WORK-RELATED STRESS AND ITS RELATIONSHIP TO DISORDERED EATING BEHAVIORS IN ATHLETIC TRAINERS

by

SHELBY ERIN BARTER, ATC

B.S., Grand Canyon University, 2016

A thesis submitted to the Graduate Faculty of the University of Colorado Colorado Springs in partial fulfillment of the requirements for the degree of Master of Sciences Department of Health Sciences 2018
This thesis for the Master of Sciences degree by

Shelby Erin Barter

has been approved for the

Department of Health Sciences

by

Andrea M. Hutchins, Chair

Keston Lindsay

Amanda Elder

Date May 2, 2018
ABSTRACT

Background: The relationship between stress and disordered eating has been clearly documented throughout literature. However, the research regarding unique work-related stress and disordered eating amongst healthcare professionals is scant and no research in this area has been conducted on athletic trainers (ATs). Purpose: The purpose of this study was to examine work-related stress and its relationship to disordered eating behaviors in athletic trainers. Design: Cross-sectional study. Setting: Participating ATs completed a computer-based survey in November/December 2017. Participants: Responding participants were certified ATs randomly sampled from the National Athletic Trainer’ Association (NATA) membership. One thousand participants were randomly selected but only 84 (8.4%) completed the survey in its entirety (n = 83; men = 26; female = 57; mean age = 31.96 ± 9.22 years). Outcome Measures: Participants completed self-reported assessments of eating habits (the Revised-18 Three Factor Eating Questionnaire1) and perceived work-related stress (Perceived Stress Scale2) via an online platform that was accessed through a secure email link. Multiple regression analyses were used to examine hypothesized relationships among study variables. Results: Regression analyses demonstrated that perceived stress was a significant predictor of disordered eating behaviors (Adjusted R² = 0.18, p < .001) and, more specifically,
emotional eating and uncontrolled eating. The majority of the sample (77%, n = 71) reported that stress affected their eating habits and 53% of those reported consuming a combination of sweet and salty foods. When compared to their male counterparts, women reported significantly higher stress levels ($p < .05$), total disordered eating scores ($p < .01$), controlled restraint scores ($p < .05$), and emotional eating scores ($p < .001$).

**Conclusion:** Job-related stress within the athletic training profession should be considered a significant factor in the development of disordered eating behaviors. Further research is needed to examine stress level differences between ATs and the general population.
ACKNOWLEDGEMENTS

This thesis became a reality with the kind support of many individuals. I would like to extend my sincerest gratitude to all of them.

First, to my thesis chair Dr. Andrea Hutchins, thank you for your encouragement and support throughout this process. Your insight and guidance has inspired me to continue to pursue further research within my profession. I am so very grateful for the opportunity you have afforded me and your help along the way.

To my thesis committee, Dr. Keston Lindsay and Dr. Amanda Elder, thank you for your contributions to this work. You have provided excellent scientific guidance and insightful suggestions that have helped make this work a success.

Finally, I would like to express my overwhelming love and appreciation to my friends and family. You have been a constant source of wisdom and support throughout this process. I could not have done this without you.
# TABLE OF CONTENTS

## CHAPTER

### I. INTRODUCTION

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Statement</td>
<td>2</td>
</tr>
<tr>
<td>Hypotheses</td>
<td>2</td>
</tr>
<tr>
<td>Limitations</td>
<td>3</td>
</tr>
<tr>
<td>Delimitations</td>
<td>3</td>
</tr>
<tr>
<td>Assumptions</td>
<td>3</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>4</td>
</tr>
</tbody>
</table>

### II. LITERATURE REVIEW

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature Search</td>
<td>5</td>
</tr>
<tr>
<td>Stress</td>
<td>6</td>
</tr>
<tr>
<td>Disordered Eating</td>
<td>7</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>14</td>
</tr>
<tr>
<td>Summary</td>
<td>15</td>
</tr>
</tbody>
</table>

### III. METHODS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>16</td>
</tr>
<tr>
<td>Study</td>
<td>16</td>
</tr>
<tr>
<td>Stress</td>
<td>17</td>
</tr>
<tr>
<td>Disordered Eating</td>
<td>17</td>
</tr>
<tr>
<td>Body Mass</td>
<td>18</td>
</tr>
<tr>
<td>Statistical Analysis</td>
<td>18</td>
</tr>
</tbody>
</table>

### IV. MANUSCRIPT

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>19</td>
</tr>
<tr>
<td>Methods</td>
<td>21</td>
</tr>
<tr>
<td>Results</td>
<td>27</td>
</tr>
<tr>
<td>Discussion</td>
<td>32</td>
</tr>
<tr>
<td>Conclusion</td>
<td>35</td>
</tr>
<tr>
<td>Limitations and Future Directions</td>
<td>36</td>
</tr>
</tbody>
</table>
CHAPTER I

Introduction

Certified ATs are recognized by the American Medical Association, Health Resources Services Administration, and the Department of Health and Human Services as allied healthcare professionals. Athletic trainers provide preventative services, emergency care, clinical diagnosis, therapeutic intervention, and rehabilitation of injuries and illnesses. Under the direction of a physician, ATs provide these services in a variety of settings including high schools, colleges, hospitals, the armed forces, and occupational wellness.

One focus area for the AT is preventative medicine, including nutrition and daily care. ATs strive to educate their patients on the importance of proper diet and exercise to increase performance and decrease injury rates. However, long working hours accompanied by the unique emotional stress of emergency situations can take a toll on the AT’s own health and wellbeing.

Hendrix et al. examined stress and burnout in 118 NCAA Division I certified athletic trainers. They determined that personal or situational variables such as hardiness, athletic training-related issues, and social support predicted how the athletic trainer perceived stress ($p < .001$). Higher levels of hardiness (control, commitment, and challenge of a situation) were associated with lower perceived stress scores where lower perceived social support was associated with increased stress scores. Burnout characteristics (emotional exhaustion and personal accomplishment) also predicted perceived stress ($p < .01$). Increased emotional exhaustion increased perceived stress and
increased personal accomplishment decreased stress scores. In an attempt to maintain normality, ATs are forced to implement coping strategies. These strategies may include changes in mood, behavior, and eating habits.

Björntorp\textsuperscript{6} demonstrated that work-related stress increased cortisol levels, which have been shown to compromise the immune system, cause weight gain, and possibly contribute to the development of other diseases such as hypertension, heart disease, and depression.\textsuperscript{6} Björntorp\textsuperscript{6} suggested the AT who is coping with work-related stress through their diet (i.e. binge eating or controlled restraint) may find that increased cortisol levels present during stress may also predispose them to diet-related issues such as hypertension and heart disease by inhibiting appetite suppressors and increasing appetite stimulators.\textsuperscript{7,8}

**Problem Statement**

Most of the studies examining the effects of stress on dietary habits focused on the general population\textsuperscript{8–16}. Very few studies examined the effects in healthcare professionals\textsuperscript{17,18}, and there is no research regarding athletic trainers. The purpose of this study was to determine the relationship between stress and disordered eating behaviors amongst certified athletic trainers.

**Hypotheses**

The following hypotheses for this study will be tested at $\alpha$ of $.05$:

- Athletic trainers will have high stress scores.
- As stress increases, the prevalence of disordered eating behaviors increases.
- Athletic trainers will be highly predisposed to disordered eating behaviors because of work-related stress.
Limitations

Based on the study design, the following limitations may have affected the outcome of this study:

- The information from the survey was self-reported data.
- Only 84 of the original 1000 participants chose by random sample completed the survey.

Delimitations

The study was designed to improve the outcome measures through the following methods:

- One thousand participants will be randomly selected from the member database of the National Athletic Trainers’ Association (NATA).
- Participants will be excluded if they do not currently hold proper certification.

