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The Correlation between Undergraduate Students who Attend the University Recreation Center
and Students Exhibiting Symptoms of an Eating Disorder
IRB #19-0171
Spring 2019, Honors College Capstone
Olivia Daniels

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Acknowledgements

The researcher would like to recognize the dedication and gracious counseling of Dr. Audrey Burnett. Her guidance and support while conducting the study was irreplaceable and her advice on the composition of the final project aided greatly in its completion. Dr. Burnett assisted the researcher throughout the project from advising the construction of the survey, conducting the study itself, and following through to the final composition. Dr. Monica Reis-Bergan aided significantly in the statistical analysis of the data, and her leadership significantly impacted the study's efficacy. Her instruction also benefited the analysis of the datasets. Additionally, Dr. Reis-Bergan supervised the construction of the survey and points of analysis. The researcher would also like to recognize Dr. Theresa Enyeart Smith for her refinement of the composition, as well as her constant dedication to the study. Dr. Enyeart Smith provided skillful feedback and invaluable advice when finalizing the composition of this study.

Abstract

Background: The prevalence of eating disorders on college campuses indicates an important issue in contemporary society. As students experience a heightened level of freedom, they have the option to explore multiple forms of weight- management, including compulsive exercise.

Methodology: An online survey was distributed to female undergraduate students(n=206) at James Madison University.

Results: A significant relationship was found between eating disorder symptomology and where participants decided to spend their time at the University Recreation Center (UREC), as well as what type of physical activity they chose to perform. A significant inverse relationship between increasing muscle mass and burning calories was also observed.

Discussion: Participants with the goal of burning calories experienced overall less positive attitudes towards working out, used appearance as a main motivator for where they decide to work out, and were more likely to exhibit symptoms of an eating disorder.

Conclusion: This study provides evidence that undergraduate females who have the main goal of burning calories are more likely to exhibit eating disorder symptoms and experience less intrinsic enjoyment from their physical activity.

Keywords: Eating disorder, recreation center, motivation, eating disorder symptomatology

Literature Review

Eating disorders are a commonality among college students. A range of 8% to 17% of college students expressed having an eating disorder while attending college, and 20% reported suffering from an eating disorder at some point in life. In a college population of 20,000 students, approximately 4,000 have experienced an eating disorder, and between 1,600 and 3,400 students are currently suffering (Eisenberg, Kirz, Nicklett, & Roeder, 2011). Eating disorders can prove to be deadly, as up to 20% of individuals with chronic anorexia nervosa die due to their illness. Additionally, suicide is a common cause of death surrounding eating disorders due to other comorbid mental illnesses (National Eating Disorder Association [NEDA], 2015). Supplementary studies are essential in order to improve the screening of eating disorders in college students, as well as improve treatment with the ultimate goal of reducing prevalence.

Another concern is the co-occurring risky behaviors commonly associated with eating disorders. Compulsive exercise has often been found in conjunction with eating disorders (Boepple et al., 2011). While regular physical activity is an important component of health, excess in frequency, duration, and intensity of exercise can be problematic and detrimental to an individual's health. Exercise is also dangerous when it is compulsive, obligatory, or compulsory (Adkins & Peel, 2005). Physical activity must be taken into account in order to efficiently investigate eating disorders on college campuses.

The prevalence of eating disorders on college campuses indicates an important issue in contemporary society. As students experience a heightened level of freedom, they have the option to explore multiple forms of weight-management, including compulsive exercise. The NEDA (2018a) reported that approximately 90-95% of college individuals with eating disorders

also belong to a fitness facility. Additionally, compulsive exercise has been strongly related to the development of an eating disorder (NEDA, 2018a).

The purpose of this study was to examine whether a correlation exists between female students who attend James Madison University's Recreation Center (UREC) and students showing symptoms of suffering from an eating disorder. The ultimate goal of this study was to identify possible adjustments to improve screening procedures at recreation centers. Additionally, this study sought to improve personnel education surrounding eating disorders to effectively offer resources to participants and encourage body inclusivity in university recreation centers. The primary research questions for this study included:

1. Is there a relationship between students who attend UREC and students who have an eating disorder?
2. Are there differences in the likelihood of having an eating disorder according to class standing?
3. Are there differences in the likelihood of having an eating disorder in relation to time spent at UREC?
4. Is there a relationship between college major and attendance at UREC?

Eating disorders represent a pertinent issue on college campuses. Not only do additional comorbidities often arise in conjunction with eating disorders, but the mental and physical consequences of compulsive exercise and a malnourished diet also draw attention to the issue. Eisenberg, Nicklett, Roeder, and Kirz (2011) found that individuals exhibiting eating disorder symptoms are more likely to experience mental health concerns. Previous research (e.g., Boepple, Glunz, Goldschmidt, Le Granger, & Stiles-Shields, 2011; Eisenberg, Kirz, Nicklett, & Roeder, 2011) has found a connection between positive eating disorder symptomatology and

mental illness, including depression, anxiety, suicidal ideation, and non-suicidal self-injury, with depressive symptomatology and anxiety being the most common. Furthermore, an unhealthy relationship with exercise has been found to positively correlate with disordered eating, specifically in females (Martin Pelly, Rocks, & Slater, 2017).

Previous research has found that female college students are more susceptible to developing eating disorders than their male counterparts (Eisenberg et al., 2011; Martin et al., 2017). For this reason, it proves important to investigate compulsive exercise to prevent furthering the possibility of adopting or worsening an eating disorder. College students do not often view symptoms as dangerous, which results in a lack of diagnosis and treatment. In fact, symptoms of an eating disorder can be experienced for years after the initial diagnosis (Eisenberg et al., 2011). The lack of identification and treatment of these dangerous symptoms shed light on the importance of early detection and treatment. Not only are female undergraduate students at risk of compulsively exercising, but 40 to 80% of individuals diagnosed with anorexia nervosa have been reported as extremely likely to compulsively exercise in an effort to reduce the guilt experienced when eating and to prevent weight gain (NEDA, 2018a).

