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### **An investigation of resistance training behavior, non-specific psychological distress, and perceived barriers to resistance training in self-identifying female undergraduate students**

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An Investigation of Resistance Training Behavior,  
Non-Specific Psychological Distress, and Perceived Barriers to Resistance Training  
in Self-Identifying Female Undergraduate Students

by

Jody Sobel

Submitted in Partial Fulfillment of the  
Requirements for the Master of Science in Exercise Science Degree

Kinesiology Department

STATE UNIVERSITY OF NEW YORK COLLEGE AT CORTLAND

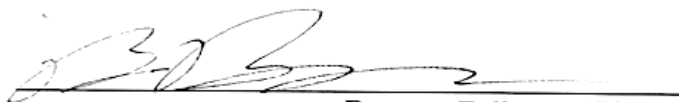
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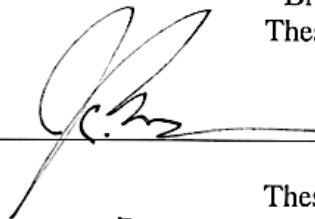
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## ABSTRACT

Independent investigations and national surveys of the prevalence and severity of depression symptoms among college students, specifically self-identifying female undergraduate students, paints a worrisome picture. There is a great deal of research that suggests a relationship between exercise, specifically resistance training (RT), and mental health. That said, current literature suggests that many self-identifying female undergraduate students are not engaging in enough due to perceived barriers. The purpose of this study was multifold and intended to: 1) examine the prevalence and severity of non-specific psychological distress; 2) determine if there were differences between Kessler 6 Non-Specific Psychological Distress Scale (K6) categories (i.e., no or low, moderate, and serious psychological distress) regarding RT program variables (i.e., frequency, intensity, and volume) and Perceived Barriers to Resistance Training (PBRTQ) total and subscale (i.e., time-effort, physical effects, social, and specific obstacles) scores; and 3) establish a relationship between RT program variables and PBRTQ total and subscale scores in a sample of self-identifying female undergraduate students. Participants included a sample of self-identifying female undergraduate students who were enrolled at the State University of New York at Cortland during the 2022-2023 academic year. An extensive questionnaire was used to gather data that included the following: informed consent, demographic data, and RT program variables, K6, and the PBRTQ. Results indicated that individuals in the severe psychological distress category perceived greater barriers to RT than individuals in the no and low ( $p < 0.001$ ) and moderate ( $p = 0.001$ ) psychological distress categories. With that, a moderate negative correlation was found between perceived barriers to RT and RT frequency ( $\rho = -0.44, p < 0.001$ ). Therefore, it could be inferred that individuals experienced greater psychological distress due to their no or low RT frequency. For self-identifying female undergraduate students to acquire the

benefits of RT, specifically the psychological benefits, universities and campus recreational services must help students overcome their perceived barriers, specifically their perceived time/effort and social barriers.

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## CHAPTER 1

### INTRODUCTION

The prevalence and severity of depression symptoms continues to be a concern across all age and gender groups, especially among college students and, more specifically, across self-identifying female undergraduate students. Numerous studies within the past decade highlight this troubling trend across different depression severity classifications (Arslan et al., 2009; Beiter et al., 2015; Garlow et al., 2008; Shah & Pol, 2020). Corroborating these independent findings are the recent 2022 results from the National College Health Assessment (NCHA) administered by the American College Health Association (ACHA). The national survey revealed that 29% of cis-gender women reported being diagnosed with depression (ACHA, 2022). Given the consistent finding over time that females, in particular self-identifying college females, continue to deal with depression or depression-like symptoms, colleges are ideally situated to address this issue.

While it is important for universities to encourage students that are struggling with their mental health to seek psychological treatment, there are other opportunities in which universities can play a part in student well-being. Several recent investigations suggested anti-depressive effects in college female students performing aerobic physical activity (Ghorbani et al., 2014; Herbert et al., 2020; Zhang et al., 2020). Research on resistance training (RT), however, is beginning to emerge relative to mood benefits. Studies during the late 1980s and early 1990s (e.g., Doyne et al., 1987; Martinsen et al., 1989, Stein et al., 1992) and more recent (e.g., Aidar et al., 2014; Sims et al., 2009; Singh et al., 2001) all suggest improvements in markers of depression, although specific exercise program variables still require further systematic evaluation (Stanton et al., 2014). If there is psychological benefit, in addition to the physiological

adaptations, that stem from RT, it begs the question as to why college undergraduate self-identifying females do not engage in more RT.

Using the finding that 29% of cis-gender women reported being diagnosed with depression in the NCHA survey, even more disconcerting was the nearly 27% drop in those meeting the recommendation for aerobic activity (67.9%) to those meeting the recommendation for Active Adults (41.3%; combination of aerobic and strength training activities; ACHA, 2022). Studies of perceived barriers to RT among college females suggest varied reasons for avoiding such activity with two barriers being more critical: time-effort (Harne & Bixby., 2005; Hurley et al., 2018) and social barriers (Peters et al., 2019). Thus, it appears that rate of depression in college undergraduate self-identifying females makes them a group worthy of study relative to improvement in mood that stems from RT.

### **Statement of the Problem**

According to the American College Health Association National College Health Assessment III (ACHA-NCHA III) Spring 2022 Undergraduate Student Reference Group (ACHA, 2022), out of the approximate 35,000 cis-gender women who responded, 29% reported being diagnosed with depression. Additionally, there was a 27% reduction in those that reported aerobic activity but zero days of exercises to strengthen or tone muscles in the last seven days. For these students to achieve the benefits of RT, specifically the psychological benefits, universities and campus recreational services must first identify and then help students overcome their perceived barriers as well as encourage students who are currently engaged in RT to do so in a way that is most beneficial.

## **Purpose**

The purpose of this study was multifold and intended to: 1) examine the prevalence and severity of non-specific psychological distress; 2) determine if there were differences between Kessler 6 Non-Specific Psychological Distress Scale (K6) categories (i.e., no or low, moderate, and serious psychological distress) regarding RT program variables (i.e., frequency, intensity, and volume) and Perceived Barriers to Resistance Training (PBRTQ) total and subscale (i.e., time-effort, physical effects, social, and specific obstacles) scores; and 3) establish a relationship between RT program variables and PBRTQ total and subscale scores in a sample of self-identifying female undergraduate students.

## **Hypotheses**

It was hypothesized that in a group of self-identifying female undergraduate students:

H<sub>1</sub>: RT frequency would decrease across K6 categories (i.e., no or low psychological distress > moderate psychological distress > serious psychological distress) per the K6.

H<sub>2</sub>: RT intensity would decrease across K6 categories (i.e., no or low psychological distress > moderate psychological distress > serious psychological distress).

H<sub>3</sub>: RT volume would decrease across K6 categories (i.e., no or low psychological distress > moderate psychological distress > serious psychological distress).

H<sub>4</sub>: PBRTQ total and subscale scores would increase across K6 categories (i.e., no or low psychological distress < moderate psychological distress < serious psychological distress).

H<sub>5</sub>: There would be significant correlations between RT program variables and PBRTQ total and subscale scores.

## **Delimitations**

The delimitations of this study included:

1. Use of a sample of undergraduate self-identifying female students from the State University of New York at Cortland.
2. Use of the Kessler 6 (K6) Non-specific Psychological Distress questionnaire.
3. Use of the Perceived Barriers to Resistance Training (PBRTQ) questionnaire.
4. Self-reported measures of resistance training program variables.

### **Limitations**

The limitations of this study included:

1. Results were not generalizable to self-identifying male or non-binary undergraduate students.
2. Inability of participants to accurately recall and report their own exercise behavior over a 30-day period.

