Examination of Energy Balance, Eating Disorder Risk, and Pathogenic Behaviors among Athletic Trainers

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CONTEXT: Research exists on energy balance (EB) and eating disorder (ED) risk in physically active populations and occupations by settings, but EB and ED in athletic trainers (ATs) has not been investigated. OBJECTIVE: To assess ATs’ energy needs, including macronutrient profile, and to examine ED risk and pathogenic behavior between sex (males, females), job status (part-time=PT-AT; full-time=FT-AT) and setting (college/university, high school, non-traditional). DESIGN: Cross-sectional and descriptive. SETTING: Free-living in job settings. PARTICIPANT: ATs (n=46; males PT-AT n=12, males FT-AT n=11; females PT-AT n=11, female FT-AT n=12) in Southeastern United States. MAIN OUTCOME MEASURES: Anthropometric measurements (age, height, weight, body composition), resting metabolic rate (RMR), energy intake (EI), total daily energy expenditure (TDEE), exercise energy expenditure (EEE), EB, macronutrients (carbohydrates, protein, fats), Eating Disorder Inventory-3, and the Eating Disorder Inventory-3 Symptom Checklist. RESULTS: Majority (84.8%, n=39) had ED risk, with 26.1% (n=12) engaging in at least 1 pathogenic behavior, 50% (n=23) in 2 pathogenic behaviors, and 10.8% (n=5) in more than 2 pathogenic behaviors. 82.6% of ATs (n=38) presented in negative EB (EI<TDEE). Significant differences were found for sex and job status for RMR \((F(1,45)=16.48, P=.001)\), EI \((F(1,45)=12.01, P=.001)\), TDEE \((F(1,45)=40.36, P<.001)\) and EEE \((F(1,38)=5.353, P=.026)\). No significant differences were found in EB, sex and job status \((F(1.45)=1.751, P=.193)\); Chi-squared analysis revealed no significant differences between ATs’ sex and EB \([X^2(1.46)=0.0, P=1.00]\) and job status and EB \([X^2(1.46) = 2.42, P= 0.120]\). No significant difference found between Daily Reference Intakes recommendations for all macronutrients and sex or job status. CONCLUSIONS: Athletic trainers experience negative EB, similar to other high-demand occupational professions. Regardless of sex or job status, ATs have a high ED risk and participate in unhealthy...
pathogenic behaviors. The physical and mental concerns associated with these findings indicates a need for interventions targeted toward ATs’ health behaviors.

**KEY WORDS:** Pathogenic behaviors, health behaviors, physical activity, occupational wellness

**KEY POINTS**

1. The long-term consequences for physical and mental health should raise concerns for ATs’ longevity in the profession, as well as their inability to be good stewards of health and wellness.

2. Health and wellness policies, including dietary education, targeted toward ATs is warranted to improve physical and mental health.

**ABSTRACT WORD COUNT:** 298/300

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Health care professionals promote health and wellness in their patients by applying evidence-based principles and preventative measures with the goal of improving public health outcomes. For the practitioner to preserve high quality job performance and patient care, including patient safety and outcomes, the provider has the responsibility to maintain their own health and wellness. Making time for one’s self (physically and mentally) may mitigate some of the negative responses to chronic stress that leads to burnout, attrition from the profession, feeling exhausted, headaches, disrupted sleep patterns, poor appetite, increased alcohol and tobacco use, or developing anxiety or depression. 

Athletic trainers (ATs) primarily work in traditional settings (college/university, secondary schools, professional sports), where there are often non-traditional work hours, high work-stress, and limited physical activity (PA). Previous research on ATs’ self-reported health behaviors (e.g., PA, nutrition, alcohol use, etc.) demonstrated ATs did not meet PA recommendations; and, despite ATs’ adequate nutrition knowledge, ATs still engaged in unhealthy eating behaviors and did not meet nutritional recommendations. Inadequate PA levels and poor dietary habits in ATs is similar to other health care professionals such as nurses and physicians. 