NEDA (2018a) reported that an earlier diagnosis of an eating disorder increases the chance of an individual's successful recovery. A prominent sign of an individual at risk of developing an eating disorder is excessive exercise (Bratland, Hoffart, Martinsen, Sundgot-Borgen, & Rosenvinge, 2010). This information validates the importance of investigating the use of destructive exercise routines, such as compulsive exercise, to feed the mentality of an eating disorder. Specifically, in cases of anorexia nervosa, individuals have been reported to likely maintain a rigid exercise regime, and these cases can be linked to a subtype of obsessive-compulsive disorder (OCD) (Davis & Kaptein, 2006; NEDA, 2018a). Linking excessive exercise

to mental illness, including OCD, depression, and anxiety, highlights the significance of early detection of an eating disorder in college undergraduate students as a way to improve the mental and physical health of an individual and his/her chances of recovery. Excessive exercise differs from compulsive exercise in that the exercise is carried out for a longer period of time, as a quantitative measurement of exercise. In contrast, compulsive exercise is physical activity carried out at a more intense pace, noted as a qualitative measure. Excessive exercise, however, can become a compulsory activity and should be carefully considered (Adkins & Keel, 2005).

Young women have historically been a population of concern when attempting to screen for eating disorder symptoms in conjunction with excessive exercise due to their historical and present association with EDs. A study conducted on a large university campus showed a three-to-one ratio of women to men exhibiting signs of an eating disorder (NEDA, 2018a).

Additionally, according to Hay and Ward (2006), 'extreme dietary restraint' and 'food avoidance' were more commonly seen in young women between the ages of 18 and 22. The presence of these symptoms of anorexia nervosa in college-aged females implies that they may also be at risk for compulsively exercising as a way to manage guilt. While the information provided by Hay and Ward (2006) was gathered in Australia and has the possibility of varying internationally, it may be implied that the basis of the information remains true in the United States, as multiple other studies have investigated the presence of compulsive exercise and eating disorder symptomology in women (Bell, Donovan, & Ramme, 2016; Boepple et al., 2011; Brown, Holland, & Kelly, 2014; Dalton et al., 2018; Martin et al., 2017).

Compulsive exercise has served as an indicator of further mental health problems and can also be extremely dangerous to the health of an individual with an eating disorder (Brown et al., 2014; Hatch, Hotopf, Micali, Solmi, & Treasure, 2015). While Brown and colleagues (2014)

examined an older population than that of college students, they found that compulsive exercise can improve the diagnosis of eating disorders and should, therefore, be viewed as an area for intervention. Furthermore, Brown and colleagues (2014) found that women are more likely to report using destructive exercise to contribute to a peace of mind established by controlling or losing weight.

In contrast to prior research, Bilenberg and colleagues (2014), whose study focused on exercise addiction, found that exercise addiction is a separate entity from eating disorders. While a correlation existed between exercise addiction and eating disorders (e.g., being concerned with bodily performance,) Bilenberg and colleagues (2014) found that the determination that drives excessive exercise was due to the personal individual's motivation to achieve athletic goals. Given that exercise addiction serves as another form of destructive exercise habits, researchers can take the addiction into account when investigating the correlation between eating disorders and compulsive exercise. An addiction to exercise can also serve as a form of compulsory exercise and, therefore, is relevant to this study. However, Bilenberg and colleagues (2014) also found that the treatment group consisting of individuals exhibiting exercise addiction exhibited symptoms of an eating disorder as well, findings that counter previous research. In addition, Bilenberg and colleagues' (2014) study provided additional support to the theory that those who participate in compulsive exercise also exhibit symptoms of an eating disorder.

While eating disorders are connected to a variety of other harmful behaviors, including self-inflicted harm, use of diuretics, and self-induced vomiting, compulsive exercise represents a great cause for concern, as over-exercise can lead to life-long complications, such as osteopenia, increased likeliness of injury, and an imbalance in electrolytes and hormones (Eisenberg et al., 2011; NEDA, 2018a). Compulsive exercise has also been connected with greater depressive

symptomatology, as well as greater eating disorder psychopathy, highlighting the importance of early detection as a way to prevent the worsening of symptoms (Boepple et al., 2011).

Identifying compulsive exercise may increase the likelihood that an individual suffering from an eating disorder is diagnosed, treated, and will prevent life-complicating consequences associated with eating disorders and compulsive exercise.

Martin and colleagues (2017) found a correlation between exercise addiction and disordered eating, with almost a quarter of the participants, all health-related majors, at-risk for exercise addiction. The heightened risk of exercise addiction warrants investigation as, in this study, students in health-related majors exhibited dangerous symptoms of exercise addiction regardless of their knowledge of health. While self-report is a limitation of this study, it has been found that self-report questionnaires provide a more comprehensive understanding on the more complex aspects of eating disorders (Davis & Kaptein, 2006).

College students at risk of developing eating disorders commonly attend recreation centers or gyms and experience symptoms of excessive exercise (NEDA, 2018a). With James Madison University's newly renovated and modern recreation center, it is likely that college students struggling with weight management and eating disorders will take advantage of the calorie-counting machines available at the facility. The life-threatening symptoms of eating disorders and consequences of compulsive exercise will likely become progressively more severe without early detection (Boepple et al., 2011). In an effort to add to the existing literature, this study investigated the potential connection between the amount of time a female student spends at the James Madison University Recreation Center (UREC) and the potential correlation between college major and UREC attendance. Minimal literature has investigated what drives a

person's activities in a university recreation center; therefore, this study also examined some of the intrinsic factors that influence a female student's athletic activities while attending UREC.