### **Assumptions**

The following assumptions were made about this study:

1. There was a large population of self-identifying female undergraduate students that resistance train.
2. Participants would answer questions honestly.

### **Definition of Terms**

*Aerobic exercise* rhythmic exercise (e.g., walking, jogging, running, sprinting) intended to maintain or improve cardiorespiratory fitness i.e., the functional capabilities of the heart, blood vessels, lungs, and skeletal muscles (Liguori et al., 2020).

|                               |   |
|-------------------------------|---|
| <i>Depression</i>             | a common but serious mood disorder that affects how one feels, thinks, and handles everyday activities such as sleeping, eating, and working; also referred to as major depressive disorder or clinical depression (National Institute of Mental Health, 2022). |
| <i>Frequency</i>              | days per week dedicated to an exercise program (Liguori et al., 2020).  |
| <i>Intensity</i>              | the magnitude of loading i.e., amount of weight lifted (Liguori et al., 2020).  |
| <i>Perceived Barrier</i>      | barriers that interfere with exercise (Myers & Roth, 1997).   |
| <i>Psychological Distress</i> | a constellation of psychological and somatic symptoms that are common among individuals with a wide range of mental disorders but are not specific to any single disorder (Dohrenwend et al. 1980)  |
| <i>Resistance training</i>    | the use of external loads (e.g., free weights, machines, band/tubing) to maintain or improve muscular fitness i.e., strength, hypertrophy, power, and local muscular endurance (Liguori et al., 2020).  |
| <i>Volume</i>                 | the total amount of sets performed for a given muscle group/movement pattern per week (Liguori et al., 2020).   |

### **Significance of the Study**

This study expanded on the current literature as there were few studies that have examined the relationship between exercise, specifically RT, and mental health in self-identifying female undergraduate students. Moreover, studies that have examined RT have not sought to determine if there were differences between K6 categories regarding RT program variables and PBRTQ total and subscale scores. This was the first study to determine if there were differences between K6 categories regarding RT measures of program variables and PBRTQ total and subscale scores in addition to examining the strength of the relationship between RT measures and PBRTQ total and subscale scores in self-identifying female undergraduate students.

## CHAPTER 2

### LITERATURE REVIEW

This chapter includes a review of the literature about the relevant topics central to this investigation. These topics included: the prevalence and severity of depression, the psychological benefits of exercise, specifically RT, as well as the perceived barriers to RT in self-identifying female undergraduate students. The review is organized into three sections based upon these topics using the following subheadings: *The Prevalence and Severity Undergraduate Students*, *The Anti-Depressive Effect of Resistance Training*, and *The Perceived Benefits and Barriers to Resistance Training*. This chapter concludes with a summary of these three sections.

#### **The Prevalence and Severity of Depression in Undergraduate Students**

In the past decade, multiple researchers have examined the prevalence and severity of mental health disorders such as stress, anxiety, and depression among college students. When looking at depression specifically, the findings were troublesome. For example, Garlow et al., (2008) found that out of 729 college students, 210 (29.6%) were experiencing mild depression, 217 (30.6%) were experiencing moderate depression, 118 (16.6%) were experiencing moderately severe depression, and 47 (6.6%) were experiencing severe depression. Likewise, Arslan et al., (2009) found that out of 822 college students, 179 (21.8%) were experiencing depression and/or depression symptoms, and similarly, Beiter et al., (2015) found that out of 378 college students, 42 (11.0%) reported severe or extremely severe depression. Furthermore, Shah and Pol (2020) found that out of 400 college students, depression was prevalent in 48.3%, and that out of these students, 26.5% were suffering from depression at clinically significant levels. While percentages vary among these studies, it is evident as to why mental health, specifically depression, has become of significant importance to universities in the past decade.



Unfortunately, while some of studies were conducted some time ago, results of the ACHA-NCHA III Spring 2022 Undergraduate Student Reference Group, suggests little improvement (ACHA, 2022). Out of the approximate 55,000 undergraduate students who responded, 27% reported that they had been diagnosed by a healthcare or mental health professional with depression. When looking at females specifically, out of the approximate 35,000 cis-gender women who responded, 29% reported the same. This was more than double the amount reported by males (14%) making female students disproportionately at risk for the mental health outcomes associated with depression. With that, 24% of these women reported that depression has negatively impacted performance in a class within the last 12 months. Again, this is almost double the amount reported by men (15%). This corroborates findings from Bruffaerts et al., (2018) and Turner et al., (2012) who both suggested that there was a relationship between depression and/or the experience of depression symptoms and poor academic performance.

It is important to note that many of the studies mentioned were conducted prior to the COVID-19 pandemic which had devastating effects on mental health. According to a scientific brief released by the World Health Organization (2022), in the first year of the COVID-19 pandemic, global prevalence of anxiety and depression increased by a 25%, and the pandemic has affected the mental health of young people making them disproportionately at risk for suicidal and self-harming behaviors. It is for this reason, as well as reasons previously mentioned, that universities must continue to make the mental health of college students, specifically those dealing with depression, a greater priority moving forward. While it is important for universities to encourage students that are struggling with their mental health to seek psychological treatment, there are other opportunities in which universities can play a part in student well-being. For example, by encouraging students to utilize the campus recreation facilities as there is

a great deal of research that suggests a relationship between exercise, specifically resistance training, and mental health.

### **The Anti-Depressive Effect of Resistance Training**

There is a great deal of research suggesting a relationship between exercise and mental health, specifically depression. Much of this research focuses on the anti-depressive effects of aerobic exercise rather than nonaerobic exercise (e.g., RT), especially those that include only female students (Ghorbani et al., 2014; Herbert et al., 2020; Zhang et al., 2022). This is perhaps because females traditionally gravitate toward aerobic exercise to lose weight and uphold society's unobtainable beauty standard. As society progresses, and RT becomes more common among females, researchers have started to question whether nonaerobic exercise also has an anti-depressive effect.

In the late 1980s, both Doyme et al., (1987) and Martinsen et al., (1989) compared aerobic and nonaerobic exercise (RT) in the treatment of depression in clinically depressed patients. In both studies participants were separated into either an aerobic or nonaerobic exercise group. All participants completed approximately three exercise sessions per week for eight weeks. Results of both studies indicated that in both exercise groups, aerobic and nonaerobic, reduced depression scores to the same extent.

Stein et al., (1992) also compared nonaerobic exercise (RT) with aerobic exercise in a nonclinical population of 89 undergraduate college students. Experimental groupings were based off classes the students were enrolled in. Each class met two times a week for approximately 90 minutes. Results indicated that both exercise groups reduced their depression scores. The researchers also noted that the nonaerobic group demonstrated greater increase on a measure of

over-all self-concept compared with the aerobic and control. This suggested an additional psychological benefit of nonaerobic exercise.

Since then, many researchers have examined the relationship between depression and nonaerobic exercise (e.g., RT). These studies have been conducted on a variety of populations including, but not limited to, stroke survivors (Aidar et al., 2014) and elderly patients (Singh et al., 2001). While the intervention strategies varied across these studies, all results suggested that there was an anti-depressive effect to RT (Aidar et al., 2014; Sims et al., 2009; Singh et al., 2001). Stanton et al. (2014) conducted a systematic review to get a general sense of which exercise program variables are most beneficial in eliciting this anti-depressive effect. While they were able to determine aerobic program variables (i.e., frequency, intensity, and duration), they were unable to determine nonaerobic variables due to limited available evidence. They concluded that further research was required before making recommendations related to nonaerobic exercise.

