	9	0	1	1	1	0	**18**
	25	10	6	7	10	1	6	8	10	6	**64**
	26	7	9	8	5	5	7	6	6	7	**60**
	27	8	5	2	5	2	2	5	5	5	**39**
	28	0	7	0	10	2	2	2	4	5	**32**
	29	10	8	7	10	8	8	8	10	10	**79**
	30	7	10	4	7	3	3	5	7	4	**50**
	31	10	8	8	8	4	4	5	8	8	**63**
	32	8	3	1	7	2	5	7	6	2	**41**
Post	21	5	0	0	2	0	0	1	0	0	**8**
	22	7	2	2	2	1	3	6	3	2	**28**
	23	0	3	0	0	0	0	0	1	0	**4**
	24	10	0	0	2	7	10	6	7	7	**49**
	25	8	6	7	8	5	6	6	8	8	**62**
	26	8	5	8	7	7	8	7	9	8	**67**
	27	3	7	3	5	5	3	5	6	5	**42**
	28	7	5	5	10	10	4	2	7	7	**57**
	29	10	8	7	10	10	8	10	10	10	**83**
	30	8	7	6	6	7	4	7	9	6	**60**
	31	9	7	6	10	7	6	6	9	8	**68**
	32	5	5	4	5	2	4	5	5	4	**39**

Pre and post data per participant per SEE statement.

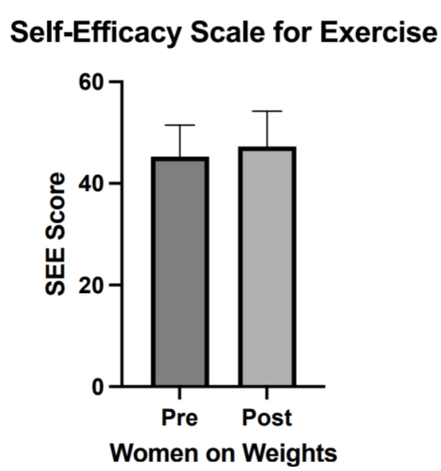

Figure 4: *Mean changes in SEE pre- and post-intervention for all participants.*

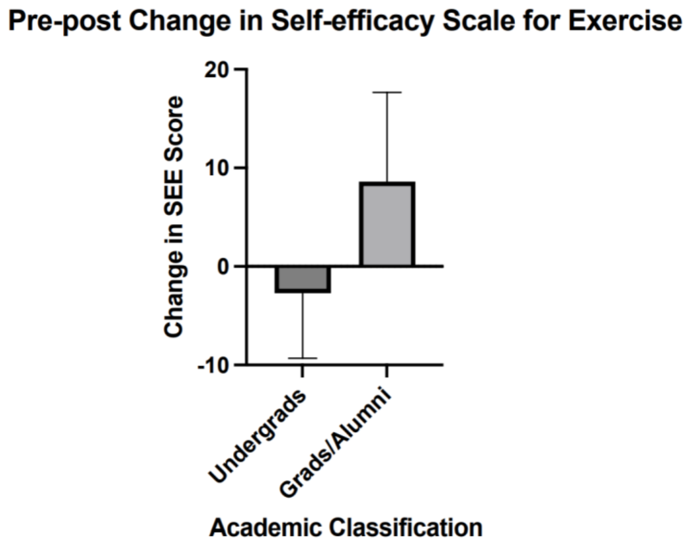

Figure 5: *Mean changes between pre- and post-intervention in SEE score based on classification of participants.*

Table 4 shows the Profile of Mood States subscales as referenced in Methods and Materials under POMS Survey. Each category is placed into the scoring equation to determine an overall score. Figure 6 shows the mean TMD Score pre and post for all participants using a paired t-test, with a desired outcome being a decrease in TMD scores. Mean changes in TMD score pre- and post-intervention are shown in Figure 7 when comparing classification demographics of participants (Table 1). Figure 8 is a paired t-test representation of pre- and post- scores of the Tension Subscale from the POMS data. Figure 9 is a paired t-test representation of pre- and post- scores of the Anger Subscale from the POMS data. Figure 10 is a paired t-test representation of pre- and post- scores of the Fatigue Subscale from the POMS data. Figure 11 is a paired t-test representation of pre- and post- scores of the Depression Subscale from the POMS data showing a trending p-value toward significance within the 4 weeks ($p=0.0858$). Figure 12 is a paired t-test representation of pre- and post- scores of the Esteem-Related Affect Subscale from the POMS data which shows a significant increase program ($p< 0.01$) in Esteem-Related Affect (ERA) pre- and post-intervention for participants.