Inadequate dietary intake along with low PA levels can result in energy imbalances. Energy balance (EB) is defined as total dietary energy intake (EI) minus total daily energy expenditure (TDEE). Energy balance can demonstrate how bodyweight will change over time in response to EI and TDEE changes. When an individual has positive EB there can be adverse health effects including obesity, cardiovascular disease, high blood pressure, type-2 diabetes, sleep apnea, decreased metabolic processes, or decreased bone mass. Obese individuals tend to experience high levels of dieting, overeating, and body image dissatisfaction; whereas those overweight tend to engage more in binge eating or compulsive overeating. Undernutrition is a complex issue associated with negative EB. Negative EB can lead to being underweight, which increases risk for a decline in metabolism, malnutrition, decreases in bone mass, reduction in metabolic and reproductive hormones, and inability to concentrate. Both negative and positive EB have implications for body weight regulation (i.e., weight gain or weight loss) and may lead to self-consciousness, anxiety, stress, body image dissatisfaction, depression, anxiety, eating
disorders (ED), and low self-esteem. These psychosocial factors may also be comorbid with ED / disordered eating (DE) risk, which are not commonly examined when assessing health care providers’ health and wellness. The multidimensional ED model describes perpetuating factors that involve the psychological, emotional, and physical starvation effects, which in turn link to starvation, dieting, binge eating, purging, and non-purging behaviors. It is important to note, these underlying psychological constructs (specially feeding and eating disorders and depression) are commonly associated with one engaging in pathogenic behaviors (e.g., dieting, excessive exercise, vomiting, diuretics, etc.).

Previous research exists on ATs’ health behaviors specific to self-reported PA and dietary intake; however, research on ATs’ PA levels in a free-living environment (real time), dietary habits, and psychological constructs related to ED/DE have not been examined in conjunction. To support prevention and management strategies within the profession aimed at improving the ATs’ overall quality of life, it is important to understand how these health concerns may be present in ATs. The purpose of our study was to examine EB, ED/DE risk, and pathogenic behaviors among ATs and to examine differences between sex (male, female), job status (PT-AT: part time is a graduate assistant AT; FT-AT: full time AT) and job setting (college/university: CU, high school: HS, non-traditional: NT). We hypothesized FT-ATs and ATs would have higher prevalence of positive EB, increased ED risk, and increased pathogenic behaviors compared to PT-ATs, HS and NT ATs. Due to the stressors already placed on ATs (e.g., long hours, job-related stressors, burnout, etc.) we hypothesized females would have higher negative EB and increased ED/DE risk and pathogenic behaviors.

METHODS

This study is part of a larger cross-sectional, descriptive, and free-living study design. A convenience sample of ATs (males: n=23, age: 29.1±7.9yrs; females: n=23, ages 28.9±7.9yrs) from the southeastern region of the United States were recruited from local colleges/universities, high schools, and non-traditional settings (e.g., clinics, recreations centers, outreach programs). Specific inclusion criteria included ATs certified by the Board of Certification®. Specific exclusion criteria included ATs working...
primarily under different credential (e.g., ATC, PT; ATC, PA). Institutional review board approval was attained, and all participants provided consent prior to participation.

**Demographic & Anthropometric Measurements**

Basic demographic and anthropometric information included sex, occupational setting, job status (PT-AT or FT-AT), job setting (CU, HS, or NT), years of AT experience, exercise background, alcohol use, and self-reported height, weight, ideal weight, and mental weight (perceived weight if one did not try to control their weight). We measured participants’ height, weight, and body composition in compliance with American College of Sports Medicine (ACSM) standards. Height was measured using a Shorr Productions Stadiometer (Shorr Productions, Maryland, USA) to the nearest 0.1 cm. Weight was measured, with minimal clothes, to the nearest 0.1 kg with the Tanita SC331S Body Composition Scale (Tanita, Tokyo, Japan). Body fat percentage was obtained using a Dual-Energy X-Ray Absorptiometry (DEXA; GE Lunar Prodigy densitometer).

**Resting Metabolic Rate**

Resting metabolic rate (RMR) was measured by indirect calorimetry from the Microlite MedGem (HealtheTech, Golden, CO) to determine the participant’s total calories utilized at rest. The MedGem is clinically validated to assess RMR.

**Energy Intake**

Energy intake (EI) was assessed and analyzed using online daily food logs (FoodProdigy, ESHA Food Processor 8.0, Salem, OR) for 7-consecutive days. Each participant was briefed about portion sizes and given at-home examples for their logs. Food logs were assessed for total kilocalories for EI and for macronutrient intake (proteins, carbohydrates-CHO, and fats). Using 7-consecutive days minimizes daily bias. The Dietary Reference Intake (DRI) were used to determine whether individuals met recommendations for protein (10-35% of total kilocalories), CHO (45-65% of total kilocalories), and fat (20-35% of total kilocalories).