Although none of these RT specific intervention studies were conducted on undergraduate students, there have been studies signifying other notable benefits of RT for this population. For example, improved academic performance, and when looking at female identifying undergraduate students specifically, improved body image and self-esteem (Ahmed et al., 2002; Keating et al., 2013; Morrow et al., 2021). This is in addition to the numerous physiological benefits of resistance training (i.e., muscle hypertrophy, increased bone mineral density, neural adaptations, etc.). According to the ACHA-NCHA III Spring 2022 Undergraduate Student Reference Group, out of the approximate 35,000 cis-gender women who responded, there was approximately 27% drop in those who reported zero days of exercises to

strengthen or tone muscles in the last seven days from those who reported both aerobic and strength training activity (ACHA, 2022).

All that being said, it would be naive not to mention the hypothesized mechanisms in which exercise improves mental health. Surprisingly, while there is a great deal of research that suggests a relationship between exercise and mental health, specifically depression, there are discrepancies as to the actual mechanisms that elicit the anti-depressive effect. According to Peluso et al. (2005) it is likely a combination of the hypothesized psychological (i.e., distraction, self-efficacy, social interaction) and physiological (i.e., monoamines, endorphins) mechanisms. They concluded that to determine the exact contribution of each mechanism a further understanding of each mechanism is necessary.

### **The Perceived Benefits and Barriers to Resistance Training**

The benefits of RT are well-documented; however, according to the ACHA-NCHA III Spring 2022 Undergraduate Student Reference Group, out of the approximate 35,000 cis-gender women who responded, 41% reported zero days of exercises to strengthen or tone muscles in the last seven days (ACHA, 2022). While this was a recent statistic, researchers have sought to understand this lack of participation for quite some time. Myers and Roth (1997) created the Perceived Benefits and Barriers to Exercise Questionnaire to investigate the multidimensional structure of perceived benefits of exercise and barriers to exercise within a multistage theoretical framework for exercise adoption in a sample of undergraduate students. This questionnaire has since been modified by Harne and Bixby (2005) to address RT specifically and has been used by other investigators (Hurley et al. (2018); Peters et al. 2019).

Harne and Bixby (2005), Hurley et al. (2018), and Peters et al. (2019) all examined the perceived benefits and barriers to RT in college-aged females. The perceived barrier subscale

that appeared most significant, however, differed across studies. Harne and Bixby (2005) and Hurley et al. (2018) found the most significant perceived barrier subscale to be time-effort while Peters et al. (2019) found the most significant perceived barrier subscale to be social. This dissimilarity across studies could perhaps be explained by Hurley et al. (2018) who found that both the benefits and barriers subscales were significantly correlated to one another. Meaning, that if an individual perceives benefits and/or barriers in one subscale, they are more likely to perceive benefits and/or barriers from another subscale. This presents a challenge in accurately identifying which perceived barrier subscale is most significant.

Surprisingly, Harne and Bixby (2005) found that women who did and women who did not engage in RT did not differ in terms of perceived benefits. They also found that those that did not engage in RT reported significantly greater scores on all four barrier factors compared to strength trainers. This suggested that both women who did and women who did not engage in RT were aware of the benefits of RT, and lack of engagement is not due to lack of awareness of the benefits, but more so due to the inability to overcome numerous perceived barriers (Harne & Bixby, 2005). This was later supported by Peters et al. (2019) who found that individuals who did not report current resistance training participation reported greater barriers compared to those who reported some resistance training participation.

## **Summary**

To summarize, the prevalence and severity of depression symptoms among college students, specifically self-identifying female undergraduate students, is bothersome. There is a great deal of research that suggests a relationship between exercise, specifically RT, and mental health. However, current results suggests that many female identifying students are not engaging recommended amounts of RT. This is due to a multitude of perceived barriers. For self-

identifying female undergraduate students to acquire the benefits of RT, specifically the psychological benefits, universities and campus recreational services must first identify and then help students overcome their perceived barriers (mostly likely time-effort and social-related barriers) as well as encourage students who are currently engaged in RT to do so in a way that is most beneficial.

## CHAPTER 3

### METHODS

This chapter includes a description of (a) participants, (b) the questionnaire survey tool including detailed information about the K6 and PBRTQ instruments, (c) the data collection method, (d) the study design, procedures, and (e) the statistical analyses used. The chapter is organized into four main sections based upon these topics using the subheadings of: *Participants*, *Instrumentation*, *Design and Procedures*, and *Statistical Analysis*.

#### **Participants**

Participants included a sample of self-identifying female undergraduate students who were enrolled at the State University of New York at Cortland during the 2022-2023 academic year. Recruitment was done via e-mail (Appendix A). An *a priori* power analysis indicated that 159 participants were needed for statistical power.

#### **Instrumentation**

##### *Informed Consent*

An informed consent (Appendix B) contained information regarding the purpose of the study, the expected length of the study, risks and benefits, Institutional Review Board approval information, and contact information of the researcher. Participants were informed that they could withdraw from the study at any point without penalty.

##### *Demographic Data Collection Sheet*

A demographic data collection sheet (Appendix C) included questions regarding self-identifying as female, age, class standing, race/ethnicity, training status, and diagnosis and/or treatment for depression in addition to questions regarding participant aerobic physical activity frequency and resistance training program variables (frequency, intensity, and volume).

Kessler 6 Non-Specific Psychological Distress Scale (K6 ; Kessler et al., 2002)

The K6 (Appendix D) was used to measure levels of non-specific psychological distress. Dohrenwend and colleagues (1980) defined non-specific psychological distress as “*a constellation of psychological and somatic symptoms that are common among individuals with a wide range of mental disorders but are not specific to any single disorder.*” Level of non-specific psychological distress was measured instead of depression symptom severity as questionnaires pertaining to depression, such as the Beck Depression Inventory, tend to be invasive and more likely to cause unintentional harm. Moreover, the K6 has been used in large national surveys assessing college student health (e.g., National College Health Assessment). As such, these scales complement each other and should yield comparable results. The K6 consists of six questions which require participants to self-assess the amount of time in which they felt the following symptoms during the past 30 days: (1) nervous; (2) hopeless; (3) restless or fidgety; (4) so depressed that nothing could cheer you up; (5) that everything was an effort; and (6) worthless. Participants indicated the frequency in which they felt each symptom by selecting one of four items. Items were listed in order of increasing frequency, measured on a scale from 0 to 4. Therefore, participants’ final score ranged from 0 to 24. Participants final score determined in which of three categories they were grouped: no or low psychological distress (0-4); moderate psychological distress (5-12), or serious psychological distress (13-24) (ACHA, 2022). Kessler et al. (2002) found the K6 Non-Specific Psychological Distress Scale to have acceptable internal and consistent reliability ( $\alpha = 0.865$ ).

Perceived Barriers to Resistance Training Questionnaire (PBRTQ; Harne & Bixby, 2005)

The PBRTQ (Appendix E) was used to assess perceived barriers to resistance training. The PBRTQ is a slightly modified version of the Perceived Benefits and Barriers to Strength



Training Questionnaire (BBSTQ; Harne & Bixby, 2005). The purpose of this modification was to make the questionnaire more consistent with the current study (i.e., using the term resistance training vs. strength training). Like the BBSTQ, the PBRTQ contains thirty-one barrier items which are subcategorized into time-effort (10 items), physical effects (8 items), social (6 items), and specific obstacles (7 items). Each item contains a five-point Likert scale ranging from 1 (not important) to 5 (extremely important). Participants selected the appropriate number to indicate the importance of that item in determining why they would not participate in resistance training. A high score in any of the subcategories suggested participants perceive high barriers to resistance training in that category. Test-retest reliability over a 2-week period was examined in a sample of undergraduate students ( $N = 143$ ). The reliability of the total barrier score was 0.68. Test-retest reliabilities of individual barrier subscale scores ranged from 0.60 to 0.86 (Myers & Roth, 1997).