Figure 13 is a paired t-test representation of pre- and post- scores of the Vigour Subscale from the POMS data. Figure 14 is a paired t-test representation of pre- and post- scores of the Confusion Subscale from the POMS data. And Figure 15 is a paired t-test representation of pre- and post- scores of the Depression Subscale from the POMS data.

Table 4: Abbreviated Profile of Mood States Subscales.

	Participant Number	Total Mood Disturbance Subscales							TMD
		TEN	ANG	FAT	DEP	ERA	VIG	CON	
Pre	21	13	2	6	3	9	10	6	11
	22	16	6	10	15	7	9	11	42
	23	20	6	20	17	5	7	16	67
	24	7	3	6	3	16	4	12	11
	25	6	0	0	0	18	10	2	-20
	26	7	7	7	3	16	12	3	-1
	27	18	9	19	12	8	1	8	57
	28	4	0	3	1	10	4	2	-4
	29	7	0	4	0	14	9	4	-8
	30	10	1	5	8	13	9	7	9
	31	11	2	1	1	17	9	4	-7
	32	0	0	2	1	21	15	0	-33
Post	21	2	0	4	1	14	11	2	-16
	22	14	6	9	10	9	8	12	34
	23	3	0	4	0	15	7	3	-12
	24	12	2	3	4	22	4	11	6
	25	6	1	6	0	19	14	3	-17
	26	8	5	9	3	18	11	4	0
	27	18	9	16	11	13	5	12	48
	28	6	1	5	1	16	7	2	-8
	29	10	0	5	0	20	2	3	-4
	30	6	3	5	1	19	13	7	-10
	31	8	2	3	0	19	13	2	-17
	32	0	0	1	0	17	10	2	-24

Pre and post data per participant per abbreviated POMS subscale used in the calculation. Tension (TEN), Anger (ANG), Fatigue (FAT), Depression (DEP), Esteem-Related Affect (ERA), Vigour (VIG), Confusion (CON).

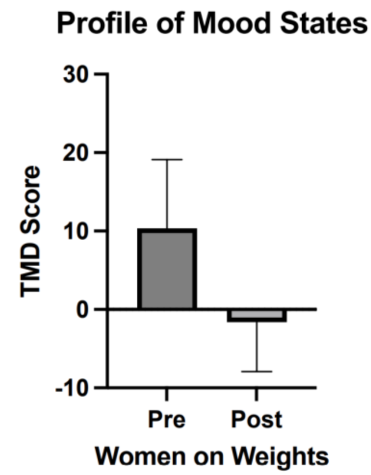

Figure 6: *Mean changes in POMS TMD pre- and post-intervention for all participants.*

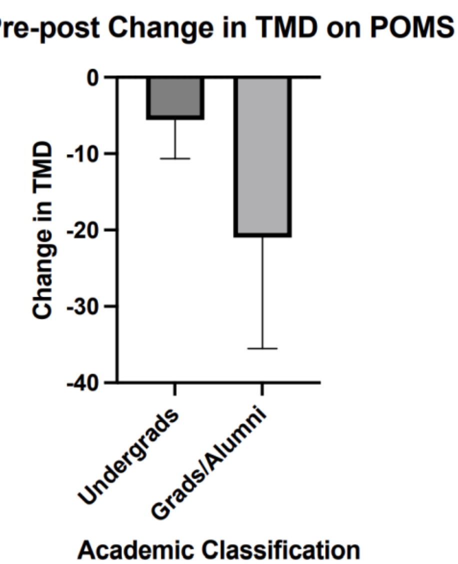

Figure 7: *Mean changes between pre- and post-intervention in POMS TMD score based on classification of participants*.