Assumptions

The following assumptions were made during the course of the study:

- Participants will be current certified athletic trainers.
- Participants will provide honest answers to all questions.
Definition of Terms

- **Athletic Trainer (AT):** Recognized healthcare professional working under the guidance of a physician to provide preventative services, emergency care, clinical diagnosis, therapeutic intervention, and rehabilitation of injuries and illnesses.4

- **Cognitive Restraint:** An individual’s attempt to limit consumption of certain food groups in an attempt to prevent weight gain.13

- **Disordered Eating (DE):** Maladaptive eating behaviors which may include decreased caloric intake, fasting, vomiting, use of diet pills and laxatives, binge eating, or emotional eating.19

- **Eating Disorder (ED):** Highly defined conditions outlined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) including anorexia nervosa (AN), bulimia nervosa (BN), and eating disorders not otherwise specified (EDNOS).20

- **Emotional Eating:** Excessive eating in response to an arousal state.13

- **Ghrelin:** A gut-brain hormone released just before mealtime to stimulate hunger and food intake.8, 7

- **Leptin:** A hormone released by adipose tissue to signal satiety.8, 7

- **Uncontrolled Eating:** Eating in response to food-related cues regardless of hunger or satiety.13

- **Stress:** The body’s multi-system response to any challenge that overwhelms, or is judged to overwhelm, selective homeostatic response mechanisms.21
CHAPTER II

Literature Review

Literature Search

An extensive literature review was conducted over six months (March 2017 to August 2017) to determine a link between stress and disordered eating behaviors. The search was conducted through the University of Colorado Colorado Springs online library database. Inclusion criteria included peer-reviewed journal articles published between 2001 and 2017 with open access and full text online. Articles were excluded if they were not written in the English language or if they were newspaper articles, book reviews, or dissertations.

Keywords: stress, eat, disordered eating, healthcare, healthcare professional, disorder, behavior, eating disorder, athletic trainer, burnout

Eating Behavior

The body was designed in such a way to signal hunger and satiety to ensure that nutrients were being consumed for survival. Several hormones act upon the brain and gut to produce those signals. Two of the more important hormones are ghrelin and leptin. Ghrelin, a gut-brain hormone, is released just before mealtime to stimulate hunger and food intake.\(^8,7\) Once food has been consumed, ghrelin decreases so as to prevent overconsumption.\(^22\) Leptin, a hormone released by adipose tissue, is released to signal satiety.\(^8,7\) Both ghrelin and leptin work together to guarantee the individual has consumed enough nutrients; however, an imbalance in these hormones may cause undo harm by either causing a decrease in intake resulting in a deficit in nutrients or an
increase in intake resulting in an overconsumption of nutrients. An imbalance may lead to a variety of issues including energy deficiencies, visceral fat buildup, and heart disease.\(^6\) Stress is one factor with the ability to overthrow homeostasis of ghrelin and leptin.

**Stress**

Day\(^{21}\) broadly defined stress as “the body’s multi-system response to any challenge that overwhelms, or is judged to overwhelm, selective homeostatic response mechanisms.” The presence of stress is not inherently bad. It is simply used to announce to the body that something needs fixing. Starkey said that “to be without stress is to be without life,” because it plays an important role in the survival of every species.\(^{23}\) Stress regulates the secretion of hormones, increases blood flow to certain organs, and stores energy in anticipation of an event. However, when stress is experienced on a regular basis, it can cause negative effects as well. Stress can directly cause cardiovascular dysfunction, suppress the immune system, contribute to cancer, and indirectly influence eating behaviors.\(^9\)

The two biggest areas activated by stress are the central sympathetic nervous system, regulated by the brain stem, and the hypothalamic-pituitary-adrenal (HPA) axis, which is regulated by centers in the hypothalamus.\(^6\) Activation of the HPA axis stimulates the corticotropin-releasing hormone (CRH) from the parvocellular (mp) paraventricular nucleus of the hypothalamus (PVN).\(^6,8\) CRH stimulates adrenocorticotropic hormone (ACTH) release from the pituitary gland as well as a glucocorticoid release which stimulates cortisol secretion from the adrenals.\(^6,8\) When CRH is released into the arcuate nucleus of the hypothalamus (ARC), it inhibits the neuropeptide Y(NPY)/agouti-related peptide (AgRP) neurons.\(^8\) An inhibition of these
neurons suppresses an individual’s appetite in the case of acute stress. This natural response is used to store energy to ensure proper fight or flight response.\textsuperscript{8} Once the stressor has been removed, the hormone levels return to basal levels.\textsuperscript{6} However, excessive or chronic responses can become maladaptive.

Chronic stress elevates glucocorticoid levels in the bloodstream. With an increase in glucocorticoids levels, there is an increase in AMP-activated protein kinase in the ARC, which increases up-take of NPY and AgRP while cortisol levels remain elevated.\textsuperscript{6,8} Stimulation of NPY and AgRP is further increased by ghrelin, a hormone that signals hunger prior to meal time.\textsuperscript{8} Brain sensitivity to leptin, an appetite suppressor, is reduced and the body increases its resistance to insulin.\textsuperscript{6,8} Without the proper insulin response, the body is unable to take up glucose present in the blood to store it or use it for energy which can lead to prediabetes and/or diabetes mellitus (DM) type 2.\textsuperscript{24} Cortisol, when combined with insulin, inhibits the lipid mobilization system which, in turn, leads to the accumulation of visceral fat.\textsuperscript{6,12} Although acute stress may suppress hunger, chronic stress may increase an individual’s appetite by inhibiting the appetite suppressors. If the chronic stressors are not addressed, they may lead to disordered eating behaviors and health issues like diabetes\textsuperscript{24} and excessive visceral fat buildup.\textsuperscript{6,12}

**Disordered Eating**

Disordered eating (DE) encompasses a wide range of maladaptive eating behaviors which may include cognitive restraint (i.e. decreased caloric intake, fasting, vomiting, use of diet pills and laxatives), uncontrolled eating (i.e. binge eating), and emotional eating (i.e. excessive calories high in fat).\textsuperscript{19} Disordered eating differs slightly from eating disorders (ED) in that EDs are specifically defined conditions outlined in the
Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and include anorexia nervosa (AN), bulimia nervosa (BN), and eating disorders not otherwise specified (EDNOS). However, DE behaviors can quickly progress to an ED. These ED symptoms may include cardiovascular irregularities (i.e. bradycardia, hypotension), endocrine changes (i.e. hypoglycemia, stress fractures), gastrointestinal problems (i.e. constipation, abdominal pain), fluids and electrolytes imbalances (i.e. hypokalemia, edema), thermoregulation issues (i.e. hypothermia), hematologic dysfunctions (i.e. anemia), dermatologic complications (i.e. hair loss, dry skin), oral and facial decay, and other symptoms such as significant weight loss or frequent weight fluctuations. Any combination of these behaviors may be detrimental to the wellbeing of the individual.

Jacobson et al. examined the effects of deployment on disordered eating and weight changes in 46,219 military personnel (male = 31,988; female = 10,186). They determined that the trauma experienced while on deployment has a negative impact on diet and weight directly after returning from deployment by examining pre- and post-deployment survey answers and weight measurements. The most significant findings determined that military women with combat exposure were 1.78 times more likely to develop new-onset disordered eating (95% CI: 1.02, 3.11) and 2.35 times more likely to lose extreme amounts of weight after deployment (95% CI: 1.17, 4.70) compared to women without combat exposure; however, the same associations were not found in men.

Keith et al. surveyed 435 (male = 19; female = 414) nurses in the hospital setting about their disordered eating behaviors and job stress. The researchers determined that nurses with higher stress levels had significantly higher disordered eating scores than
nurses with lower stress scores \((p < .05)\).\(^{18}\) The highest stressors came from workload (70.9%), paperwork (67.1%), and the number of interruptions throughout the day (61.5%).\(^{18}\) DE amongst the same nurses was also tied to low body satisfaction \((p < .001)\).\(^{18}\)

Jordan et al.\(^{17}\) examined 120 nurses (96% female) in the hospital setting as well and determined that those who worked in the surgical or ICU departments were more stressed than those working in other departments \((p < .01)\). Jordan et al.\(^{17}\) also found that 70% of the nurses consumed more “junk food” when stressed. “Junk food” or “comfort food” referred to high-caloric foods that are also high in fat and sucrose.\(^{8}\)

An increase in glucocorticoids, seen with chronic stress, increases a preference for foods high in fat and sucrose. These highly palatable foods lead to a reward-mediated negative feedback onto the HPA axis.\(^{8}\) Consumption of fatty foods actually alleviates the symptoms of stress. As Keith et al.\(^{18}\) and Jordan et al.\(^{17}\) demonstrated, nurses within the hospital setting experienced high levels of job stress which may increase consumption of “comfort foods”.