### **Design and Procedures**

The questionnaire was administered electronically via the Select Survey platform. Before beginning the questionnaire, participants were instructed to read a statement on the purpose and procedures of the study. Participants were then prompted to give electronic consent before beginning the questionnaire. Participants completed the questionnaire on their own and in one sitting. The questionnaire took approximately 5-10 minutes to complete, and participants could withdraw at any time without penalty by closing their browser. At the end of the questionnaire, participants could self-select to be entered into a raffle for a chance to win a free 50-minute massage from a Licensed Massage Therapist at the Student Life Center by entering their Cortland email address. To ensure anonymity, the email address was not associated with their submissions.

## Statistical Analysis

Descriptive statistics ( $M \pm SD$ ) were calculated for all dependent variables, and the Shapiro-Wilk's tests assessed normality for all dependent variables. A nonparametric test was utilized when normality was violated. A series of Kruskal-Wallis tests determined differences between K6 Non-Specific Psychological Distress Scale categories (i.e., no or low, moderate, and serious psychological distress) in regard to aerobic frequency, RT program variables (i.e., frequency, intensity, and volume), and PBRTQ total and subscale (i.e., time-effort, physical effects, social, and specific obstacles) scores. Significant main effects were followed up with Tukey's Honestly Significant Difference (HSD) pairwise comparisons.

A series of Spearman's rho correlations examined the relationship between RT program variables and PBRTQ total and subscale scores. All statistical analyses were performed using JASP (Version 0.16.4, Amsterdam, The Netherlands). Significance level was set at  $p < 0.05$  for all analyses.

## CHAPTER 4

### RESULTS

This chapter includes a summary of results and features a breakdown of participant demographics, results of the Kruskal-Wallis tests including follow-up Tukey's HSD pairwise comparisons, as well as results of the Spearman's rho correlations. The chapter is organized into three sections based upon these topics using the subheadings of: *Participant Demographics*, *Kruskal-Wallis and Tukey's HSD Results*, and *Spearman's Correlations*. Within each section are tables to provide further detailed results.

#### **Participant Demographics**

In total, 444 individuals consented to participate in the questionnaire. Of these individuals, 155 were excluded (137 for incompleteness, seven for completing more than once, eight for self-identifying as male, and three for not being an undergraduate student) for a response rate of 65.10%. The remaining 289 self-identified female undergraduate participants were included for all statistical analyses (refer to Tables 1 and 2). Of these 289 participants, 60 (20.76%) were grouped into the no or low psychological distress category, 162 (56.05%) were grouped into the moderate psychological distress category, and 67 (23.18%) were grouped into the severe psychological distress category. In total, the average age of participants was  $20.11 \pm 2.07$  years. 49 (16.96%) participants were first-year students, 67 (23.18%) were sophomores, 90 (31.14%) were juniors, and 83 (28.72%) were seniors. Most participants ( $n = 240$ ; 83.04%) identified as being White, with smaller percentages identifying as Mixed ( $n = 25$ ; 8.65%), Hispanic, Latinx, or Spanish origin ( $n = 13$ ; 4.50%), Black or African American ( $n = 5$ ; 1.73%), Asian ( $n = 3$ ; 1.04%), Native American or Alaskan Native ( $n = 1$ ; 0.35%), Hawaiian Native or another Pacific ( $n = 1$ ; 0.35%), and Other ( $n = 1$ ; 0.35%). In terms of training status, 127

(43.94%) participants were beginners, 55 (19.03%) were intermediate, 78 (26.99%) were advanced, and 28 (9.69%) were highly advanced according to their previous training experience. Finally, 107 (37.02%) participants reported that they had been diagnosed by a healthcare or mental health professional with depression or another psychological condition and were receiving treatment to lessen severity of symptoms (e.g., therapy and/or medication) while 181 (62.63%) participants did not report any such diagnosis. One participant failed to disclose if they were receiving treatment.

Table 1. Demographics (*n*; %) of Sample Split by K6 Category and Full Participant Sample

|   | No or low<br><i>n</i> = 60 |       | Moderate<br><i>n</i> = 162 |       | Severe<br><i>n</i> = 67 |       | Full sample<br>N = 289 |       |
|---|----------------------------|-------|----------------------------|-------|-------------------------|-------|------------------------|-------|
|   | <i>n</i>                   | %     | <i>n</i>                   | %     | <i>n</i>                | %     | <i>n</i>               | %     |
| <b>Class Standing</b>                             |                            |       |                            |       |                         |       |                        |       |
| First-year  | 10                         | 16.67 | 25                         | 15.43 | 14                      | 20.90 | 49                     | 16.96 |
| Sophomore   | 10                         | 16.67 | 40                         | 24.69 | 17                      | 25.37 | 67                     | 23.18 |
| Junior  | 27                         | 45.00 | 48                         | 29.63 | 15                      | 22.39 | 90                     | 31.14 |
| Senior  | 13                         | 21.67 | 49                         | 30.25 | 21                      | 31.34 | 83                     | 28.72 |
| <b>Race/Ethnicity</b>                             |                            |       |                            |       |                         |       |                        |       |
| White   | 52                         | 86.67 | 133                        | 82.10 | 55                      | 82.09 | 240                    | 83.04 |
| Hispanic, Latinx,<br>or Spanish Origin            | 2                          | 3.33  | 6                          | 3.70  | 5                       | 7.46  | 13                     | 4.50  |
| Black or African<br>American                      | 0                          | 0     | 4                          | 2.47  | 1                       | 1.49  | 5                      | 1.73  |
| Asian   | 0                          | 0     | 1                          | 0.62  | 2                       | 2.99  | 3                      | 1.04  |
| Native American<br>or Alaskan Native              | 0                          | 0     | 1                          | 0.62  | 0                       | 0     | 1                      | 0.35  |
| Hawaiian Native or<br>another Pacific<br>Islander | 0                          | 0     | 1                          | 0.62  | 0                       | 0     | 1                      | 0.35  |
| Mixed   | 6                          | 10    | 15                         | 9.26  | 4                       | 5.97  | 25                     | 8.65  |
| Other   | 0                          | 0     | 1                          | 0.62  | 0                       | 0     | 1                      | 0.35  |
| <b>Training Status</b>                            |                            |       |                            |       |                         |       |                        |       |
| Beginner  | 27                         | 45.00 | 64                         | 39.51 | 36                      | 53.73 | 127                    | 43.94 |
| Intermediate                                      | 9                          | 15.00 | 36                         | 22.22 | 10                      | 14.93 | 55                     | 19.03 |
| Advanced  | 13                         | 21.67 | 50                         | 30.86 | 15                      | 22.39 | 78                     | 26.99 |
| Highly Advanced                                   | 10                         | 16.67 | 12                         | 7.41  | 6                       | 8.96  | 28                     | 9.69  |
| <b>Currently Receiving<br/>Treatment</b>          |                            |       |                            |       |                         |       |                        |       |
| Yes   | 8                          | 13.33 | 57                         | 35.19 | 42                      | 62.69 | 107                    | 37.02 |
| No  | 51                         | 85.00 | 105                        | 64.81 | 25                      | 37.31 | 181                    | 62.63 |

*Note.* Mixed is defined as participants selecting multiple races/ethnicities. For Training Status, Beginner = no experience up to 2 months, Intermediate = between 2 and 13 months, Advanced = between 1 and 3 years, Highly Advanced = at least 3 years.