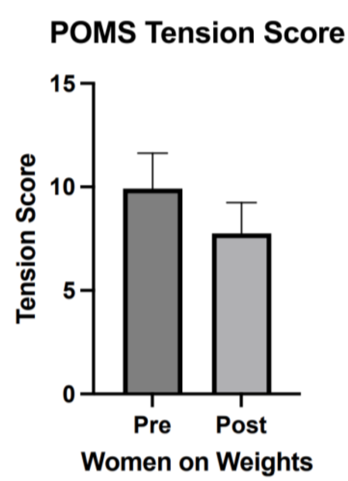

Figure 8: *Mean changes in POMS TEN (Tension) subscale pre- and post-intervention for all participants.*

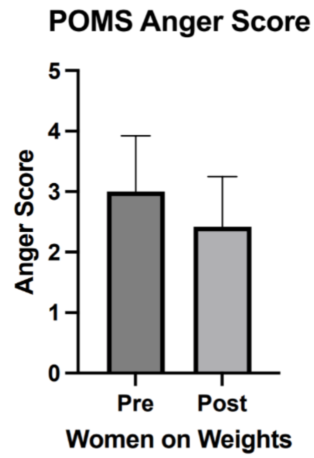

Figure 9: *Mean changes in POMS ANG (Anger) subscale pre- and post-intervention for all participants***.**

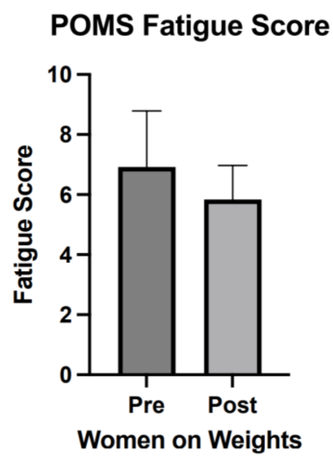

Figure 10: *Mean changes in POMS FAT (Fatigue) subscale pre- and post-intervention for all participants.*

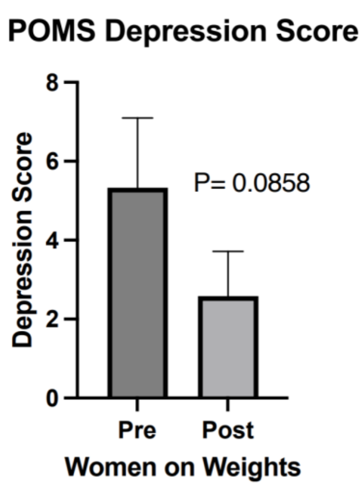

Figure 11: *Mean changes in POMS DEP (Depression) subscale pre- and post-intervention for all participants.*

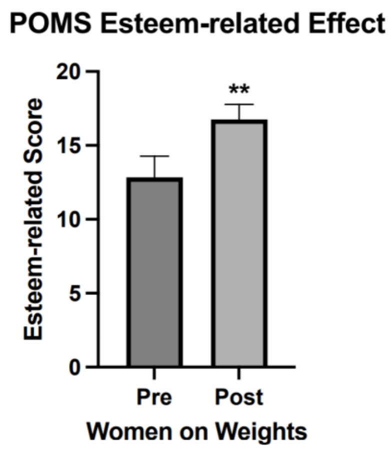

Figure 12: *Mean changes in POMS ERA (Esteem-Related Affect) subscale pre- and post-intervention for all participants.*

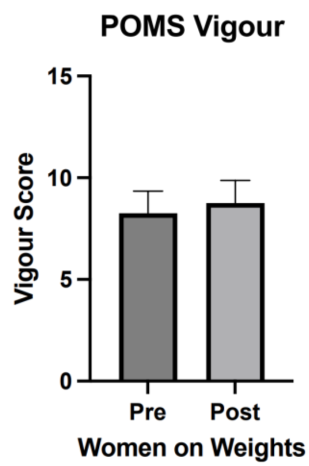

Figure 13: *Mean changes in POMS VIG (Vigour) subscale pre- and post-intervention for all participants.*

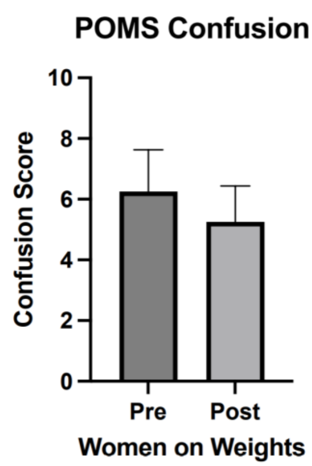

Figure 14: *Mean changes in POMS CON (Confusion) subscale pre- and post-intervention for all participants.*