Zellner et al.\(^{9}\) discovered similar results within the general population. Thirty-four participants were given either solvable or unsolvable anagrams to induce psychological stress and were provided with healthy and unhealthy snacks during the test.\(^{9}\) The researchers concluded that stressed individuals ate more unhealthy snacks (M&M’s®) than the non-stressed individuals \((p < .05)\) while the non-stressed individuals ate more healthy foods (grapes) than the stressed individuals \((p < .05).\(^{9}\)

Darbor et al.\(^{10}\) determined that consumption of highly palatable foods could also be increased with the presence of physical pain and not just psychological pain or stress.
The researchers recruited 70 participants from the general population and induced pain through cold water emersion. After removal from the cold water, participants were offered cheesecake while they waited. The pain group ate significantly more unhealthy food (cheesecake) than the non-pain group ($p < .05$).

Psychological stress and physical pain seem to share a similar pathway for reward-mediated negative feedback on the HPA axis when selecting high-caloric foods high in fat and sucrose. Zellner et al. concluded that the selection of high caloric fatty foods brought comfort and was a positive experience after a negative situation. The same conclusion can be drawn from the study completed by Darbor et al.

The relationship between stress and disordered eating behaviors can be further cemented when examining specific behaviors such as cognitive restraint, uncontrolled eating, and emotional eating. Cognitive restraint is an individual’s attempt to limit consumption of certain food groups in an attempt to prevent weight gain. However, excessive restraint can be detrimental one’s health.

**Cognitive Restraint.** Tomiyama et al. examined the effects of caloric restriction and tracking caloric intake on psychological stress in 121 females from a general population sample. They found a significant relationship between a restricted diet (1200 cal.) and increased cortisol levels ($p < .01$, Cohen’s $d = 0.63$). Participants also reported increased perceived stress when monitoring caloric intake ($p < .05$). The combination of increased stress and elevated cortisol levels can increase the risk of developing other issues such as cardiovascular and immune system dysfunction.

Nagai et al. examined 487 (male = 106, female = 381) individuals during a general health check-up to determine correlations between dietary habits, bone mineral
density (BMD), visceral fat area (VFA), and arterial stiffness. The results demonstrated that skipping meals lowered BMD ($p < .05$) and found a relationship between skipping meals and the increased susceptibility toward atherosclerosis.\textsuperscript{12}

Doumit et al.\textsuperscript{13} surveyed 894 female Lebanese undergraduates for perceived stress, body image satisfaction, eating behaviors, anxiety, and depression. Restrained eaters were positively correlated with anxiety ($p < .001$), stress ($p < .01$), and depression ($p < .001$).\textsuperscript{13} There was also a positive correlation between body image dissatisfaction (BID) and restrained eating ($p < .01$) as well as a highly significant correlation between BID and anxiety ($p <.001$), stress ($p < .001$), and depression ($p < .001$).\textsuperscript{13} Overweight participants also had the highest emotional eating and restrained eating scores than participants with a normal BMI ($p < .001$).\textsuperscript{13}

Not only does a restrictive diet limit the number of calories consumed and energy availability but, when combined with stress, it can have serious health consequences. Decreased BMD caused by a restrictive diet can increase the prevalence for osteopenia, osteoporosis, and fractures.\textsuperscript{26} A restrictive diet also increases the likelihood of depression, anxiety, and BID.\textsuperscript{13} A restrictive diet correlated with stress has the potential to cause life-altering and life-long changes to the body and mind.

**Uncontrolled Eating.** An inability to control one’s diet can be just as detrimental as cognitive restraint to an individual’s health. Groesz et al.\textsuperscript{14} supported these findings when determining high stress levels correlated with a high intake of non-nutritious food ($r = 0.15, p < .001$). Groesz et al.\textsuperscript{14} surveyed 457 random females from northern California to determine correlations between perceived stress, chronic stress, and eating behaviors. The researchers found that situations perceived as stressful reduced control
over eating \((r = 0.32, p < .001)\), increased hunger \((r = 0.36, p < .001)\), and contributed to more binge eating behaviors \((r = 0.36, p < .001)\) compared to the general population.

Zellner et al.\(^9\) completed a second experiment examining the rate of overeating and undereating in response to stress in 169 undergraduate students (male = 41; female = 128; mean age 24 years) from Montclair State University. The researchers found that there were significantly different eating patterns between men and women \((p < .01)\). Women (46%) had a higher tendency to overeat when stressed while men (54%) were more likely to under eat when stressed. Of those that reported overeating when stressed, 73% ate foods they normally avoided and 63% stated that they consumed sweet foods. The normally avoided foods were deemed unhealthy and tended to be high caloric fatty foods but were consumed when stressed because they produced a relaxing and comforting feeling.

Groesz et al.\(^{14}\) and Zellner et al.\(^9\) both found that stress was related to an increased consumption of food. Zellner et al.\(^9\) concluded that stress eaters ate foods that made them happy and/or distracted them from the stressful situation. It became a positive experience after a negative situation. Unfortunately, uncontrolled eating may not only entail a high intake of non-nutritious food but also an overconsumption of calories that may contribute to obesity.\(^6,7\)

**Emotional Eating.** The final disordered eating behavior is emotional eating. Emotional eating is excessive eating in response to an arousal state and may be an attempt to find comfort in food. Sominsky and Spencer\(^8\) determined that an increase in glucocorticoid levels during chronic stress enhanced the preference for “comfort food”. They suggested that foods high in fat and sucrose actually alleviated the symptoms of
stress. Unfortunately, Sominsky and Spencer also determined that emotional eaters had lower basal ghrelin levels than non-emotional eaters suggesting that emotional eaters required more palatable food to suppress stress-induced ghrelin to the same degree as non-emotional eaters. The need for an excess of palatable food suggests that emotional eaters gain more weight than non-emotional eaters because of the food’s likelihood to be high in fat and sucrose.

Lazarevich et al. hypothesized that emotional eating would also be tied to depression and obesity. They examined 1453 first-year students at Mexico City University (male = 663; female 789; mean age 20.6 ± 2.5 years). Women were significantly more likely to be emotional eater than men \((p < .01)\) and that 33.6% of the participants in the study were considered overweight or obese. The researchers also found highly significant correlations between emotional eating and BMI \((p < .001)\) and emotional eating and depression \((p < .001)\) in both men and women. They determined that more depressive symptoms increased the likelihood for emotional eating issues which led to a greater BMI. Just like Zellner et al., Lazarevich et al. concluded that the participants were attempting to decrease the negative mood state through food consumption.

Strien et al. further solidified the findings of Lazarevich et al. when examining food intake after experiencing sadness and joy. Sixty females (mean age = 23.9 years) attending the University of Valencia and Barcelona who reported extreme EE scores in a former study were placed in a virtual reality room and shown clips from two movies (Singing in the Rain and The Champ) to induce sadness or joy. Participants were then given a variety of healthy (apples, bananas) and unhealthy (chocolate) food choices. The
Researchers found a borderline significance between mood and food intake \((p < .05)\) and determined that emotional eaters were significantly more likely to eat more food after a sad experience than after a joyful experience \((p < .01)\). The sad experience also induced more consumption of sweet foods than salty foods \((p < .05)\).

Eating in response to an aroused state may be the individual’s way of maintaining control during a stressful situation but the overconsumption of foods high in fat\(^8,15,16\) may lead to similar issues seen in uncontrolled eating.\(^6,7\) Unfortunately, emotional eaters have the added issue of lower basal ghrelin levels which requires more palatable food to reach satiety.\(^8\)

**Comorbidities**

With the combination of stress and disordered eating, other comorbidities are bound to follow. Depression, anxiety, and heart disease are only a few of the conditions that may develop. Jordan et al.\(^{17}\) found that of the surveyed nurses 13.6% had hypertension, 21.5% had high cholesterol, and 65.4% presented with a BMI > 25. The long-term effects of stress play a large role in the health and wellbeing of the individual.