Table 2. Descriptive Statistics (Mean  $\pm$  SD) of Sample Split by K6 Category and Full Participant Sample

|                              | No or low<br><i>n</i> = 60 |       | Moderate<br><i>n</i> = 162 |       | Severe<br><i>n</i> = 67 |       | Full sample<br>N = 289 |       |
|------------------------------|----------------------------|-------|----------------------------|-------|-------------------------|-------|------------------------|-------|
|                              | Mean                       | SD    | Mean                       | SD    | Mean                    | SD    | Mean                   | SD    |
| Age (y)                      | 20.22                      | 2.55  | 20.11                      | 2.05  | 20.02                   | 1.65  | 20.11                  | 2.08  |
| Aerobic Frequency (d)        | 3.85                       | 1.94  | 3.75                       | 1.94  | 3.49                    | 2.31  | 3.71                   | 2.03  |
| Resistance Training Measures |                            |       |                            |       |                         |       |                        |       |
| Frequency (d)                | 2.87                       | 2.24  | 2.63                       | 2.26  | 2.24                    | 2.21  | 2.59                   | 2.25  |
| Intensity                    | 3.93                       | 2.01  | 3.95                       | 1.95  | 3.77                    | 1.32  | 3.91                   | 1.84  |
| Volume                       | 2.12                       | 0.74  | 2.00                       | 0.75  | 1.93                    | 0.75  | 2.01                   | 0.75  |
| PBRTQ total score            | 62.53***                   | 21.61 | 65.83**                    | 20.35 | 76.52                   | 21.03 | 67.63                  | 21.31 |
| PBRTQ subscales scores       |                            |       |                            |       |                         |       |                        |       |
| Time/Effort                  | 21.23***                   | 8.87  | 23.27**                    | 8.27  | 26.94                   | 8.85  | 23.70                  | 8.72  |
| Physical Effects             | 14.38**                    | 5.85  | 15.48*                     | 5.73  | 17.70                   | 6.44  | 15.77                  | 6.01  |
| Social                       | 14.55**                    | 5.31  | 14.33***                   | 5.14  | 17.18                   | 4.12  | 15.04                  | 5.08  |
| Specific Obstacles           | 12.37*                     | 4.88  | 12.75*                     | 4.56  | 14.70                   | 5.32  | 13.13                  | 4.88  |

*Note.* For Resistance Training Intensity, 0 = no exertion at all, 10 = maximal exertion. For Resistance Training Volume, 1 = < 5 sets, 2 = between 5-9 sets, 3 = 10+ sets per muscle group. Significance indicates differences from individuals in the severe psychological distress category. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

## **Kruskal-Wallis and Tukey's HSD Results**

### ***K6 and PBRTQ Total Score***

Differences were found between K6 categories regarding PBRTQ total score ( $H_{(2)} = 16.42, p < 0.001$ ). Follow-up pairwise comparisons indicated that individuals in the severe psychological distress category had higher PBRTQ total scores than individuals in the no or low ( $p < 0.001$ ) and moderate ( $p = 0.001$ ) psychological distress categories.

### ***K6 and PBRTQ Subscale Time/Effort Score***

Differences were found between K6 categories regarding perceived time/effort barriers ( $H_{(2)} = 14.16, p < 0.001$ ). Follow-up pairwise comparisons indicated that individuals in the severe psychological distress category had higher perceived time/effort barriers than individuals in the no or low ( $p < 0.001$ ) and moderate ( $p = 0.009$ ) psychological distress categories.

### ***K6 and PBRTQ Subscale Physical Barriers Score***

Differences were found between K6 categories regarding perceived physical barriers ( $H_{(2)} = 10.16, p = 0.006$ ). Follow-up pairwise comparisons indicated that individuals in the severe psychological distress category had higher perceived physical barriers than individuals in the no or low ( $p = 0.005$ ) and moderate ( $p = 0.027$ ) psychological distress categories.

### ***K6 and PBRTQ Subscale Social Barriers Score***

Differences were found between K6 categories regarding perceived social barriers ( $H_{(2)} = 16.98, p < 0.001$ ). Follow-up pairwise comparisons indicated that individuals in the severe psychological distress category had higher perceived social barriers than individuals in the no or low ( $p = 0.009$ ) and moderate ( $p < 0.001$ ) psychological distress categories.

### ***K6 and PBRTQ Subscale Specific Obstacles Score***

Differences were found between K6 categories regarding perceived specific obstacles ( $H_{(2)} = 9.34, p = 0.009$ ). Follow-up indicated that individuals in the severe psychological distress category had greater perceived specific obstacles than individuals in the no or low ( $p = 0.018$ ) and moderate ( $p = 0.016$ ) psychological distress categories.

### ***K6 and Aerobic Frequency and Resistance Training Program Variables***

No differences were found between K6 categories regarding aerobic frequency ( $H_{(2)} = 0.97, p = 0.62$ ), RT frequency ( $H_{(2)} = 2.40, p = 0.30$ ), RT intensity ( $H_{(2)} = 0.06, p = 0.97$ ), nor RT volume ( $H_{(2)} = 1.42, p = 0.49$ ) (Table 2).

### **Spearman's Correlations**

#### ***Resistance Training Program Variables and PBRTQ Total Score***

A moderate negative correlation was found between PBRTQ total score and RT frequency ( $\rho = -0.44, p < 0.001$ ), a nonsignificant correlation was found between RT intensity ( $\rho = -0.11, p = 0.11$ ), and a weak negative correlation was found between RT volume and ( $\rho = -0.23, p = 0.001$ ).

#### ***Resistance Training Frequency and PBRTQ Subscale Scores***

A moderate negative correlation was found between RT frequency and PBRTQ time/effort subscale score ( $\rho = -0.51, p < 0.001$ ), a moderate negative correlation was found between PBRTQ physical effects subscale score ( $\rho = -0.32, p < 0.001$ ), a moderate negative correlation was found between PBRTQ social subscale score ( $\rho = -0.41, p < 0.001$ ), and a weak negative correlation was found between PBRTQ specific obstacles score ( $\rho = -0.18, p = 0.003$ ).



***Resistance Training Intensity and PBRTQ Subscale Scores***

A weak negative correlation was found between RT intensity and PBRTQ time/effort subscale score ( $\rho = -0.14, p = 0.045$ ), a nonsignificant correlation was found between PBRTQ subscale physical effects score ( $\rho = -0.06, p = 0.42$ ), a weak negative correlation was found between PBRTQ social subscale score ( $\rho = -0.17, p = 0.020$ ), and a nonsignificant correlation was found between PBRTQ specific obstacles subscale score ( $\rho = 0.01, p = 0.90$ ).

***Resistance Training Volume and PBRTQ Subscale Scores***

A weak negative correlation was found between RT volume and PBRTQ time/effort subscale score ( $\rho = -0.22, p = 0.002$ ), a weak negative correlation was found between PBRTQ physical effects subscale score ( $\rho = -0.20, p = 0.005$ ), a weak negative correlation was found between and PBRTQ social subscale score ( $\rho = -0.25, p < 0.001$ ), and a nonsignificant correlation was found between PBRTQ specific obstacles subscale score ( $\rho = -0.12, p = 0.11$ ) (Table 3).