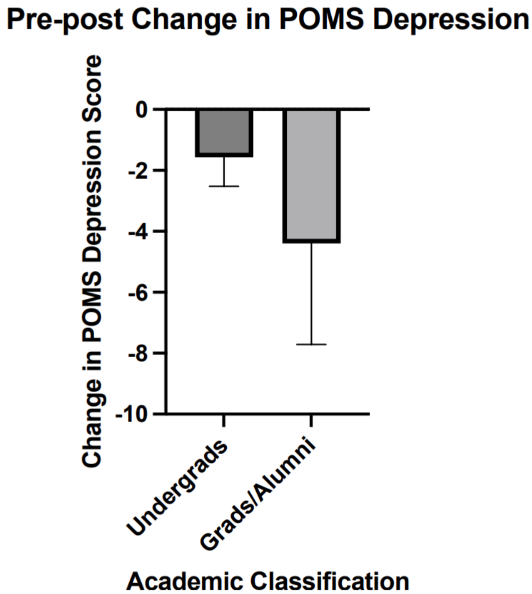

Figure 15: *Mean changes between pre- and post-intervention in POMS DEP (Depression) subscale based on classification of participants.*

Change in Recreational Sports Usage

Participant's usage of Recreational spaces went from 1.281 average days of use per week pre-participation in this study (August 21, 2023 through December 6, 2023) to 1.563 average days of use per week post participation in this study (February 16, 2024 through May 1, 2024). Graduates and Alumni had a slight decrease while undergraduates had an increase but variability in the data was too large to find significance. One participant did see their Recreational Sports usage go from 0.065 average weekly usage to 3.827 average weekly usage. Swipes in Table 5 denote the number of times a participant presented their Hokie Passport in order to access a Recreational Sports space. Table 5 shows all data for each participant as total number of swipes, average swipes per day, with average swipes per day multiplied by 7 to get average attendance in Recreational Sports spaces per week. Figure 16 displays the mean change in average weekly participation within a Recreational Sports spaces for each participant using a paired t-test. Figure 17 shows the mean change of access into Recreational Sports spaces among the classification demographics (Table 1) of undergraduate and graduate/alumni pre- and post-intervention using an unpaired t-test.

Table 5: Participant usage of Recreational Sports facilities

Participant Number	Pre: 8/21/2023 - 12/6/2023 (107 days) Total Swipes	Pre: Average Swipes per day	Pre: Average swipes per week	Post: 2/16/2024 - 5/01/2024 (75 days) Total Swipes	Post: Average Swipes per day	Post: Average swipes per week	Change per week
21	15	0.140	0.981	14	0.187	1.307	0.326
22	10	0.093	0.654	4	0.053	0.373	-0.281
23	6	0.056	0.393	2	0.027	0.187	-0.206
24	3	0.028	0.196	1	0.013	0.093	-0.103
25	74	0.692	4.841	44	0.587	4.107	-0.734
26	1	0.009	0.065	41	0.547	3.827	3.762
27	0	0.000	0.000	0	0.000	0.000	0.000
28	1	0.009	0.065	7	0.093	0.653	0.588
29	8	0.075	0.523	13	0.173	1.213	0.690
30	1	0.009	0.065	0	0.000	0.000	-0.065
31	51	0.477	3.336	45	0.600	4.200	0.864
32	65	0.607	4.252	30	0.400	2.800	-1.452
Total	235	2.196	15.374	201	2.680	18.760	3.386
Average per week per participant			1.281			1.563	

Pre and post intervention data per participant for Recreational Sports facilities usage trends.

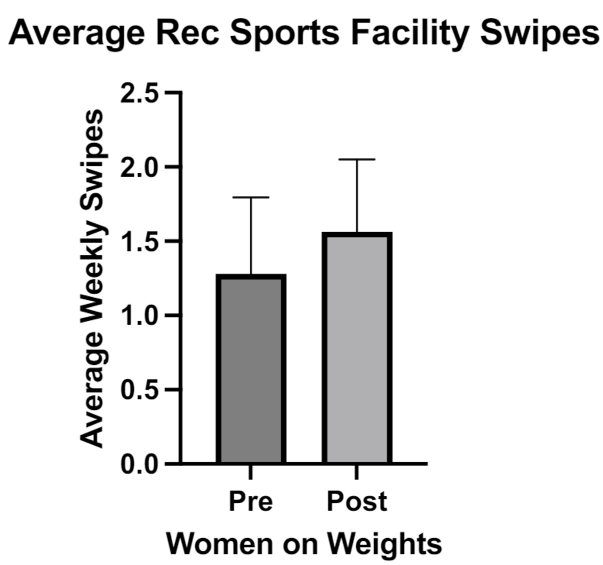

Figure 16: *Mean changes in average weekly Recreational Sports facilities usage pre- and post-intervention for all participants.*