The most significant complication of disordered eating behaviors caused by stress is obesity. Chronic consumption of high caloric fatty foods under stress leads to inhibition of the lipid mobilization system and accumulation of visceral fat.\(^6,7,28\) Doumit et al.\(^{13}\) determined that body mass index (BMI) was positively correlated with emotional eaters \((p < .001)\). The accumulation of visceral fat combined with stress’s ability to inhibit insulin may also predispose individual to insulin-resistant diabetes mellitus.\(^24\) Obese individuals also have a decreased ability to mobilize ghrelin in response to stress,
which may explain the inability to cope with anxiety and an increased susceptibility to
depression.\textsuperscript{29}

Depression can also be triggered by chronic stress and contribute to a reduction in
appetite.\textsuperscript{8,30} Emotional and restrained eaters had a high correlation with depression ($p < .001$, $p < .001$ respectively), as well as a high likelihood of body image dissatisfaction ($p < .001$).\textsuperscript{13} Marks\textsuperscript{29} also determined that depressed individuals who overate had decreased HPA axis activity suggesting that depressed individuals lacked the ability to control food consumption.

Anxiety, the final comorbidity, has also been associated with prolonged
psychological stress.\textsuperscript{30,31} Chen et al.\textsuperscript{31} found that anxiety had an indirect effect on
disordered eating behaviors ($p < .01$). Anxiety was also highly correlated with emotional
and restrained eaters.\textsuperscript{13} Mujica-Parodi et al.\textsuperscript{32} also determined that body fat percentage
was associated with cortisol reactivity ($p < .01$) and state of anxiety ($p < .01$).

**Summary**

Stress and its effect on dietary habits has been studied extensively. Several
aspects of stress have been tied to a number of disordered eating behaviors. However,
there is a distinct lack of research regarding healthcare professionals and, specifically,
athletic trainers. The ability of stress to cause a number of diet-related issues including
obesity, depression, and anxiety speaks to its power and a need to learn how to control it,
but first the population needs to be educated. An athletic trainer who does not understand
how their work-related stress is affecting their lives will not have the tools to effectively
address the issues. Therefore, the purpose of this study was to determine stress’s
correlation to disordered eating behaviors specifically in athletic trainers.
CHAPTER III

Methods

Population

After approval (Appendix A) from the University of Colorado Colorado Springs Institutional Review Board, one thousand certified athletic trainers were randomly selected from the National Athletic Trainers’ Association (NATA) member database. Approval for access to the member list was given by the NATA (Appendix B). Inclusion of participants was solely based on certification status. Non-certified athletic trainers were not included in any study analysis.

Sample size was calculated using G*Power 3.1. using the multiple linear regression model. A sample size of 35 was needed to ensure a large effect (80% power with a significance level of $p < .05$, large effect $f^2 = 0.35$).

Study

An introductory email (Appendix C) describing the study was sent to the randomly selected NATA members on November 6th, 2017. Athletic trainers willing to participate in the study clicked on the secure link located within the introductory email and were directed to an online platform (SurveyMonkey). Before beginning the survey, the participants were presented with an informed consent form (Appendix D) detailing any risks, benefits, confidentiality, withdrawal, and contact information. Participants were also informed of the anonymity of any answers and the ability to skip questions they did not wish to answer. Participants who skipped one or more questions were still included in the study analysis. By clicking ‘Next’ on the consent form, the participants...
indicated their consent to willingly participate in the study and were redirected to the first
survey question. The survey took approximately 9 minutes to complete and included two
validated questionnaires as well as general health questions and demographics including
age, sex, ethnicity, work setting (i.e. secondary school, professional athletics), practice
location (i.e. Oregon, Colorado), and employment status (i.e. full-time, part-time). One
survey reminder was sent out by the NATA two weeks after the initial email and the
survey was closed two weeks after the reminder email (open for four weeks total).

**Stress**

The 10-item Perceived Stress Scale\(^2\) (PSS) was used to measure stress levels.
Previous studies\(^5,35\) in the athletic training population have demonstrated scores on this
measure to possess acceptable internal-consistency reliability and evidence for validity in
AT samples. The questionnaire also demonstrated good psychometric properties with an
internal consistency ranging from 0.87 to 0.89.\(^36\) Participants were assessed on stress-
related experience at work during the past month. A 5-point Likert point scale (i.e. 0 =
*never*, 4 = *very often*) was used to measure perceived stress. Four of the 10 questions
reflected low stress and scores were, therefore, reversed to reflect the difference. Total
scores for all 10 items were calculated with a maximum score of 40. Higher scores
indicated higher levels of perceived stress.

**Disordered Eating**

The revised 18-item Three Factor Eating Questionnaire\(^1\) (TFEQ-R18) was used to
differentiate between three types of disordered eating behaviors: cognitive restraint (CR;
6 items), uncontrolled eating (UE; 9 items), and emotional eating (EE; 3 items). Previous
studies have demonstrated good internal consistency within the general population.\(^1,37\)
Behaviors were assessed on a 4-point scale (i.e. 1 = definitely false, 4 = definitely true).

Scores were calculated for each of the three disordered eating behaviors as well as a total disordered eating (DE) score. Maximum scores are as follows: CR = 24, UE = 32, EE = 12, DE = 68. Higher scores demonstrated a higher predisposition toward any of the three disordered eating behaviors or toward disordered eating behaviors as a whole.

**Body Mass**

Body mass index (BMI) was calculated from the self-reported height (in.) and weight (lbs.) using the formula \([(weight / height^2) \times 703]\). Averages (mean ± SD) were calculated for the sample (n = 89, mean = 28.25 ± 5.49) and split by gender. Scores were also used to determine correlations to PSS$^2$ and TFEQ-R18$^1$ scores.

**Statistical Analysis**

The data was collected and analyzed using SPSS, Version 24 (version 24; IBM Corporation, Armonk, NY). All data was inspected for normality using histograms, box plots, Shapiro-Wilk test, and examination of means and standard deviations. Descriptive statistics were calculated with all study variables, including demographics, using frequency counts or means and standard deviations. Non-normally distributed data was transformed into categories to ensure normalization. The independent variable was perceived stress (PSS) and the dependent variables were disordered eating, diet, and BMI. Effect size was calculated for any significant $p$-values ($p < .05$) using $R^2$ and partial $\eta^2$. Comparisons between groups were performed using ANOVA for normally distributed data. Where significance was found, post-hoc tests (Tukey) were used to identify specifically where the significant differences were in the data. Two-tailed tests were used for all comparisons.
CHAPTER IV

Manuscript

Introduction

Healthcare professionals and, more specifically, athletic trainers (AT) experience emotional and physical stress that is associated with the demands of their profession. Long irregular hours accompanied by the unique emotional stress experienced during emergency situations can take a toll on a person’s health and well-being. Hendrix et al.\(^5\) and DeFreese and Milhalik\(^35\) demonstrated that ATs with increased emotional exhaustion reported higher perceived stress that led to an increased risk for burnout. The effects of stress on the hypothalamic-pituitary-adrenal axis have been shown to increase cortisol and ghrelin levels, inhibit leptin and insulin, and increase the up-take of NPY and AgRP.\(^7,21,24\) Seen in combination, stress may lead to disordered eating behaviors.\(^21\)

Disordered eating (DE) encompasses a wide range of maladaptive eating behaviors which may include cognitive restraint (i.e. decreased caloric intake, fasting, vomiting, use of diet pills and laxatives), uncontrolled eating (i.e. binge eating), and/or emotional eating (i.e. excessive calories high in fat).\(^19\) Disordered eating may act as a precursor to eating disorders (ED) and may cause a variety of health-related issues including excessive visceral fat build-up,\(^6\) heart disease,\(^6\) and insulin resistance that can lead to type 2 diabetes mellitus.\(^24\) Disordered eating behaviors may also be related to food’s ability to relieve the symptoms of stress. Sominsky and Spencer\(^8\) demonstrated that highly palatable foods were able to decrease perceived stress due to foods’ reward-mediated negative feedback on the HPA axis. Other researchers\(^9,10,17,18\) examined stress in
both the general population and other healthcare professionals have demonstrated that high stress was correlated to an increased consumption of “comfort foods”. “Comfort foods” and/or “junk food” was defined as food high in fat and sucrose.