Table 3. Spearman's Correlations Between Resistance Training Measures and PBRTQ Total and Subscale Scores

|                     |   |                    | Spearman's rho |
|---------------------|---|--------------------|----------------|
| RT Frequency (days) | - | PB Total           | -0.44***       |
| RT Intensity        | - | PB Total           | -0.11          |
| RT Volume           | - | PB Total           | -0.23**        |
| RT Frequency        | - | Time/Effort        | -0.51***       |
| RT Frequency        | - | Physical Effects   | -0.32***       |
| RT Frequency        | - | Social             | -0.41***       |
| RT Frequency        | - | Specific Obstacles | -0.18**        |
| RT Intensity        | - | Time/Effort        | -0.14*         |
| RT Intensity        | - | Physical Effects   | -0.06          |
| RT Intensity        | - | Social             | -0.17*         |
| RT Intensity        | - | Specific Obstacles | 0.01           |
| RT Volume           | - | Time/Effort        | -0.22**        |
| RT Volume           | - | Physical Effects   | -0.20**        |
| RT Volume           | - | Social             | -0.25***       |
| RT Volume           | - | Specific Obstacles | -0.12          |

*Note.* For RT Intensity, 0 = no exertion at all, 10 = maximal exertion. For RT Volume, 1 = < 5, 2 = between 5-9, 3 = 10+ sets per muscle group. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

## CHAPTER 5

### DISCUSSION

The purpose of this study was multifold and intended to: 1) examine the prevalence and severity of non-specific psychological distress; 2) determine if there were differences between Kessler 6 Non-Specific Psychological Distress Scale (K6) categories (i.e., no or low, moderate, and serious psychological distress) regarding RT program variables (i.e., frequency, intensity, and volume) and Perceived Barriers to Resistance Training (PBRTQ) total and subscale (i.e., time-effort, physical effects, social, and specific obstacles) scores; and 3) establish a relationship between RT program variables and PBRTQ total and subscale scores in a sample of undergraduate self-identifying female students.

This study expanded on the current literature as there were few studies that have examined the relationship between exercise, specifically RT, and mental health in self-identifying female students. Moreover, studies that have examined RT have not sought to determine if there were differences between K6 categories regarding RT program variables and PBRTQ total and subscale scores. This was the first study to determine if there were differences between K6 categories regarding RT program variables and PBRTQ total and subscale scores in addition to examining the relationship between RT measures and PBRTQ total and subscale scores in self-identifying female undergraduate students.

Results indicated that out of the 289 participants, 60 (20.76%) were grouped into the no or low psychological distress category, 162 (56.05%) were grouped into the moderate psychological distress category, and 67 (23.18%) were grouped into the severe psychological distress category. These results were consistent with findings from the ACHA-NCHA III Spring 2022 Undergraduate Student Reference Group. In that survey, out of the approximate 35,000 cis-

gender college students who responded, 21.3%, 52.9%, and 25.7% were grouped into the no or low, moderate, and severe psychological distress categories (ACHA, 2022), respectively. This is important to note as it suggests that participant distribution in the current study was not random, and that the distribution reflected that of a much larger scale study.

Hypotheses 1-3 stated that RT frequency, intensity, and volume would decrease across K6 categories. These hypotheses were not supported by results as no differences were found. These results are inconsistent with previous studies suggesting an anti-depressive effect from both aerobic and nonaerobic exercise (Aidar et al., 2014; Doyne et al., 1987; Ghorbani et al., 2014; Herbert et al., 2020; Martinsen et al., 1989; Sims et al., 2009; Singh et al., 2001; Stein et al., 1992; Zhang et al., 2020). However, previous studies included an exercise intervention unlike the present study which required participants to recall their own exercise behavior. Therefore, the reason for this inconsistency could be due to the inability of participants to accurately recall and report their own exercise behavior.

The fourth hypothesis stated that PBRTQ total and subscale scores would increase across K6 categories. This hypothesis was supported by results as differences were found between K6 categories regarding PBRTQ total and subscale scores. Specifically, follow-up pairwise comparisons indicated that individuals in the severe psychological distress category had significantly higher PBRTQ total and subscale scores than individuals in the no or low and moderate psychological distress categories.

The final hypothesis stated there would be significant correlations between RT program variables and PBRTQ total and subscale scores. This hypothesis was partially supported as a moderate negative correlation was found between PBRTQ total score and RT frequency. Moderate negative correlations were also found between RT frequency and all subscale scores.

Significant correlations were also found between RT intensity and volume and PBRTQ total and subscale scores; however, these were weak correlations. These results were consistent with past literature as previous investigations supported an anti-depressive effect of both aerobic and nonaerobic exercise (Aidar et al., 2014; Doyne et al., 1987; Ghorbani et al., 2014; Herbert et al., 2020; Martinsen et al., 1989; Sims et al., 2009; Singh et al., 2001; Stein et al., 1992; Zhang et al., 2020). Past literature also suggested that individuals who did not report current RT participation reported greater perceived barriers compared to those who reported some RT participation (Harne & Bixby, 2005; Peters et al., 2019). Thus, it could be inferred that individuals who perceive greater barriers to resistance training engage in resistance training less frequently, and therefore are unable to acquire the anti-depressive effects and experience greater psychological distress.

Universities, specifically university recreation departments, could use these findings to help self-identifying females overcome their perceived barriers. As the strongest correlation was found between RT frequency and PBRTQ time-effort subscale followed by PBRTQ social subscale, efforts should be focused on providing programs that overcome these perceived barriers. To help students overcome perceived time-effort barriers, universities and campus recreational services could provide group fitness classes that are shorter in duration. For example, instead of providing solely one-hour classes, classes could be 20 and 30 minutes long as well. Universities could also educate their students as well as their fitness instructors (i.e., group fitness instructors and personal trainers) on the importance of programming rest intervals into their programs. While high intensity interval training (HITT) has gained popularity in recent years, for most, this is not a sustainable way of exercising as exercising at a high intensity, with little to no rest, can be exhausting and unpleasant.

To help students overcome perceived social barriers, universities and campus recreational services could create spaces where self-identifying female students feel comfortable to RT. To do this, campus recreational services could schedule times in which a facility or a certain space within a facility is only available to self-identifying female students. Further, these spaces could encourage connection as a barrier for many self-identifying female students is that they do not like to RT alone and that they do not have friends that RT. In addition to these smaller scale efforts, university recreation departments could strive to build relationships with other departments, such as campus counseling and wellness services. It is through collaboration with these departments that larger scale efforts to enhance student wellbeing can be achieved.

This study is not without limitations. In terms of the sample, it would be naive to ignore the binary nature of this study. While results are not generalizable to self-identifying male or non-binary undergraduate students, it is understood that there are many self-identifying male and non-binary undergraduate students who are struggling with their mental health and all students, regardless of gender identity, should be included in efforts to reduce psychological distress. In terms of measurement, it may have been difficult for participants to accurately recall their exercise behavior during the previous 30 days. Likewise, it may have been difficult for participants, specifically those classified as beginners, to accurately report their own exercise behavior as they may not have the knowledge and/or experience to identify their training intensity and volume accurately.

It is recommended that future researchers continue to investigate if there are differences between the K6 categories and/or other psychological inventories regarding RT program variables to develop a better understanding of what would be most beneficial in eliciting the anti-depressive effect. It is also recommended that future researchers continue to examine perceived

barriers, specifically before and after an intervention, to determine if efforts are effective at reducing barriers. This, in conjunction with the K6 and/or other psychological inventories could provide further evidence that reducing perceived barriers to RT subsequently reduces psychological distress.

### **Conclusion**

To conclude, individuals in the severe psychological distress category perceived greater barriers than individuals in the no or low and moderate psychological distress categories. With that, a moderate negative correlation was found between perceived barriers and RT frequency. Therefore, it could be inferred that individuals experienced greater psychological distress due to their no or low RT frequency. For self-identifying female students to acquire the benefits of RT, specifically the psychological benefits, universities and campus recreational services must help students overcome their perceived barriers to RT, specifically their perceived time/effort and social barriers.