Methodology

Procedures

Participants

Participants for this study included 206 female college students attending James Madison University, over the age of 18, with a class standing ranging from freshman through senior.

Recruitment occurred through the use of a convenience sample using an online survey.

Participants received the online survey supplied by the researcher via email.

Study Design

This study was primarily descriptive. The online survey asked participants' class standing in regard to credit hours. Participants were also asked their age, major, and ethnicity to establish a demographic. Following the demographic questions, the study investigated the length of time participants spend at UREC per day, why participants chose to exercise in general, where they chose to exercise, and the frequency with which they attended UREC. To screen the participant for symptoms of an eating disorder, the SCOFF questionnaire was included. The SCOFF questionnaire has been shown to be an accurate tool for analyzing the possible likelihood of having an eating disorder; however, the questionnaire has a high sensitivity and low specificity (Hatch et al., 2015).

To continue assessing the participant's possibility of exhibiting symptoms of an eating disorder, participants were asked to respond to a series of statements that include a frequency of days with which they experience certain body image or food consumption-related issues. Some examples of these statements included, "Have you ever felt fat?," "Have you been deliberately trying to limit the amount of food you eat to influence your shape or weight (whether or not you have succeeded)?," and "Have you ever had a definite fear that you might gain weight?"

Participants responded to these statements on a scale of one through six, with one indicating “no days” and six indicating “everyday.” The scores of this portion and the likelihood of the participant having an eating disorder, according to these symptoms, were directly related, with a higher sum implying a greater chance that the individual exhibits eating disorder symptoms.

When the bulk email was distributed, the student anonymously completed the survey. The participant reserved the right to stop answering the survey questions at any point and, if chosen to do so, the survey was deemed unusable and the data was forfeited by the researcher. The cumulative data was saved electronically to the researcher’s computer in a password-protected electronic file.

Risk and Benefits

Risks associated with this study were minimal due to the anonymity of participants. Slight risks associated with this study included discomfort when answering personal questions and potential upset among individuals with personal experience of eating disorders. To combat the aforementioned repercussions, the researcher provided information regarding James Madison University’s counseling center, so that the participant may seek counseling, if necessary.

Benefits of this study included investigating the prevalence of female undergraduates with eating disorders and examining how an individual decides on personal level of physical activity. Additionally, this study offers the potential to promote improved screening of eating disorders on college campuses, as well as inform UREC employee education to help provide resources to those who exhibit symptoms of an eating disorder. Participants may benefit from increased self-awareness resulting from the personal nature of the survey questions, and may seek counseling for their symptoms, if they recognize a detrimental habit they impart on their health.

Results

The researcher was unable to analyze the possibility of a connection between students who attended UREC and their likelihood of expressing eating disorder symptoms versus students who did not attend UREC. This discrepancy was because all the individuals who participated in the study attended UREC, resulting in the lack of a control group consisting of individuals who did not attend the recreation center. While the first research question could not be analyzed, the researcher conducted one-way between subjects Analysis of Variance (ANOVA) tests to evaluate the remaining three research questions. The researcher proceeded to conduct Exploratory Analysis using subsets of the MPAM-R.

The first possible relationship examined was whether a connection between class rank and eating disorder symptomology existed. A one-way between subjects ANOVA was conducted to compare the effect of class rank on the likelihood of expressing symptoms of an eating disorder. There was a significant effect of class standing on eating disorder symptomatology at $p < .05$ level for the three conditions [$F(3,202)=4.75, p=.003$]. The Post hoc comparisons using the LSD test indicated that that First Years shared the same likelihood of expressing symptomatology as Sophomores, but were significantly different from Juniors and Seniors (See Table 1).

The researcher's third research question was investigated in two separate ways. First, a one-way between subjects ANOVA was conducted to compare the location in UREC where time was spent to eating disorder symptomatology. There was not a significant effect of location on eating disorder symptomatology at $p < .05$ level for the three conditions [$F(4,200)=1.02, p=.400$]. Post hoc comparisons were unnecessary to conduct, as no significance was found. These results

suggested that the location of where individuals spend time was not an influential factor on the likelihood to express eating disorder symptoms (See Table 2).

The second manner in which the third research question was investigated analyzed motivations related to physical activity. A second one-way between subjects ANOVA was conducted to compare the motivation for exercise to eating disorder symptomatology. There was a significant effect of motivation on eating disorder symptomatology at $p < .05$ level for the three conditions [$F(3,198)=8.89, p=.000$]. Given that significance was found, an LSD Post hoc test was conducted to compare each motivation to every other motivation. The results of the ANOVA suggested that motivation was an influential factor for determining the likelihood of expressing eating disorder symptoms. More specifically, it was found that ‘burn calories’ was significantly different from ‘increasing muscle mass,’ ‘how I’m feeling,’ and ‘improve physical fitness’ when determining where an individual wanted to spend time at UREC (See Table 3).

In order to analyze participants’ majors, the researcher first recoded responses into eight Colleges. The Colleges included were: College of Arts and Letters, College of Business, College of Education, College of Health and Behavioral Studies, College of Integrated Science and Engineering, College of Science and Mathematics, and College of Visual and Performing Arts, and Undeclared. The Colleges were assigned a number between one and eight. A one-way between subjects ANOVA was run to compare the impact of college major on eating disorder symptomatology. There was not a significant effect of college major on eating disorder symptoms at the $p < .05$ level for the three conditions [$F(7,196)=.991, p=.439$]. These results suggested that there was no significant influence of class major on an individual’s likelihood of expressing an eating disorder (See Table 4)..