Keith et al.\textsuperscript{18} found than nurses with higher perceived stress reported higher DE scores and lower body dissatisfaction while Jordan et al.\textsuperscript{17} determined that 70\% of nurses consumed more junk food when stressed. Similar results were found within the general population. Zellner et al.\textsuperscript{9} and Darbor et al.\textsuperscript{10} demonstrated that psychological and physical pain shared similar pathways for reward-mediated negative feedback on the HPA axis when participants selected high-caloric foods high in fat and sucrose after experiencing either physical or psychological pain. Increases in glucocorticoids seen with chronic stress increased a preference for foods high in fat and sucrose because these foods brought comfort and were a positive experience after a negative situation.\textsuperscript{9}

When examining the specific categories of disordered eating, the research demonstrated further issues. A preference toward caloric restraint not only limited energy availability but also demonstrated decreased bone mineral density (BMD), and increased likelihood toward depression, anxiety, and body image dissatisfaction.\textsuperscript{13}

Stressful situations were also tied to significantly reduced control over eating, increased hunger, and contributed to more binge eating behaviors.\textsuperscript{14} While binge eating, participants were also more likely to consume non-nutritious food.\textsuperscript{14} Zellner et al.\textsuperscript{9} supported those findings by demonstrating that those that overate, ate foods they normally avoided and 63\% ate sweet foods when stressed.

In those that identified as emotional eaters, research demonstrated that they had lower basal ghrelin levels than non-emotional eaters and, therefore, required more food to
reach satiety. There was also a significantly high correlation between emotional eating and BMI and emotional eating and depression in men and women. Lazarevich et al. and Strien et al. agreed that emotional eating was usually induced after a sad or stressful event in an attempt to decrease the negative emotional state.

If disordered eating behaviors are allowed to continue, it may lead to cardiovascular and immune system dysfunction, atherosclerosis, anxiety and depression, and large accumulations of visceral fat. It is, therefore, necessary to demonstrate the effects of stress to help mitigate the responses it may cause in one’s diet. Although research has found strong correlations between stress and disordered eating in a variety of settings (general population, military, nurses) and studies have found high stress levels in athletic trainers, there still remains no research that specifically ties work stress and disordered eating behaviors within the athletic training population. Therefore, the purpose of this study was to investigate the relationship between work-related stress and disordered eating behaviors in athletic trainers.

Methods

Participants and Procedures. The study was approved by the University of Colorado Colorado Springs Institutional Review Board. One thousand certified athletic trainers were randomly selected from the National Athletic Trainers’ Association (NATA) member database by the NATA. Participants were only included in the study if they were certified athletic trainers. Individuals were not excluded according to geographical location, position type, years of experience, or any other demographic variable.
Sample size was calculated using G*Power 3.1.\textsuperscript{33} using the multiple linear regression model. A sample size of 35 was needed to ensure a large effect (80% power with a significance level of $p < .05$, large effect $f^2 = 0.35$).

\textbf{Figure 1. Flow Chart}

- Athletic trainers surveyed $n = 1000$
- Total responses $n = 93$
- Surveys analyzed $N = 90$
- Complete surveys $n = 84$
- Incomplete surveys $n = 6$
- Non-certified athletic trainers $n = 3^*$

*non-certified participants were not included in study analyses.
One-thousand randomly selected ATs were sent an introductory email by the NATA introducing the primary investigator and explaining the purpose of the study. Athletic trainers willing to participate in the study were directed to an online survey platform (SurveyMonkey). The first page of the survey detailed any risks, benefits, confidentiality, and contact information as well as the voluntary nature of the survey. By proceeding with the survey, respondents indicated their consent to participate. Consenting participants assessed their self-reported work-related perceptions of stress, disordered eating behaviors and demographic information. Study measures were presented in the same order for all participants. Participants were informed that all answers would be kept anonymous and that answers were neither correct nor incorrect. They were given the option to skip any survey question they did not feel comfortable answering. An unwillingness to answer certain questions did not void the rest of the participant’s responses and, therefore, were included in the rest of the study analyses. Participants were only excluded from the study if they reported that they were non-certified athletic trainers. The average time for completion was nine minutes. One survey reminder was sent out by the NATA two weeks after the initial email and the survey was closed two weeks after the reminder email (open for four weeks total). Figure 1 demonstrates the breakdown of participants. Of the original 1000 randomly selected ATs, 93 participated in the study by completing some or all of the survey. Eighty-four participants who were certified athletic trainers completed all of the survey questions. Participants who were certified athletic trainers but did not complete all of the survey questions (n = 6) were still included in all study analyses. Three participants responded that they were not certified ATs and were, therefore, not included in the study.
Demographics: Questionnaire items were used to differentiate participants based on their self-reported age, sex, ethnicity, work setting (i.e. secondary school, professional athletics), practice location (i.e. Oregon, Colorado), and employment status (i.e. full-time, part-time).

Measurements: Perceived work stress was assessed using the Perceived Stress Scale (PSS).\(^2\) Previous studies in the athletic training population\(^5,^{35}\) have demonstrated scores on this measure to possess acceptable internal-consistency reliability and evidence for validity in AT samples. The questionnaire also demonstrated good psychometric properties with an internal consistency ranging from 0.87 to 0.89.\(^{36}\) Participants were assessed on stress-related experience at work during the past month. A 5-point Likert point scale (i.e. 0 = never, 4 = very often) was used to measure perceived stress. Four of the 10 questions reflected low stress and scores were, therefore, reversed to reflect the difference. Total scores for all 10 items were calculated with a maximum score of 40. Higher scores indicated higher levels of perceived stress.

The revised 18-item Three Factor Eating Questionnaire (TFEQ-R18)\(^1\) was used to measure disordered eating behaviors within the athletic training sample. The eating behaviors that were measured included Controlled Restraint (CR; 6 items), Uncontrolled Eating (UE; 9 items), and Emotional Eating (EE; 3 items). Previous studies have demonstrated good internal consistency within the TFEQ-R18 in the general population.\(^1\) Behaviors were assessed on a 4-point scale (i.e. 1 = definitely false, 4 = definitely true). Scores were calculated for each of the three disordered eating behaviors as well as a total disordered eating (DE) score. Maximum scores are as follows: CR = 24, UE = 32, EE =
12, DE = 68. Table 1 demonstrates the two measures used along with their calculations and interpretations of the results.

Table 1. Description, Calculation, and Interpretation of Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Variable(s)</th>
<th>Description</th>
<th>Calculation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Stress Scale (10-item)</td>
<td>Perceived Stress</td>
<td>Assesses stress-related experience at work during past month on 5-point scale (0 = never, 4 = very often)</td>
<td>After reverse-scoring items reflecting low stress, aggregate work stress score calculated by adding scores for all 10 items (t = 40).</td>
<td>Higher scores indicate higher levels of perceived stress.</td>
</tr>
<tr>
<td>Three Factor Eating Questionnaire-Revised (18-item)</td>
<td>Disordered eating behavior: Cognitive Restraint (CR), Uncontrolled Eating (UE), Emotional Eating (EE)</td>
<td>Assesses disordered eating behaviors on a 4-point scale (1 = definitely false, 4 = definitely true)</td>
<td>Scores were calculated for a total disordered eating score (t = 68) as well as a CR score (t = 24), UE score (t = 32), and EE score (t = 12)</td>
<td>Higher scores indicate higher levels of disordered eating behavior.</td>
</tr>
</tbody>
</table>

$t = \text{highest available score}$

Body mass index (BMI) was calculated from the height (in.) and weight (lbs.) values supplied by the participants using the formula $[(\text{weight} / \text{height}^2) \times 703]$. Average BMI (mean ± SD) was calculated for the sample (n = 89; mean = 28.25 ± 5.49) and split by gender, which is reported in Table 2. Scores were also used to determine correlations to PSS$^2$ and TFEQ-R18$^1$ scores.