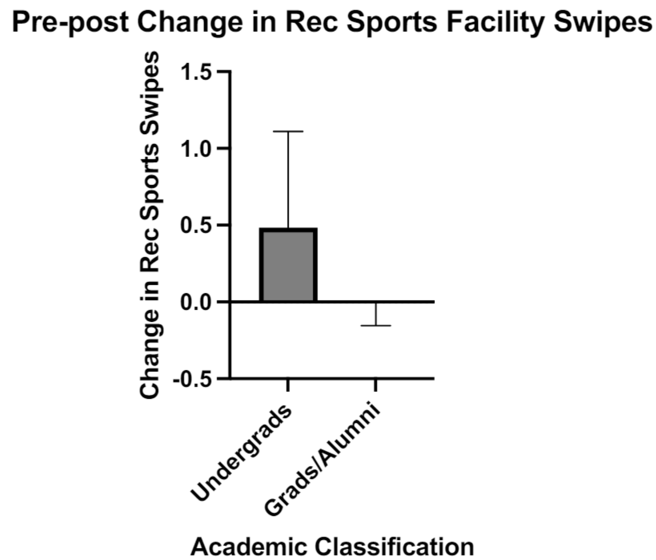

Figure 17: *Mean changes between pre- and post-intervention in average weekly Recreational Sports facilities usage based on classification of participants.*

DISCUSSION

This investigation sought to assess whether a 4-week structured Women on Weights intervention was effective in decreasing depression, decreasing mood disturbances, and increasing self-efficacy among college women. Results indicate a mean significant reduction in depression symptoms, no significant changes in self-efficacy, and significant improvements in Esteem-Related affect, highlighting the potential of resistance training interventions to improve mental well-being among college women.

A significant mean improvement was seen on the Beck's Depression Inventory (BDI). This is similar to Stein & Motta (1992) who did a study involving college students who met 14 times over 7 weeks with an aerobic, weight lifting, and no exercise group and found that both exercise groups had significant decreases in depression, assessed by the BDI, when compared to the control group. Showing the important role movement plays on depression symptoms for college students. Stein & Motta (1992) even claim that a consistent exercise plan can help students challenge feelings of helplessness, hopelessness, and worthlessness along with the physical benefits of exercise. Herring et al. (2010) also demonstrated the role of physical activity in the mitigation of depressive symptoms in college students. The results of our study are supported by these findings and indicate a notable reduction in depression symptoms pre- and post-intervention in the Women on Weights program. Specifically, BDI revealed a significant ($p < 0.01$) decrease in depression symptoms across all participants when analyzed using a paired t-test. However, when comparing classifications of undergraduates and graduates/alumni, this decrease was not statistically significant.

Interestingly, while the SEE Scale did not show a significant increase, it's worth noting that this may be due to its inability to capture certain changes only experienced within this study.

The SEE Scale was studied by Wilcox et al. (2005) and showed strong validity and reliability regardless of participants age, gender, race, etc. While self-efficacy, as stated by Higgins et al. (2014), “represents one of the most intensively assessed constructs associated with exercise behavior” and Bandura’s (1986) assessment that a high self-efficacy is the primary determination of an individual choosing to participate in physical activity, we did not see this change exhibited during the study. LeCheminant et al. (2014) conducted an 18-week study on postpartum females and found that the resistance training group had a 16.2% increase in the SEE scale question “ability to exercise when tired” and a 10.1% increase in the “ability to exercise when in a bad mood,” suggesting a significant increase in the exercise self-efficacy for participants with longer duration using the same scale in our study. Mullane et al. (2017) also found that during an 8-week intervention using 20 children ages 10-11 that self-efficacy scores increased by 50% when compared to preintervention further solidifying the potential for SEE scores to change in a positive trend if given more time within the intervention. The lack of change in the current study could be possibly attributed to the small sample size or the length of the intervention. The Women on Weights program is a 4-week intervention and a longer intervention such as seen in the LeCheminant et al. (2014) and Mullane et al. (2017) studies, could possibly also show improvements in self-efficacy.