Exploratory Analysis

Using the subscales of the MPAM-R, several additional factors influencing the likelihood of exhibiting eating disorder symptoms were examined according to location and motivation. The five subsets investigated motivations, including appearance, social, enjoyment, competence, and fitness. These subjects were assessed using a one-way between subjects ANOVA to compare each motivation's impact on where a participant chose to spend their time at UREC. First, an ANOVA was run to determine if appearance as a motivating factor influenced participants on where they decided to spend their time at UREC. There was not a significant effect of appearance on where a participant decided to spend time at the $p < .05$ level for the three conditions [$F(3, 199) = 2.56, p = .056$]. These results suggested that appearance does not play a role in influencing participants on where they will spend their time at UREC (See Table 5).

Next, a one-way between subjects ANOVA was run to compare the effect of social aspects on deciding where to spend time at UREC. There was not a significant effect of social motivations on deciding where to spend time at UREC at the $p < .05$ level for the three conditions [$F(3, 199) = .74, p = .528$]. This finding suggested that participants were not socially influenced to exercise in certain parts of the recreation center (See Table 6).

The third one-way between subjects ANOVA was run to compare the effect of enjoyment on how an individual decides where to exercise. There was a significant effect of enjoyment on the decision of where to exercise at the $p < .05$ level for the three conditions [$F(3, 199) = 7.49, p = .000$]. More specifically, it was found that those who spend time in Group Exercise were driven by the same levels of enjoyment as those who spend time on the Cardio Deck. However, the Cardio Deck was the only location that was significantly different in levels of enjoyment from Multipurpose Studio and the Weight Room, in that those in Group Exercise were not

significantly different from those in the latter two locations. This finding implied that whether an individual enjoys exercise influences where he/she spends their time at UREC, and that those who spend most of their time on the Cardio Deck were less likely to be driven by enjoyment (See Table 7).

The fourth one-way between subjects ANOVA was conducted to compare the motivational influence of competence, or the desire to be challenged, improve at an activity, or improve skills, on where an individual decided to spend time. There was a significant effect of competence on where an individual decided to exercise at the $p < .05$ level for the three conditions [$F(3,199)=7.05, p=.000$]. More specifically, it was found that those who spend the most time on the Cardio Deck, in the Multipurpose Studio, and Group Exercise shared the same levels of competence, while those who spent the most time in the Weight Room only shared the same levels of competence as those in the Multipurpose Studio. This finding implied that competence does have an influence on where an individual decides to perform physical activity (See Table 8).

The final one-way ANOVA that investigated motivations on location choice examined fitness as a motivation. A one-way between subjects ANOVA was conducted to compare the effect of fitness as a motivation on the how an individual decides where to spend time at UREC. There was a significant effect of fitness on the decision of where to spend time at the $p < .05$ level for the three conditions [$F(3, 199)=2.70, p=.047$]. More specifically, it was found that those who spent time on the Cardio Deck, in the Multipurpose Studio, and the Weight Room all shared the same levels of fitness motivation. Those who spent time on the Cardio Deck were also significantly similar to those in Group Exercise, while the Multipurpose Studio and Weight

Room participants were significantly different from those in Group Exercise, but were significantly similar to each other (See Table 9).

The second manner in which these subsets were used to investigate motivations was using a one-way between subjects ANOVA to compare each motivation's impact on why an individual chooses to exercise (e.g., the influence of appearance on an individual's motivation to burn calories). To begin, a one-way between subjects ANOVA was conducted to compare the effect of appearance on why an individual chooses to exercise. There was a significant effect of appearance on an individual's motivation to exercise at the $p < .05$ level for the three conditions [$F(3,198)=2.77, p=.043$]. The ANOVA found that those who worked out based on burning calories expressed the same levels of motivation by appearance as those who exercised to increase muscle mass and improve physical fitness. However, 'increase muscle mass', 'how I'm feeling,' and 'improve physical fitness' were all statistically similar. See Table 10 for explanation.

The next one-way between subjects ANOVA was run to compare the impact of social aspects on an individual's motivation to exercise. There was not a significant effect of social motivations on the motivation to exercise at $p=.05$ level for the three conditions [$F(3,198)=0.67, p=.570$]. These results implied that social aspects were not a motivating factor for participants to decide what physical activity to perform.

The following ANOVA conducted was to compare the effect of enjoyment on the motivation to perform exercises. There was a significant effect of enjoyment on an individual's motivation to exercise at the $p < .05$ level for the three conditions [$F(3,198)=11.52, p=.000$]. More specifically, it was found that burn calories and increase muscle mass shared the same levels of enjoyment as motivation and were both significantly different from the levels of 'how I'm

feeling’ and ‘improve physical fitness.’ However, both ‘how I’m feeling’ and ‘improve physical fitness’ shared similar levels of enjoyment motivation. This finding suggested that enjoyment was a motivating factor when participants decide what motivates them to exercise (See Table 12).

A one-way between subjects ANOVA was conducted to compare the effect of competence on an individual’s motivation to exercise. There was a significant effect found of competence on the motivation to exercise at the $p < .05$ level for the three conditions [$F(3,198)=7.38, p=.000$]. The results of the ANOVA found that those who wish to burn calories shared the same levels of competence as those who decide based on ‘how I’m feeling.’ ‘How I’m feeling’ also shared similar levels of this motivation with ‘improve physical fitness’ See Table 13).

Finally, a one-way between subjects ANOVA was conducted to compare the effect of fitness on an individual’s decision to exercise. There was not a significant effect of fitness on decision to perform physical activity at the $p < .05$ level for the three conditions [$F(3,198)=2.19, p=.091$]. This finding suggested that fitness does not serve as a motivating factor when deciding to exercise (See Table 14).

Table 1: Influence of class standing on likelihood of exhibiting eating disorder symptoms.