**Data Analysis:** All statistical analyses were completed using SPSS (version 24; IBM Corporation, Armonk, NY). All data was inspected for normality using
histograms, box plots, Shapiro-Wilk test, and examination of means and standard deviations. Descriptive statistics were calculated with all study variables, including demographics, using frequency counts or means and standard deviations. Non-normally distributed data was transformed into categories to ensure normalization. The independent variable was perceived stress (PSS) and the dependent variables were disordered eating, diet, and BMI. Effect size was calculated for any significant $p$-values ($p < .05$) using $R^2$ and partial $\eta^2$. Comparisons between groups were performed using ANOVA for normally distributed data. Where significance was found, post-hoc tests (Tukey) were used to identify specifically where the significant differences were in the data. Two-tailed tests were used for all comparisons. Non-normally distributed continuous variables (alcohol consumption, exercise) were transformed into normally distributed categories. Other variables (weight satisfaction, diet changes under stress) involved multiple levels of analysis. When assessing weight satisfaction, a new variable was created to demonstrate who was and who was not satisfied. If they answered that they wanted to remain the same weight, they were categorized as satisfied with their weight, whereas participants that wanted to gain or lose weight were categorized as unsatisfied with their weight. When examining diet changes under stress, a new variable was created to demonstrate those who did or did not change their habits. If participants reported that they ate more or less under stressful situations, they were categorized as having a change in diet under stress, whereas participants that reported that their diet did not change were categorized as having no change in diet under stress.
Results

Participants: Table 2 presents the descriptive statistics for the participants in the study. Participants were certified NATA members (n = 83, 26 males, 57 females, 7 not reported) and ranged in age from 22 to 61 (mean = 31.96 ± 9.22 years). Most participants self-identified as white (88.1%, n = 74) with the remaining participants self-identifying as Asian (3.3%, n = 3), Black or African American (3.3%, n = 3), or Hispanic or Latino (3.3%, n = 3). The breakdown of ethnic diversity within this study was congruent with the NATA’s overall membership based on the most recent study in 2017; however, the gender ratio was slightly higher for females (68%) in this study than the NATA’s membership report (55%).

Participants had been certified from 1 to 39 years (mean = 8.74 ± 8.60 years). The majority of participants worked in the collegiate (37%, n = 34) or secondary school settings (37%, n = 34) and almost half (46.7%, n = 43) reported having a second work setting. The largest percentage of those that reported a second job (37.2%, n = 16) worked in the secondary schools. Only 31.5% (n = 29) held an additional certification with the most common (n = 12) certifications pertaining to strength and conditioning. They included the following certifications: certified strength and conditioning specialist (CSCS), corrective exercise specialist (CES), performance enhancement specialist (PES), National Strength Professionals’ Association (NSPA), and USA weightlifting (USAW).

The majority of the sample (71.6%, n = 63) presented with a BMI greater than 25 and, therefore, were characterized as overweight or obese according to the health guidelines for BMI. Men (mean BMI = 28.33 ± 4.90) were generally heavier than women (mean BMI = 27.92 ± 5.85) but the difference was not significant (p > .05). Very few women
(22.8%, n = 13) were satisfied with their weight compared to their male counterparts (42%, n = 11). A large majority of the sample (81.2%, n = 75) wanted to lose weight (69.2% of males, 84.2% of females) but the difference between the genders not significant ($p > .05$).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender: n (%)</td>
<td>26 (31%)</td>
<td>57 (67.9%)</td>
<td>84</td>
</tr>
<tr>
<td>Age: mean ± SD (n)</td>
<td>37.69 ± 11.59 (26)</td>
<td>29.47 ± 6.60 (57)</td>
<td>31.96 ± 9.22 (84)</td>
</tr>
<tr>
<td>Marital status: n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unmarried</td>
<td>10 (38.5)</td>
<td>33 (57.9)</td>
<td>44 (52.4)</td>
</tr>
<tr>
<td>Married/Cohabitating</td>
<td>16 (61.5)</td>
<td>23 (40.4)</td>
<td>39 (46.4)</td>
</tr>
<tr>
<td>Race: n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>21 (80.8)</td>
<td>52 (91.2)</td>
<td>74 (88.1)</td>
</tr>
<tr>
<td>Other</td>
<td>5 (19.2)</td>
<td>5 (8.8)</td>
<td>10 (11.9)</td>
</tr>
<tr>
<td>Years certified: mean ± SD (n)</td>
<td>14.19 ± 11.50 (26)</td>
<td>6.72 ± 6.14 (57)</td>
<td>8.74 ± 8.60 (92)</td>
</tr>
<tr>
<td>BMI: mean ± SD (n)</td>
<td>28.33 ± 4.90 (24)</td>
<td>27.92 ± 5.85 (56)</td>
<td>28.25 ± 5.49 (89)</td>
</tr>
</tbody>
</table>

$n =$ number of participants; $\% =$ percentage of participants; $SD =$ standard deviation

On average, men consumed more alcohol than women, but the difference was not significant ($p > .05$). Those that did not drink alcohol ($n = 20$, mean BMI = $31.36 \pm 6.05$) reported higher BMIs than those that did drink alcohol ($n = 69$, mean BMI = $27.34 \pm 5.01$; $p < .01$; partial $\eta^2 = 0.09$). Younger participants and those that held a second work setting drank significantly more alcohol than their counterparts ($p < .05$, partial $\eta^2 = 0.13$ and $p < .01$; partial $\eta^2 = 0.07$ respectively). However, no relationship was found among
the number of children at home and alcohol consumption or among exercise and alcohol consumption.

Perceived Stress and Disordered Eating. Table 3 demonstrates the correlation matrix for the study variables. Regression analysis demonstrated that PSS was a significant predictor of DE [F(1,75) = 867.58, p < .001, R² = 0.19, Adjusted R² = 0.18] with the driving forces specifically being EE (p < .05, R² = 0.24) and UE (p < .05, R² = 0.18).

Table 3. Correlation Matrix for Stress and DE Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>PSS</th>
<th>DE</th>
<th>CR</th>
<th>UE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE</td>
<td>0.434*</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR</td>
<td>0.084</td>
<td>0.555*</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>UE</td>
<td>0.424*</td>
<td>0.786*</td>
<td>0.032</td>
<td>-</td>
</tr>
<tr>
<td>EE</td>
<td>0.485*</td>
<td>0.810*</td>
<td>0.195</td>
<td>0.724*</td>
</tr>
</tbody>
</table>

n = number of participants
PSS = Perceived Stress Scale; DE = total disordered eating score; CR = controlled restraint score; UE = uncontrolled eating score; EE = emotional eating score
*p < 0.05

The majority of the sample (77%, n = 71) reported that their eating habits changed when stressed and that they consumed a combination of sweet and salty foods (53.4%) during or after the stressful situation. Fifty-two percent of those that reported changes in their eating habits when stressed stated that they ate more than usual (52.2%, n = 48) while a smaller percentage of participants reported consuming less while stressed (25%, n = 23).
Table 4 demonstrates the continued breakdown between stress, disordered eating behaviors, and participant specifics. When compared to their male counterparts, women reported significantly higher stress levels ($p < .05$, partial $\eta^2 = 0.08$), total disordered eating scores ($p < .01$, partial $\eta^2 = 0.12$), controlled restraint scores ($p < .05$, partial $\eta^2 = 0.05$), and emotional eating scores ($p < .001$, partial $\eta^2 = 0.14$) while uncontrolled eating was not significant ($p > .05$, partial $\eta^2 = 0.05$).

Those that were not satisfied with their weight were significantly more stressed than those that were satisfied with their weight ($p < .04$, partial $\eta^2 = 0.05$) and reported higher total disordered eating scores ($p < .001$, partial $\eta^2 = 0.13$), uncontrolled eating scores ($p < .01$, partial $\eta^2 = 0.11$), and emotional eating scores ($p < .01$, partial $\eta^2 = 0.11$); however, controlled restraint scores were not significant ($p > .05$, partial $\eta^2 = 0.02$).
### Table 4. Stress and Disordered Eating

<table>
<thead>
<tr>
<th>Perceived Stress</th>
<th>Dietary Habits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Disordered Eating</td>
</tr>
<tr>
<td></td>
<td>mean ± SD (n)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>14.63 ± 6.33</td>
</tr>
<tr>
<td>(24)</td>
<td>(24)</td>
</tr>
<tr>
<td>Female</td>
<td>18.87 ± 7.14</td>
</tr>
<tr>
<td>Diet</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>16.98 ± 7.53</td>
</tr>
<tr>
<td>Yes</td>
<td>18.96 ± 5.88</td>
</tr>
<tr>
<td>Weight satisfaction</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>18.60 ± 7.02</td>
</tr>
<tr>
<td>Yes</td>
<td>14.95 ± 6.92</td>
</tr>
<tr>
<td>Stress Eaten</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>13.30 ± 7.75</td>
</tr>
<tr>
<td>Yes</td>
<td>19.00 ± 6.31</td>
</tr>
</tbody>
</table>

SD = standard deviation; n = number of participants

* *p < 0.05
Discussion

The aim of this study was to determine the relationship among stress and disordered eating behaviors (cognitive restraint, uncontrolled eating, and emotional eating) using the PSS\(^2\) and TFEQ-R18\(^1\) in a sample of 1000 randomly selected certified athletic trainers.