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## APPENDIX A – E-MAIL TO PARTICIPANTS

Hello,

My name is Jody Sobel, and I am a graduate student in the Exercise Science program. I am emailing you today because I am seeking participants for a study that I am conducting. The purpose of this study is to examine the relationship between resistance training variables (e.g., how often you resistance train), non-specific psychological distress (e.g., feelings of worthiness or sadness), and reasons for not resistance training (e.g., perceived lack of time) in a sample of self-identifying female undergraduate students. A survey will be used to gather data about your resistance training behavior, your level of non-specific psychological distress, and reasons why you would not engage in resistance training. To be eligible for participation, you must identify as female, be 18 years of age or older, and be a current undergraduate student at SUNY Cortland. The survey should take approximately 5-10 minutes to complete, and you are able to withdraw at any time by closing the browser. At the end of the survey, you may self-select to be entered into a raffle for a chance to win a free 50-minute massage from a Licensed Massage Therapist at the Student Life Center by entering their Cortland email address. To ensure anonymity, your email address will not be associated with your submission.

The link to the survey can be found by clicking **HERE** or copying and pasting the link below into your web-browser:

**<https://survey.cortland.edu/TakeSurvey.aspx?SurveyID=84MK7581>**

Thank you,  
Jody

Please feel free to ask about the project, its procedures, or objectives by emailing the primary researcher, Jody Sobel, at [jody.sobel@cortland.edu](mailto:jody.sobel@cortland.edu) or her advisor, Dr. Erik Lind, at [erik.lind@cortland.edu](mailto:erik.lind@cortland.edu).

Protocol #222316

Approval expiration date: January 13, 2024

## APPENDIX B – INFORMED CONSENT

The research in which you have been asked to participate is being conducted by Jody Sobel of the Exercise Science Department at SUNY Cortland. Your informed consent is requested to be a voluntary participant in the project described below. Please feel free to ask about the project, its procedures, or objectives by emailing the primary researcher, Jody Sobel, at [jody.sobel@cortland.edu](mailto:jody.sobel@cortland.edu) or her advisor, Dr. Erik Lind, at [erik.lind@cortland.edu](mailto:erik.lind@cortland.edu).

### Information and Procedures of This Research Study:

The purpose of this study is to examine the relationship between resistance training variables, non-specific psychological distress, and reasons for not resistance training in a sample of self-identifying female undergraduate students. A questionnaire will be used to gather data about your resistance training behavior, your level of non-specific psychological distress, and reason you would/do not engage in resistance training. Once consent is given, you will begin the questionnaire. You must complete the questionnaire on your own, and in one sitting. The questionnaire should take approximately 5-10 minutes to complete, and you can withdraw at any time by closing the browser.

### **Before agreeing to participate you should know that:**

#### A. Freedom to Withdraw:

Your participation is voluntary. You are free to withdraw consent at any time without penalty, at any time up until the time you submit. If you are uncomfortable answering a question, you may skip that question. If you begin answering questions and realize for any reason that you do not want to continue, you are free to withdraw from the study. To do this, you will simply close the browser.

#### B. Protection of Participants' Responses:

The internet protocol (IP) address of the computer, tablet, or phone that you use to complete the survey will be collected by the survey software but will not be associated with your submission. Likewise, if you choose to self-select to be entered into the raffle, your email address will not be associated with your submission as a third-party server will be used.

#### C. Length of Participation and Remuneration:

The questionnaire will take you approximately 10-15 minutes to complete. Further, you may self-select to be entered into a raffle for a chance to win a free 50-minute massage from a Licensed Massage Therapist at the Student Life Center by entering their Cortland email address.

#### D. Full Disclosure:

All the information pertaining to the study will be available to participants at any time by contacting Jody Sobel at [jody.sobel@cortland.edu](mailto:jody.sobel@cortland.edu).

#### E. Risks Expected:

Although you should not experience any discomforts or risks due to voluntary participation in this study, in rare cases individuals may learn something about themselves that might make them uncomfortable. In the event this occurs, please contact the Counseling Center

at (607) 753-4728 during business hours. After hours, on the weekends, or in the event of an emergency, please call 911 or UPD at 607-753-2111. In the event of emergency, you may also contact the Suicide and Crisis Lifeline that provides 24/7 service via a toll-free hotline at 988.

F. Benefits Expected:

By consenting, and therefore participating, you are contributing to the limited body of research about the relationship between resistance training variables, non-specific psychological distress, and reasons for not resistance training in a sample of self-identifying female undergraduate students.

G. Contact Information:

If you have any questions concerning the purpose or results of this study, you may contact the primary researcher, Jody Sobel, at [jody.sobel@cortland.edu](mailto:jody.sobel@cortland.edu) or her advisor, Dr. Erik Lind, at [erik.lind@cortland.edu](mailto:erik.lind@cortland.edu). For questions or concerns about your rights as a research participant, please contact the SUNY Cortland Institutional Review Board by email at [irb@cortland.edu](mailto:irb@cortland.edu), or by phone 607-753-2511.

I have read the description of the project for which this consent is requested. I understand my rights, and by selecting “I agree” below, I consent to participate voluntarily in this study. When I select “I agree” my browser will open the survey.

I Agree

**APPENDIX C – DEMOGRAPHIC DATA COLLECTION SHEET**

Do you identify as a female? \*

- Yes
- No

What is your age in years? \_\_\_\_\_

Are you a current undergraduate student? \*

- Yes
- No

What is your academic class standing?

- First-year
- Sophomore
- Junior
- Senior

What is your race/ethnicity? (Check all that apply)

- White
- Hispanic, Latinx, or Spanish Origin
- Black or African American
- Asian
- Native American or Alaskan Native
- Hawaiian Native or another Pacific Islander
- Other: \_\_\_\_\_

Have you been diagnosed by a healthcare or mental health professional with depression or another psychological condition and are currently receiving treatment to lessen severity of symptoms? (e.g., therapy and/or medication)

- Yes
- No

On average, how many days per week did you engage in aerobic exercise during the past 30 days? Note, aerobic exercise is rhythmic exercise (e.g., walking, jogging, running, sprinting) intended to maintain or improve cardiorespiratory fitness i.e., the functional capabilities of the heart, blood vessels, lungs, and skeletal muscles (ACSM, 2020).

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7



On average, how many days per week did you engage in resistance training during the past 30 days? Note, resistance exercise is the use of external loads (e.g., free weights, machines, band/tubing) to maintain or improve muscular fitness i.e., strength, hypertrophy, power, and local muscular endurance (ACSM, 2020).

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

Select the number that best corresponds with your average exertion during your resistance training sessions during the past 30 days. Disregard any one factor such as leg pain or shortness of breath and try to focus on the whole feeling of exertion (Williams, 2017).

- N/A (You did not engage in resistance training during the past 30 days)
- 0 - No exertion at all
- 0.5 - Very, very slight (just noticeable)
- 1 - Very slight
- 2 - Slight
- 3 - Moderate
- 4 - Somewhat severe
- 5 - Severe
- 6
- 7 - Very severe
- 8
- 9 - Very, very severe (almost maximal)
- 10 - Maximal

On average, how many sets did you perform for a given muscle group per week during the past 30 days? For example, 3 sets of squats + 3 sets of lunges = 6 total sets for a given muscle group (quadriceps) per week.

- N/A (You did not engage in resistance training during the past 30 days)
- <5
- Between 5-9
- 10+

How long have you been consistently engaging in resistance exercise for without taking substantial time off?

- No experience up to 2 months
- Between 2 and 13 months
- Between 1 and 3 years
- At least 3 years

**APPENDIX D – KESSLER 6 NON-SPECIFIC PSYCHOLOGICAL DISTRESS SCALE**

Instructions: The next six questions ask about how you have been feeling during the past 30 days. For each question, please select the response the best describes how often you had this feeling.