Group	n	Mean	SD
First Year	71	2.26a	1.52
Sophomore	39	1.97ab	1.56
Junior	42	1.39b	1.19
Senior	54	1.54	1.10

Table 2: Influence of location on likelihood of exhibiting eating disorder symptoms.

Group	n	Mean	SD
Cardio Deck	74	1.93	1.15
Multipurpose Studio	20	1.55	1.08
Group exercise	54	1.85	1.32
Weight Room	55	1.89	1.44

Table 3: Influence of motivation on likelihood of exhibiting eating disorder symptoms.

Group	n	Mean	SD
Burn Calories	32	2.96a	1.59
Increase Muscle Mass	22	1.52b	1.37
How I'm Feeling	73	1.72b	1.34
Improve Physical Fitness	75	1.62b	1.16

Table 4: Influence of college major on likelihood of exhibiting eating disorder symptoms.

Group	n	Mean	SD
College of Arts and Letters	11	29.18	13.24
College of Business	40	33.28	16.76
College of Education	13	34.38	20.13
College of Health and Behavioral Science	97	35.45	17.43

College of Integrated Science and Engineering	9	36.67	16.50
College of Science and Mathematics	20	26.10	11.20
College of Visual and Performing Arts	8	34.00	13.86
Undecided	6	38.33	14.35

Table 5: Influence of appearance on where to exercise.

Group	n	Mean	SD
Cardio Deck	74	5.47	1.37
Multipurpose Studio	20	5.44	1.15
Group exercise	54	5.74	1.30
Weight Room	55	5.44	0.92

Table 6: Influence of socialization on where to exercise.

Group	n	Mean	SD
Cardio Deck	74	3.08	1.41
Multipurpose Studio	20	3.45	1.16
Group exercise	54	3.24	1.21
Weight Room	55	3.40	1.49

Table 7: Influence of enjoyment on where to exercise.

Group	n	Mean	SD
Cardio Deck	74	4.49a	1.20

Multipurpose Studio	20	5.17b	1.22
Group exercise	54	4.72ab	1.40
Weight Room	55	5.45bc	0.99

Table 8: Influence of competence on where to exercise.

Group	n	Mean	SD
Cardio Deck	74	4.61a	1.19
Multipurpose Studio	20	4.98ab	1.09
Group exercise	54	4.44a	1.27
Weight Room	55	5.39b	1.11

Table 9: Influence of fitness on where to exercise.

Group	n	Mean	SD
Cardio Deck	74	5.96ab	0.98
Multipurpose Studio	20	6.12ac	0.68
Group exercise	54	5.64b	1.12
Weight Room	55	6.12ac	0.68

Table 10: Influence of appearance on what physical activity to perform.

Group	n	Mean	SD
Burn Calories	32	5.83a	1.04
Increase Muscle Mass	22	5.68ab	1.01

How I'm Feeling	73	5.14b	1.42
Improve Physical Fitness	75	5.46ab	1.18

Table 11: Influence of socialization on what physical activity to perform.

Group	n	Mean	SD
Burn Calories	32	2.95	1.34
Increase Muscle Mass	22	3.34	1.65
How I'm Feeling	73	3.32	1.25
Improve Physical Fitness	75	3.12	1.43

Table 12: Influence of enjoyment on what physical activity to perform.

Group	n	Mean	SD
Burn Calories	32	4.05	1.11
Increase Muscle Mass	22	5.89	0.83
How I'm Feeling	73	4.78a	1.15
Improve Physical Fitness	75	5.06a	1.29

Table 13: Influence of competence on what physical activity to perform.

Group	n	Mean	SD
Burn Calories	32	4.30a	1.10
Increase Muscle Mass	22	5.80	0.91
How I'm Feeling	73	4.74ab	1.07

Improve Physical Fitness	75	4.86b	1.35
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Table 14: Influence of fitness on what physical activity to perform.

Group	n	Mean	SD
Burn Calories	32	5.77	1.08
Increase Muscle Mass	22	6.15	0.69
How I'm Feeling	73	5.78	1.02
Improve Physical Fitness	75	6.10	0.82

Discussion

The current data amplified the prevalence of eating disorder symptomatology among undergraduate females, especially those who attend UREC. The goal of the current study, in addition to supplementing existing literature, was to shed light on the commonness of eating disorder symptomatology and the risk among undergraduate females who attend the university recreation center. This study aimed to increase awareness, so that UREC can recognize the need to improve screening and prevention methods for its participants.

The results of the current study provided more information than anticipated and allowed for greater investigation into the female undergraduate participants of UREC. The results, however, did not provide ample evidence to answer all research questions due to the fact that all participants reported attending UREC, eliminating a control group to make comparisons. However, all other research questions were successfully addressed.

As expected, freshmen reported being more at risk to exhibit eating disorder symptoms, with juniors being the least likely to display symptoms. This finding substantiated the belief that, because freshmen are away from home for the first time, they experience stress and discomfort when it comes to regulating nutritional input (Faas et al., 2015; Foster et al., 2015). Additionally, freshmen begin to experiment with alcohol and experience social pressures, which can lead to weight gain and stress, and can trigger them to use disordered eating as a coping mechanism (Hay & Ward, 2015). Juniors appeared to be less at risk to exhibit these symptoms, likely due to the fact that they have become comfortable and efficient with caring for themselves. Perhaps one can assume that juniors were least expected to exhibit symptoms because they are not yet seniors, worrying about entering the workplace after graduation, which can be a stressor for some individuals.