Average scores for the PSS\(^2\) in the study sample could be considered as modest to high and demonstrated that athletic trainers did perceive high levels of stress related to their profession. These results were comparable to other studies that examined stress within the athletic training population\(^5,35\) and within the general US population\(^9,10\).

Scores for the TFEQ-R18\(^1\) demonstrated the ability of the survey to determine the likelihood of disordered eating behaviors within the athletic training population and were comparable with several other studies conducted in the general population; French\(^1\) and Finnish female\(^37\) samples demonstrated similar TFEQ-R18 scores for controlled restraint, uncontrolled eating, and emotional eating. Specifically, athletic trainers tended to have a higher prevalence of emotional eating and uncontrolled eating behaviors than controlled restraint behaviors demonstrating a lack of control over food consumption and a possible need to find comfort or solace in food. Women were also much more likely to be emotional eaters than men. This follows a previous study that determined that women were more likely to eat more after a sad experience than men were\(^15\).

The majority of the participants in the current study sample reported that they changed their eating habits under stress. Past studies within nursing samples\(^17,18\) the military\(^25\) as well as general population samples\(^9,10\) have demonstrated that stress was one of the greatest predictors for the development of disordered eating behaviors. The
same relationship was found within the athletic training population. Athletic trainers’
work-related stress was the biggest predictor for developing disordered eating behaviors
and, more specifically, uncontrolled eating and emotional eating which demonstrated a
medium-to-large effect within the study sample. The presence of a medium-to-large
effect further solidifies that the results of the study are not just limited to the sample of
athletic trainers within this study but may be construed, with the consideration of
limitations, to be true of the population of athletic trainers as a whole.

When stressed, the athletic trainers within the current study sample reported
consuming an abundance of non-nutritious foods. The foods that were being consumed
tended to include a combination of both sweet (chocolate, candy) and salty (pretzels,
chips) snacks which tend to hold higher amounts of sucrose and, depending on the
product, may also be high in fat content. The predisposition toward foods high in fat and
sucrose supports previous studies\textsuperscript{9,10,17,18} and solidifies the theory that “comfort foods”
have the ability to impact the HPA axis through reward-mediated negative feedback to
relieve the symptoms of stress. The predisposition for foods high in fat and sucrose may
also support the theory that emotional eaters need to consume more than their non-
emotional eating counterparts to reach satiety due to lower basal ghrelin levels.\textsuperscript{8}

The combination of increased intake of foods high in fat and sucrose during or
after a stressful situation as well as a greater intake of food needed to reach satiety in
emotional eaters may play a role in fat mass accumulation within this study. The majority
of the current sample reported BMI scores that were characterized as overweight or obese
and there was also a significant relationship between BMI and disordered eating
behaviors. Participants that reported higher uncontrolled eating and emotional eating
scores were more likely to have higher BMIs when compared to controlled restraint eaters.

Those with higher DE scores and higher stress were also more likely to not be satisfied with their weight. Since emotional eater and uncontrolled restraint eaters had greater BMIs in this study, it follows that BMI increases caused by DE behaviors would increase dissatisfaction with one’s weight. The relationship between the scores may also demonstrate a continuing cycle. Work stress may lead to disordered eating behaviors which, in turn, may cause an increase BMI and an accumulation of fat mass. As an individual’s weight increases, it may cause further psychological stress and promote a continued consumption of foods high in fat and sucrose. By addressing the key factor (stress), individuals may be able to break the cycle and improve their health and wellbeing.

However, there were other factors related to BMI that should be considered. BMI was not significantly related to exercise or tobacco use. Participants that did not exercise and used tobacco did not have a significantly greater BMI than participants that did exercise and did not use tobacco. Former studies have demonstrated that when cortisol (stress) and insulin were present within the blood at the same time, they interfered with the lipid mobilization system which increased visceral fat accumulation. Even with exercise, an individual may have to face excess fat accumulation because of their stress levels.

The final consideration for BMI within this study was alcohol consumption. Although alcohol consumption predictably increased with the presence of a second job and decreased with years of experience, BMI did not follow a predictable pattern. BMI
was reportedly lower in those that did consume alcohol than those that did not consume alcohol. This might suggest a coping behavior in alcohol consumption instead of reliance on food, but it may also be just an abnormality within the current study.

The results of the current study indicate a need for education on stress’s ability to affect eating behaviors and how to properly manage stress related to the athletic training profession. Perceived stress seemed to be the deciding factor in the development of DE behaviors. Specific efforts to teach healthy coping habits to help deter the onslaught of unhealthy behaviors that follow stress should be incorporated into AT education programs and offered as continuing education for ATs.

Conclusion

Ultimately, the way we perceive situations at work determines how we will cope with them and whether or not our dietary habits will be affected. This is true for a variety of health-related professions, including athletic training. An increased focus on stress management and the importance of nutrition may not only improve the psychological and physical health and wellbeing of ATs, but it may also facilitate better care for the patients, athletes, and teams that they serve. Athletic trainers have the potential to affect their patients’ and athletes’ health and wellbeing and, therefore, encouraging proper coping strategies within the profession may help ATs deter the formation of disordered eating behaviors within the populations we serve.

The athletic trainer that is dealing with increasing amounts of stress and its accompanying comorbidities may be sacrificing their quality of care as well. As our health declines, how are we, as ATs, able to address emergency situations that require precise and knowable execution? If we are dealing with our own disordered eating
behaviors, how are we going to see some of the same issues in our patients and athlete? Will we be able to address the disordered eating behaviors before they progress to actual eating disorders? How does the inability to properly cope with work stress affect our overall health as well as our patient care? This represents an important future research direction.

**Limitations and Future Directions**

This study is the first to investigate and report the correlation between work-related stress and disordered eating behaviors in athletic trainers. However, there are limitations to the study that must be considered. First, there was a modest response rate that allowed for a large effect size during analyses; however, the small sample size suggests the need for caution when generalizing the results of the study to the broader AT population, especially considering the inherent limitations of the self-reported assessments. Second, the study only focused on measures within the AT population. Several studies have demonstrated correlations between stress and disordered eating in general population samples and it would, therefore, be beneficial to compare ATs to other populations such as EMTs, construction workers, and stock brokers to determine differences between health-related fields and other professions. Third, we did not examine reasonings behind changes in dietary habits. Although we did determine that diet changed under stress, specific reasons were not gathered. It would have been interesting to compare an individual’s explanation and provided more detail into the physiological decisions that may be affected by stress. Future research may help determine what factors lay behind the decision to consume non-nutritious foods high in fat and sucrose. Fourth, we did not examine other unhealthy behaviors (i.e. laxatives,
diuretics, purging) that have been associated with disordered eating behaviors. These factors may compound already maladaptive habits and it would be beneficial to see all the variables that ATs may be using to cope with work-related stress. Fifth, BMI was used to gain a basic health perspective. Although BMI does indicate body size, it is not a good measure of lean-to-fat mass ratio; however, for this study, it was easier to gather basic height and weight because the study was presented on an online survey format and was self-reported. If the researcher had been able to gather actual anthropometric measurements via skin folds, bioelectrical impedance, or other body composition methods, stronger relationships may have been drawn between variables. Finally, the cross-sectional study design limits our ability to draw causal conclusions. Longitudinal research efforts examining associations among long-term stress and disordered eating behaviors is warranted.