During the past 30 days, about how often did you feel nervous?

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

During the past 30 days, about how often did you feel hopeless?

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

During the past 30 days, about how often did you feel restless or fidgety?

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

During the past 30 days, about how often did you feel so sad nothing could cheer you up?

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

During the past 30 days, about how often did you feel everything was an effort?

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

During the past 30 days, about how often did you feel worthless?

- None of the time
- A little of the time
- Some of the time
- Most of the time

All of the time

## APPENDIX E – PERCEIVED BARRIERS TO RESISTANCE TRAINING QUESTIONNAIRE

Instructions: Below are statements that may describe why people do not engage in resistance training. Each statement contains a five-point Likert scale ranging from 1 (not important) to 5 (extremely important). Please read each statement and select the appropriate number to indicate the importance of that item in determining why you would not engage in resistance training. There are no right or wrong answers. Do not spend too much time on any one statement.

|   | Not<br>Important |   |   | Extremely<br>Important |   |
|---|------------------|---|---|------------------------|---|
| 1. Lifting weights makes one look silly.                    | 1                | 2 | 3 | 4                      | 5 |
| 2. Resistance training takes too much discipline.           | 1                | 2 | 3 | 4                      | 5 |
| 3. The weight room environment is intimidating.             | 1                | 2 | 3 | 4                      | 5 |
| 4. My family does not encourage me to resistance train.     | 1                | 2 | 3 | 4                      | 5 |
| 5. Resistance training interferes with one's social life.   | 1                | 2 | 3 | 4                      | 5 |
| 6. I do not know how to use resistance training equipment.  | 1                | 2 | 3 | 4                      | 5 |
| 7. I have too much work to do.                              | 1                | 2 | 3 | 4                      | 5 |
| 8. Resistance training makes one hot and sweaty.            | 1                | 2 | 3 | 4                      | 5 |
| 9. I do not like to resistance train alone.                 | 1                | 2 | 3 | 4                      | 5 |
| 10. There are no convenient places to resistance train.     | 1                | 2 | 3 | 4                      | 5 |
| 11. Resistance training makes muscles look large and bulky. | 1                | 2 | 3 | 4                      | 5 |
| 12. I am too lazy to resistance train.                      | 1                | 2 | 3 | 4                      | 5 |
| 13. I am too uncoordinated to resistance train.             | 1                | 2 | 3 | 4                      | 5 |
| 14. I am too tired to resistance train.                     | 1                | 2 | 3 | 4                      | 5 |
| 15. Resistance training is an activity for men only.        | 1                | 2 | 3 | 4                      | 5 |
| 16. Bad weather keeps me from resistance training.          | 1                | 2 | 3 | 4                      | 5 |
| 17. I am too weak to resistance train.                      | 1                | 2 | 3 | 4                      | 5 |
| 18. Family obligations keep me from resistance training.    | 1                | 2 | 3 | 4                      | 5 |
| 19. Resistance training is too inconvenient.                | 1                | 2 | 3 | 4                      | 5 |
| 20. I am too busy to resistance train.                      | 1                | 2 | 3 | 4                      | 5 |
| 21. Resistance training causes sore muscles.                | 1                | 2 | 3 | 4                      | 5 |
| 22. My friends do not resistance train.                     | 1                | 2 | 3 | 4                      | 5 |
| 23. Resistance training is uncomfortable.                   | 1                | 2 | 3 | 4                      | 5 |

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 24. I am too fatigued to resistance train.                            | 1 | 2 | 3 | 4 | 5 |
| 25. I have medical problems that prevent me from resistance training. | 1 | 2 | 3 | 4 | 5 |
| 26. Resistance training is too boring.                                | 1 | 2 | 3 | 4 | 5 |
| 27. Resistance training interferes with work.                         | 1 | 2 | 3 | 4 | 5 |
| 28. I do not have enough time to resistance train.                    | 1 | 2 | 3 | 4 | 5 |
| 29. Having men in the weight room is intimidating.                    | 1 | 2 | 3 | 4 | 5 |
| 30. Resistance training interferes with school.                       | 1 | 2 | 3 | 4 | 5 |
| 31. It is too difficult to learn how to resistance train.             | 1 | 2 | 3 | 4 | 5 |

## APPENDIX F – DEBRIEF

Thank you for participating! At this time, you may self-select to be entered into a raffle for a chance to win a free 50-minute massage from a Licensed Massage Therapist at the Student Life Center by clicking **HERE** or copying and pasting the link below into your web-browser:

**<https://forms.gle/17K4AHeVromWe2z69>**

**\*To reiterate, if you learned something about yourself while participating in this study that has made you uncomfortable, please contact the Counseling Center at (607) 753-4728 during business hours. After hours, on the weekends, or in the event of an emergency, please call 911 or UPD at 607-753-2111. In the event of emergency, you may also contact the Suicide and Crisis Lifeline that provides 24/7 service via a toll-free hotline at 988.\***

## APPENDIX G – IRB APPROVAL

### MEMORANDUM




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To: Jody Sobel  
 From: Jena Curtis, Chair  
 Institutional Review Board  
 Date: January 13, 2023  
 RE: Institutional Review Board Approval

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In accordance with SUNY Cortland's procedures for human research participant protections, the protocol referenced below has been approved for a period of one year:

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**Title of the study:** An Investigation of Non-Specific Psychological Distress and Perceived Barriers to Resistance Training Measures in Self-Identifying Female Undergraduate Students

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**Level of review:** Full-Board

**Protocol number:** 222316

**Project start date:** Upon IRB approval

**Approval expiration date\*:** January 13, 2024

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\* **Note:** Please include the protocol expiration date to the bottom of your consent form and recruitment materials.

For more information about continuation policies and procedures, visit

[www.cortland.edu/irb/Applications/continuations.html](http://www.cortland.edu/irb/Applications/continuations.html)

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The federal Office for Research Protections (OHRP) emphasizes that investigators play a crucial role in protecting the rights and welfare of human subjects and are responsible for carrying out sound ethical research consistent with research plans approved by an IRB. Along with meeting the specific requirements of a particular research study, investigators are responsible for ongoing requirements in the conduct of approved research that include, in summary:

- obtaining and documenting informed consent from the participants and/or from a legally authorized representative prior to the individuals' participation in the research, unless these requirements have been waived by the IRB;
- obtaining prior approval from the IRB for any modifications of (or additions to) the previously approved research; this includes modifications to advertisements and other recruitment materials, changes to the informed consent or child assent, the study design and procedures, addition of research staff or student assistants, etc. (except those alterations necessary to eliminate apparent immediate hazards to subjects, which are then to be reported by email to [irb@cortland.edu](mailto:irb@cortland.edu) within three days);
- providing to the IRB prompt reports of any unanticipated problems involving risks to subjects or others;
- following the principles outlined in the Belmont Report, OHRP Policies and Procedures (Title 45, Part 46, Protection of Human Subjects), the SUNY Cortland College Handbook, and SUNY Cortland's IRB Policies and Procedures Manual;
- notifying the IRB of continued research under the approved protocol to keep the records active; and,
- maintaining records as required by the HHS regulations and NYS State law, for at least three years after completion of the study.

In the event that questions or concerns arise about research at SUNY Cortland, please contact the IRB by email [irb@cortland.edu](mailto:irb@cortland.edu) or by telephone at (607)753-2511. You may also contact a member of the IRB who possesses expertise in your discipline or methodology, visit <http://www.cortland.edu/irb/members.html> to obtain a current list of IRB members.

Sincerely,



Jena Curtis, Chair  
Institutional Review Board  
SUNY Cortland