Additional results supported the hypothesis regarding where participants exercise the most. Participants who reported spending most of their time on the Cardio Deck were more likely to exhibit eating disorder symptoms in comparison to the four other locations. This finding was not surprising, as cardio is often the choice of exercise when participating in excessive exercise, as excessive exercise can serve as a way to purge calories, and cardiovascular training commonly burns the most calories per session (Balady et al., 2000; National Institute of Mental Health [NIMH], 2016). Therefore, cardio often appears as a first-line of choice activities among individuals with eating disorder symptomatology.

Participants exhibiting eating disorder symptoms were also more likely to be embarrassed by their perceived image and prefer to isolate instead of comparing themselves to others (NEDA, 2018b). This isolation can be observed in the previously explained association between physical activity motivators and also where time was spent at UREC. Current findings showed that participants who value social experience spend the least amount of time on the Cardio Deck. This finding supported the characteristic of isolation by suggesting that participants on the UREC Cardio Deck can exercise unaccompanied, which appeals to their wish to not be seen by others. In addition to location's impact on the likelihood of exhibiting eating disorder symptoms, the results found when investigating the influence of motivation on an individual's likelihood of expressing an eating disorder showed that participants who were motivated to exercise based on burning calories were more inclined to exhibit eating disorder symptoms. This finding was consistent with previous findings that individuals who excessively exercise, a symptom of an eating disorder, were more likely to be motivated by burning calories (Bratland, Hoffart, Martinsen, Sundgot- Borgen, & Rosenvinge, 2010).

Surprisingly, a participant's major was not an influential factor of expressing eating disorder symptoms, as previous research found that health-related majors tend to be more prone to exhibit eating disorder symptomatology (Martin et al, 2017). However, this study found that participants in the College of Health and Behavioral Sciences were neither the most at risk of expressing eating disorder symptoms nor the least at risk. While the sample size was small, interestingly, it was found that individuals who were Undeclared were most likely to exhibit eating disorder symptoms, and those belonging to the College of Science and Mathematics were least prone to the eating disorder symptoms.

Through the Exploratory Analysis, it was found that participants whose goal was to burn calories used appearance as a main motivator for where they decided to work out in UREC. Appearance as a motivator relates to eating disorder symptomatology, as those with eating disorder symptoms are generally unhappy with how their body looks, in addition to excessive exercise (NIMH, 2016.) Based on the data collected, participants driven by appearance, and the general dissatisfaction with self-image, were more likely to use this negative sentiment to fuel their exercise sessions, which could lead to excessive exercise. Overall, both cardio and appearance relate to eating disorder symptomatology, as they both impact an individual's choice and frequency or intensity of exercise.

Negative sentiments towards cardio activity were common responses from participants. More specifically, those participants who spent most of their time on the Cardio Deck experienced the least amount of enjoyment from their workout, compared to those who spent most of their time in the weight room enjoyed their physical activity the most. This finding defended the concept that excessive exercisers do not enjoy the act of exercise, but rather perform exercise for reasons associated with appearance which, as previously stated, was the

most common motivator for those participants who frequented the Cardio Deck (Balady et al., 2000; National Institute of Mental Health [NIMH], 2016).

Various unforeseen relationships between muscular strength training and cardiorespiratory physical activity commonly occurred in the present study. An inverse relationship between the two aforementioned variables was found regarding enjoyment, social aspects, improve fitness level, and the likelihood of expressing eating disorder symptomatology. These relationships indicated that those participants attempting to gain muscle mass had more positive motivations, worked out to improve fitness, and tended to have more competence as compared to participants who wished to burn calories. Additionally, participants who exercise to burn calories were directly correlated to those who exercise to increase muscle mass when discussing eating disorder symptoms. Therefore, it can be hypothesized that participants who exercise in order to increase muscle mass or physical fitness were more likely to experience intrinsic satisfaction during physical activity and genuinely enjoy the exercise. Participants whose goal was to burn calories or participate in compensatory exercise were more likely to view exercise as a compulsion and, therefore, were not going to look for growth in social circles, fitness goals, or intrinsic happiness (Brown et al., 2014; Adkins & Peel, 2005).

Limitations

Limitations of the current study included a small sample size, lack of exercise frequency assessment questions, lack of a control group, and the numerous incomplete surveys received. Of the 304 survey responses received, the researcher chose to narrow the number of surveys analyzed on the basis that a large portion of the respondents failed to complete the survey. These surveys were narrowed to only include the data obtained by participants who completed the Likert scale portions of the survey. The questions skipped in the incomplete surveys were at random and, therefore, the researcher was unable to hypothesize why certain participants failed to complete their survey. A combined result of a lack of respondents and narrowing the surveys to those with completed information, the final sample size only accounts for approximately 1.7% of the total JMU undergraduate female population. Therefore, this sample was not an accurate representation of the full undergraduate female population under investigation.

Additionally, the survey failed to gauge the frequency by which participants attend UREC. This assessment could have been addressed by adding questions to the survey examining the duration of time spent in UREC, as well as how many days per week participants attend UREC. By assessing the frequency by which participants attend UREC, a comparison could be drawn between participants who spent the most time at UREC and those who spent the least amount of time, establishing a dose-response comparison. Through investigating a dose-response comparison, the data may have shown that, as a female's time at the recreation center increases, so does the likelihood of developing an eating disorder. Therefore, as frequency increases, so does the likelihood of developing eating disorder symptomatology. However, since the appraisal questions were not present in this study's survey, the researcher was unable to draw the

conclusion of a relationship between frequency of attending the recreation center and the likelihood of exhibiting eating disorder symptoms.

Upon further analysis, it was realized that two of the SCOFF assessment questions were inadvertently excluded from the survey. This lack of comprehensive data analysis compromised the efficacy of this particular survey, the SCOFF Questionnaire, which was used to predict correlations between undergraduate females and those exhibiting eating disorder symptoms. Therefore, the researcher was unable to take this questionnaire into account when establishing the possibility of participants exhibiting eating disorder symptoms, making it irrelevant to this survey. This presented a limitation to the study because the requirements for using this questionnaire as a form of measuring symptomatology were not met, resulting in no data being collected through this forum.