In contrast, the analysis of the POMS Survey demonstrated a significant change in the Esteem-Related Affect subscale pre- and post-intervention. In addition, the POMS Depression subscale exhibited a trending p-value ($p=0.0858$) towards significance, suggesting that with a larger sample size, significance might have been achieved. Furthermore, the increase in self-esteem, as indicated by the significant change in the POMS Esteem-Related Affect subscale, aligns with existing literature suggesting that a reduction in depression often correlates with enhanced self-efficacy (Kavanagh, 1992). However, these results were not mirrored in the SEE scale, highlighting a potential disparity between the tools used. Figure 15 illustrates the overall decrease in mean change on the POMS Depression subscale pre- and post-intervention for both undergraduates and graduates/alumni. Notably, the appearance of a difference was observed in the graduates/alumni group. With a larger sample size, we might have observed significant findings in this subgroup as well. This aligns with the results of the BDI, showing a decrease in depression over the course of the 4-week resistance training intervention again echoing the previous studies of Stein & Motta (1992) and Herring et al. (2010).

Conclusions

In conclusion, this study demonstrates that a 4-week structured Women on Weights intervention has the potential to significantly reduce depression symptoms and improve self-esteem among college women, as evidenced by the significant changes in the BDI and the Esteem-Related Affect subscale of the POMS survey. This showcases the positive impact of resistance training and exercise on mental well-being, specifically among college students. The trending p-value in the POMS Depression subscale and the appearance of a difference in the graduates/alumni group suggest that with a larger sample size, more conclusive results could be achieved, emphasizing the importance of replication with a broader participant pool. These findings provide a foundation for future research into the benefits of resistance training on mental health outcomes among college women, an area where collegiate recreation centers can provide upstream interventions for college women. The positive changes in depression symptoms and esteem-related affect, point to the therapeutic potential of structured exercise programs. Overall, this study contributes to the growing body of evidence supporting the role of physical activity in enhancing mental health and suggests practical implications for integrating structured exercise programs into collegiate recreation centers at low cost/no cost to students contributing to their well-being. Through such initiatives, colleges and universities can create supportive environments that not only promote physical health but also their mental well-being creating a more successful student.

Limitations

Despite the encouraging outcomes, certain limitations and areas for further investigation were identified. Notably, the lack of significant change in the SEE scale suggests that while this particular intervention might improve mood-related outcomes, it may not directly translate into increased self-efficacy for exercise. This inconsistency with existing literature highlights the need for further exploration into the factors contributing to exercise-related self-efficacy. A larger population as well as longer duration of intervention could possibly have shown significance in other areas, including the SEE. Our study did include various academic standings (undergraduates and graduates), conducting a similar study on one academic subgroup could produce results unique to the younger or older student allowing more a targeted approach to specific student populations. In addition, some participants in this study may have participated in Women on Weights program in the past. Lastly, there is a possibility that international students may not clearly understand each item in the inventory when completing the surveys, or when the surveys are translated to their native language, introducing possible inaccuracies in the answers on the surveys.

Dissemination

This project will be disseminated to the Director of Recreational Sports at Virginia Tech where the study was conducted. As well as the potential for presentation to the Exercise is

Medicine committee at Virginia Tech. Presentation at the Southeast Collegiate Fitness Expo annual conference, NIRSA national publication, and as a NIRSA conference presentation to discuss findings are all possible dissemination locations. Informal information sharing is also customary within collegiate recreation fitness departments nationwide where findings within this study will be shared by word of mouth.

Further Directions

There are several ways to move forward with this research. Conducting the intervention at various times within the semester to capture the ebbs and flows of students at the beginning compared to the stresses at the end of the semester, is one way to see additional trends. Also, comparing the data between the Fall and the Spring semester to assess differences, may identify additional trends. In addition, one way to add to this investigation would be to assess physical components, such as 1 repetition maximums (1RMs), with pre- and post- fitness assessments so participants are able to see their progress. Lastly, addressing the barrier of cost, as it is required for entrance into the program, and looking at other class delivery formats within Group Exercise.

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