With its limitations acknowledged, the current study fills a notable research gap by examining the influences of stress on disordered eating behaviors. Collectively, these results help explain the effects of stress within the athletic training population and inform efforts to prevent the occurrence of disordered eating behaviors.
REFERENCES


APPENDICIES

Appendix A: IRB Approval

University of Colorado
Colorado Springs

Institutional Review Board (IRB) for the Protection of Human Subjects

Date: 10/20/2017

IRB Review

IRB PROTOCOL NO.: 18-042
Protocol Title: Work-related Stress and its Correlation to Disordered Eating Behaviors in Athletic Trainers
Principal Investigator: Shelby Barter
Faculty Advisor if Applicable: Andre Hutchins
Application: New Application
Type of Review: Expedited
Risk Level: No more than Minimal Risk
Renewal Review Level (If changed from original approval) if Applicable: N/A No Change
This Protocol Involves a Vulnerable Population: N/A (No Vulnerable Population) Expires:
19 October 2018
*Note, if exempt. If there are no major changes in the research, protocol does not require review on a continuing basis by the IRB. In addition, the protocol may match more than one review category not listed.
Externally funded: ☒ No ☐ Yes OSP

# Sponsor:

Thank you for submitting your Request for IRB Review. The protocol identified above has been reviewed according to the policies of this institution and the provisions of applicable federal regulations. The review category is noted above, along with the expiration date, if applicable.

Once human participant research has been approved, it is the Principal Investigator’s (PI) responsibility to report any changes in research activity related to the project:
• The PI must submit all protocol, recruitment, advertising, and consent form amendments/revisions to the IRB for approval.
• The IRB must approve these changes prior to implementation.
• If you are a student, please note that it is required to include the IRB approval letter in the library when you submit the dissertation thesis.
• The PI must promptly inform the IRB of any unanticipated serious adverse event (within 24 hours). All unanticipated adverse events must be reported to the IRB within 1 week (see 45CFR46.113(b)(1)). Failure to comply with these federally mandated responsibilities may result in suspension or termination of the project.
• Renew study with the IRB at least 10 business days prior to expiration.
• Notify the IRB when the study is complete

If you have any questions, please contact Research Integrity Specialist in the Office of Sponsored Programs and Research Integrity at 719-255-3903 or irb@uccs.edu

Thank you for your concern about human subject protection issues, and good luck with your research. Sincerely

yours,

Michele Olshan, Ph.D. IRB
Reviewer

www.uccs.edu/~osp/
1420 Austin Bluffs Parkway Colorado Springs, CO 80920
719-255-3221 phone 719-255-3708 fax

42
Appendix B: NATA Research Survey Request Form
Appendix C: Cover Letter for Survey

Dear Fellow Certified Athletic Trainer:

I am a master’s degree candidate at the University of Colorado Colorado Springs (UCCS), requesting your help to complete part of my degree requirements. Please follow the link at the end of this letter to an online survey titled: Work-related Stress and its Correlation to Disordered Eating Behaviors in Athletic Trainers.

This student survey is not approved or endorsed by the NATA. It is being sent to you because of NATA’s commitment to athletic training education and research.

The questionnaire consists of two validated surveys, general questions, and demographics. It should take between 20-30 minutes to complete.

One thousand randomly selected certified NATA members with a listed address are being asked to submit this questionnaire, but you have the right to choose not to participate. The UCCS Institutional Review Board has approved this study for the Protection of Human Subjects.

This is a completely anonymous questionnaire and, upon submission, neither your name nor the email address will be attached to your answers. Your information will be kept strictly confidential.

As a fellow certified athletic trainer, your knowledge and opinions regarding this topic makes your input invaluable. Please take a few minutes to fill out the anonymous questionnaire you will find by clicking on this link and submit by (Date):

Webpage link

Thank you for your time and consideration,

Sincerely,

Shelby Barter, ATC
University of Colorado Colorado Springs
1420 Austin Bluffs Pkwy
Colorado Springs CO, 80918
sbarter@uccs.edu

Participants for this survey were selected at random from the NATA membership database according to the selection criteria provided by the student doing the survey. This student survey is not approved or endorsed by the NATA. It is being sent to you because of the NATA’s commitment to athletic training education and research.
Appendix D Informed Consent Form

University of Colorado
Colorado Springs (UCSS)
Consent to be a Research Subject

Title: Work-related Stress and its Correlation to Disordered Eating Behaviors in Athletic Trainers.

Principal Investigator: Shelby Bartor, ATC (Faculty mentor: Andrea M. Hutchins, PhD, RD) Funding

Source: No funding source has been utilized for this research.

Introduction
You are being asked to be in a research study because you are a BOC certified athletic trainer. This form is designed to tell you everything you need to think about before you decide to consent (agree) to be in the study or not to be in the study. It is entirely your choice. If you decide to take part, you can change your mind later on and withdraw from the research study. You can skip any questions that you do not wish to answer.

Before making your decision:
- Please carefully read this form or have it read to you.
- Please ask questions about anything that is not clear.

Feel free to take your time thinking about whether you would like to participate. By agreeing to be in the study you will not give up any legal rights. You may want to print a copy of the consent form for your records.

Study Overview: This study plans to learn more about work-related stress and its relationship to disordered eating behaviors in athletic trainers. The survey will include two validated questionnaires, general health questions, and demographics to assist the principle investigator in determining relationships between stress and dietary behaviors. Ultimately, this research may be published in a medical journal.

Procedures: You are being asked to be in this research study because you are a BOC certified athletic trainer with a current NATA membership and an email on file. The survey will take about 20 minutes to complete and your participation in this study will help the principle investigator determine relationships between work-related stress and disordered eating behaviors.

Other people in this study: Up to 3000 people will participate in this study.

Risks and Discomforts: We believe there are no known risks associated with this research study; however, a possible inconvenience may be the time it takes to complete the study. A breach in confidentiality has been minimized through the use of several platforms. The NATA has randomly selected you from their database and sent the introductory email. The principle investigator did not have access to your contact information. The survey platform SurveyMonkey was used to create the survey. Your answers are anonymous and are not associated with your email or other identifiable information. The principle investigator and her faculty mentor will be the only people to have access to your answers. Once answers have been received, the principle investigator will further decrease risk of a breach by assigning a study number to your results to remove the possibility of any remaining identifying characteristics. All the results will be saved on a password-protected computer.
Benefits: There will be no direct benefit to you from participation in this study. However, your answers are important to the success of this study. Your responses to the survey will help us determine the effects of stress and their relationship to developing disordered eating behaviors within the athletic training population.

Compensation: No compensation is provided for your voluntary participation in this study.

Confidentiality: The researchers will receive your responses anonymously. All data will be stored in a password protected electronic format and kept private. Any information that might make it possible to identify you as a participant will be separated from your survey responses when they are downloaded from the survey software and destroyed.

Your confidentiality will be maintained to the degree permitted by the technology used. Specifically, no guarantees can be made regarding the interception of data sent via the Internet by any third parties.

Certain offices and people other than the researchers may have access to study records. Government agencies and UCCS employees overseeing proper study conduct may look at your study records. These offices include the UCCS Institutional Review Board, and the UCCS Office of Sponsored Programs and Research Integrity. UCCS will keep any research records confidential to the extent allowed by law. Since names and email addresses are not collected as part of this study, a participant study number will be used on study records. Study records may be subject to disclosure pursuant to a court order, subpoena, law or regulation.

Voluntary Participation and Withdrawal from the Study
Taking part in this study is voluntary. You have the right to leave a study at any time without penalty. Withdrawal will not interfere with your future care or services at UCCS. You may refuse to do any procedures you do not feel comfortable with, or answer any questions that you do not wish to answer. If you withdraw from the study, you may request that your research information not be used by contacting the Principal Investigator listed above and below.

Contact Information
Contact Shelby Barter: sbarter@uccs.edu
• if you have any questions about this study or your part in it,
• if you have questions, concerns or complaints about the research, or
• if you would like information about the survey results when they are prepared.

Contact the Research Integrity Specialist at 719-255-8908 or via email at risk@uccs.edu: if you have questions about your rights as a research participant, or if you have questions, concerns or complaints about the research.

Consent

Please print a copy of this consent form for your records, if you so desire.

I have read and understand the above consent form, I certify that I am 18 years old or older and, by clicking the "Next" button to enter the survey, I indicate my willingness voluntarily take part in the study.

<Next>