A consequence of narrowing the number of surveys analyzed also resulted in the lack of comparison, because there was not a control group including those who did not attend UREC, to compare to those who did attend UREC. A control group would have strengthened this study providing the researcher with a group to juxtapose participants who did attend UREC and their likelihood of exhibiting eating disorder symptomology, compared to students who did not attend UREC and their likelihood of exhibiting eating disorder symptoms. All the participants taken into account reported that they attend UREC. Self-reporting was also a shortcoming of this study, as participants were not always forthcoming with the truth, which could skew the data positively or negatively, depending on the responses.

Suggestions for Future Research

In order to more accurately study the relationship between undergraduate females who attend UREC and those exhibiting symptoms of an eating disorder, this study could be conducted with an improved questionnaire over a longer period of time. Data for this study was conducted over the span of one month. Increasing the period of survey availability may increase the number of respondents, thereby increasing the sample size, potentially allowing for a more representative sample. A study's sample size can determine its strength, because a larger sample size tends to more accurately describe the population, therefore, making the results of the study more applicable and generalizable. The researcher was able to hypothesize additional conclusions from this summarized population. Assessing the use of different scales may also result in a more effective questionnaire. Another option for continued research would be to conduct a study similar to the current one over a variety of college campuses, addressing their recreation centers. This information would provide more diverse responses and increase the generalizability of the study to apply to the undergraduate female population across different regions versus focused on one university.

An interesting association revealed in the current study's findings was a strong correlation between participants who spent time at the pool and use socializing as a main motivator. The small subset size ($n = 2$) did not allow for a strong correlation between social motivations and presence in the pool, but future studies could investigate if this is a common occurrence and, if so, why people use the pool mainly for social purposes in comparison to other locations in the university recreation center. The participants in this subset did not attend the pool for other reasons beyond a social drive, so this would be an interesting aspect to examine further.

Future research also has the potential to more closely investigate the inverse relationship between burning calories and increasing muscle mass, because of the heavy presence of this relationship found in the current study.

A possible study investigating the relationship between burning calories and increasing muscle mass can examine further how these motivations connect to eating disorder symptomatology. Additionally, a future study can attempt to determine if increasing muscle mass can serve as a preventative factor for developing symptoms. The study can potentially be completed by, once again, surveying the university's undergraduate female population and labeling each participant with a randomly assigned numerical identifier. Once the data is collected, the researcher can follow up with those who reported burning calories as a motivator and those who reported increasing muscle mass as a motivator using a secondary survey or interview. The follow-up questions should consider factors, such as having a history of mental illness, influences on health (e.g., social media messages encouraging individuals to skip meals or high school coaches supporting weight lifting), and the strength of the influences, and previous knowledge of health and exercise. Future research may also examine the existence of body dysmorphia and coping mechanisms to help determine the influence of emotion on physical activity.

The investigation of these factors provides more meaningful insight to the mindset surrounding the development of eating disorder symptoms and the possible prevention of these symptoms. This information could possibly show that undergraduate females who focus more on increasing muscle mass before college have a lesser chance of developing eating disorder symptoms. Furthermore, researchers may find that individuals who have a greater focus on social media trends are more likely to exhibit harmful eating disorder symptoms. Mental illness has

been connected to eating disorder symptomology and development in the past (e.g., Boepple et al, 2011; Eisenberg et al, 2011), and the current study can provide current literature outlining research. Once the strength of associations is determined, researchers and community members can further assess the prevention of eating disorders and the initiation of programs to address the prevention based on the results of this study.

The most significant improvement on the current study would be to examine the motivations that drive undergraduate females to attend their university recreation centers. This information would provide an enhanced understanding on the motivations that influence female students' mindsets as applied to exercise and body image. By studying participants' reasons for attending their university's recreation center, future research may predict potential harmful exercise behaviors.

Ultimately, a shorter, more concise survey would have resulted in a higher completion rate of the current survey, as students may not be as willing to commit the time necessary to complete a lengthier survey. If the survey is shorter, participants may be less likely to view the survey as a time-consuming activity. Additionally, the over-usage of Likert scales may have discouraged participants from completing the survey, as the scales appear to be lengthy and time-consuming as well. A larger number of completed surveys would greatly strengthen this study by providing a greater sample size and potentially establishing a control group which, as previously stated, would allow for a more effective study on assessing the correlation between exhibiting eating disorder symptoms and attendance at university recreation centers.

Conclusion

The current study provided insight to the specific areas for improvement in university recreation centers. The staff of university recreation centers should receive additional training in approaching individuals who are at-risk of developing eating disorder symptoms, as well as place greater importance on health outside of the university recreation center, comprehensive wellness, and educating the public on the importance of self-regulation regarding physical activity. The current findings indicated that a majority of participants who expressed eating disorder symptoms attended the Cardio Deck the most often and implied that these individuals also preferred to exercise alone, as they did not perform physical activity for social reasons. A possible way to begin altering the silence surrounding eating disorder symptoms in the university recreation center is to place posters encouraging body acceptance and self-care and other environmental reinforcers of body-positivity in the cardio portions of the gym to help influence participants. Additionally, university recreation centers can offer more programs regarding physical fitness as a form of stress management because, while they can receive this type of information at many counseling facilities, participants may feel more welcomed to walk into a gym, rather than a therapy session. This strategy allows students to receive the help or guidance they may need without forcing them out of their comfort zone.

Finally, university recreation center staff can alter their roles by identifying themselves as leaders and influencers. Group exercise instructors can provide positive attitudes and serve as role models in their classes, while supervisors of the muscular strength areas can monitor that participants are not working out for hours on end, or at least feeling comfortable enough to have this conversation with the participant if he/she is performing potentially dangerous activities. Staff members regulating the cardio portions of university recreation centers can hold brief

conversations with participants they see often to address the safety of the participant's level of engaged activity related to their health. By these leaders taking more proactive roles in the lives of participants, they may be able to help a participant in need of guidance toward a healthier and safer life.

In conclusion, the current study supported previous research and has added to the existing literature in regard to motivations for how undergraduate females decide on where to exercise within a university recreation center. In support of previous literature, the current study provided evidence that freshmen undergraduate females who attend UREC are more likely to exhibit eating disorder symptoms compared to their peer class standings. In addition, undergraduate females whose main goal was to burn calories were more likely to exhibit eating disorder symptoms. Information regarding the direct inverse relationship between the drive to burn calories and the drive to increase muscle mass allows future research to be conducted and exposes a significant trend in undergraduate female motivations and exercise behavior. The current study can serve as a guidepost for future studies regarding eating disorder symptoms and undergraduate females and, most importantly, open the discussion for preventative measures and an alteration in stigma.

References

- Adkins, E., & Keel, P. (2005). Does “excessive” or “compulsive” best describe exercise as a symptom of bulimia nervosa? *International Journal of Eating Disorders*, 38(1), 24–29. doi:10.1002/eat.20140.
- Balady, G. J., Bazzarre, T., Chaitman, B. L., Fleg, J. L., Fletcher, B., Limacher, M., . . . Williams, M. (2000). Resistance exercise in individuals with and without cardiovascular disease. *Circulation*, 101, 828-833. Retrieved from <https://doi.org/10.1161/01.CIR.101.7.828>
- Bratland, S., Hoffart, A., Martinsen, E., Sundgot- Borgen, J., & Rosenvinge, J. (2010). Physical activity and exercise dependence during inpatient treatment of longstanding eating disorders: An exploratory study of excessive and non-excessive exercisers. *International Journal of Eating Disorders*, 43(3), 266-73. doi: 10.1002/eat.20769.
- Bell, H., Donovan, C., & Ramme, R. (2016). Is athletic really ideal? An examination of the mediating role of body dissatisfaction in predicting disordered eating and compulsive exercise. *Eating Behaviors*, 21, 24-29.
- Boepple, L., Glunz, C., Goldschmidt, A., Le Granger, D., & Stiles- Shields, E. C. (2011). Driven exercise among treatment-seeking youth with eating disorders. *Eating Behaviors*, 12, 328-331. doi: 10.1016/j.eatbeh.2011.09.002
- Brown, T., Holland, L., & Kell, P. (2014). Defining features of unhealthy exercise associated with disordered eating and eating disorder diagnoses. *Psychology of Sport and Exercise*, 15, 116-123.
- Dalton, S., Dinh, J., Donalson, R., Hebenstreit, C., Li, Y., Maguen, S., & Rubin, E. (2018). Screen for disordered eating: Improving the accuracy of eating disorder screening in

- primary care. *General Hospital Psychiatry*, 50, 2025. Retrieved from <http://dx.doi.org/10.1016/j.genhosppsy.2017.09.004>
- Davis, C., & Kaptein, S. (2006). Anorexia nervosa with excessive exercise: A phenotype with close links to obsessive-compulsive disorder. *Psychiatry Research*, 142(2-3), 209-17. doi: 10.1016/j.psychres.2005.11.006
- Eisenberg, D., Kirz, N., Nicklett, E., & Roeder, K. (2011). Eating disorder symptoms among college students: Prevalence, persistence, correlates, and treatment seeking. *Journal of American College Health*, 59(8), 700-707. doi: 10.1080/07448481.2010.546461.
- Faas, M. M., Groen, H., Hanck, C., Neisingh, M., Prak, D., & de Vos, P. (2015). Weight gain in college students and perceived health. *Preventative Medicine Reports*, 2, 229-234.
- Foster, C., Townsend, N., & Vadeboncoeur, C. (2015). A meta-analysis of weight gain in first year university students: Is freshman 15 a myth?. *BMC Obesity*, 2(22). doi:10.1186/s40608-015-0051-7
- Hatch, S., Hotopf, M., Micali, N., Solmi, F., & Treasure, J. (2015). Validation of the SCOFF questionnaire for eating disorders in a multiethnic general population sample. *International Journal of Eating Disorders*, 48(3), 312-316.
- Hay, M. C., & Ward, R. M. (2015). Depression, coping, hassles, and body dissatisfaction: Factors associated with disordered eating. *Eating Behaviors*, 17, 14-18. Retrieved from <https://doi.org/10.1016/j.eatbeh.2014.12.002>
- Martin, L. A., Pelly, F., Rocks, T., & Slater, G. (2017). Prevalence of exercise addiction symptomology and disordered eating in Australian students studying nutrition and dietetics. *Journal of the Academy of Nutrition and Dietetics*, 117(10), 1628-1636. Retrieved from <http://dx.doi.org/10.1016/j.jand.2017.04.001>

National Eating Disorder Association. (2018a). *Statistics & research on eating disorders*.

Retrieved from <https://www.nationaleatingdisorders.org/statistics-research-eating-disorders>

National Eating Disorder Association. (2018b, February 22). *Body image & eating disorders*.

Retrieved from <https://www.nationaleatingdisorders.org/body-image-eating-disorders>

National Eating Disorder Association. (2015). *Educator toolkit for educators*. New York, NY:

National Eating Disorder Association.

National Institute of Mental Health. (2016). *Eating disorders*. Retrieved from

<https://www.nimh.nih.gov/health/topics/eating-disorders/index.shtml>