**Total Daily Energy Expenditure & Exercise Energy Expenditure**
Total daily energy expenditure (TDEE) is the amount of energy required for essential life processes to occur, the energy expended to digest, absorb, and convert food, and the energy expended during PA and recovery. A SenseWear Armband (BodyMedia, Inc., Pittsburgh, PA) with an accelerometer continuously monitored TDEE and exercise energy expenditure (EEE). The armband was initiated using the manufacturer’s software and synchronized with the metabolic measurements system. Participant’s sex, age, height, and weight were programmed to each armband. Participants were required to wear the armband ~23-hours/day for 7-consecutive days. The SenseWear Armband is valid for assessing energy expenditure in free-living conditions. If participants were unable to wear the armband, they self-reported exercise and PA using FoodProdigy (ESHA Food Processor 8.0, Salem, OR) for 7-consecutive days. Participants recorded exercise duration, mode, and intensity, and we used the compendium of PA to determine the appropriate metabolic equivalent (MET) for exercise performed. Exercise energy expenditure was estimated using the following equation: \[ EEE = \text{duration (minutes)} \times 3.5 \times \frac{\text{weight (kg)}}{200}. \]

Energy Balance

Energy balance was defined as \( EB = EI - TDEE \). Energy balance is represented as negative, positive, or balanced; therefore, participants were categorized into these three groups: 1) negative EB \([EI<TDEE]\), 2) positive EB \([EI>TDEE]\), or 3) balanced EB \([EI=TDEE]\).

Eating Disorder Risk and Pathogenic Behavior

Eating disorder risk was assessed using the Eating Disorder Inventory-3 (EDI-3), a self-reported measure to identify ED patterns and associated psychological constructs. It included 91-items organized into scales: Drive for Thinness, Bulimia, Body Dissatisfaction, Low Self-Esteem, Personal Alienation, Interpersonal Insecurity, Interpersonal Alienation, Interoceptive Deficits, Emotional Dysregulation, Perfectionism, Asceticism, and Maturity Fears. The EDI-3 is composed of six composites: ED specific (ED Risk) and general integrative psychological constructs (Ineffectiveness-IC, Interpersonal Problems-IPC, Affective Problems-APC, Overcontrol-OC, and General Psychological Maladjustment-GPMC). It is valid in individuals aged 13-53 years to identify DE patterns and has a high reliability. The coefficient
and median values for specific composites include: ED Risk ($r=.98$, median=.95) and maladjustment ($r=.97$, median=.93). The EDI-3 Symptom Checklist (EDI-3 SC) identified the symptoms associated and frequency of ED risk behaviors, such as binge eating, self-induced vomiting, exercise patterns, use of laxative, diet pills, and diuretics. To be considered at risk for an ED, participants must have at least one composite score at “typical clinical” or “elevated clinical” and/or meet the criteria for pathogenic behavior risk.

**Procedures**

Participants were recruited through a local AT list serve through email. Interested individuals were sent a short survey to determine inclusion criteria, and then an individual meeting was scheduled to review study details and sign consent forms. After consent, participants completed anthropometric measurements, RMR, scheduled a DEXA, and completed the EDI-3 and EDI-SC. Participants were given a written and verbal overview of the weekly procedures, which included detailed instructions on the 7-day food and exercise logs and armband. Participants began self-reporting foods, fluids, and any planned and intentional exercise into the online log starting at the conclusion of the information session and for 7-consecutive days. Researchers emphasized continuing normal PA and food and fluid consumption during the 7-days. After the 7-days, participants returned the armband and emailed food and exercise logs to the researchers.

**Data Analysis**

SPSS statistical software (Version 26; SPSS Inc, Armonk, NY) and prior $\alpha=0.05$ was used for all analyses. We used G*Power software (3.1.9.4) to calculate power. Using an alpha of .05 and a large effect size (0.9), power calculation indicated 21 males and 21 females (42 participants total) needed for an estimated power of 0.9. Basic descriptive statistics examined demographic information (e.g., weight, height, job status, etc.). Data for BMI was categorized using ACSM’s classification of disease risk based on BMI and ACSM’s body composition norms by sex and age. ANOVAs determined differences between ATs’ sex (males, females), job status (PT-AT, FT-AT), and job setting (CU, HS, NT) and all anthropometric measurements and energy needs (RMR, EI, TDEE, EEE, EB, macronutrients).
Frequencies and proportions with 95% confidence intervals were calculated for categorical variables along with means and standard deviations for continuous variables. Chi-square analysis determined the difference between sex and macronutrient recommendations met by the ATs (below, within, or above). Chi-square analyses examined the proportion of participants classified as at risk for EB and ED/pathogenic behavior.

**RESULTS**

**Demographics & Anthropometric Measurements**

We achieved appropriate statistical power, with a total of 46 ATs completing this study and an equal distribution between females and males and PT- and FT-ATs. However, there was not enough power to examine both sex and job status (males part-time: n=12, males full-time: n=11; females part-time: n=11, females full-time: n=12) and job setting (CU: n=16, HS: n=19, NT: n=11). All physical and self-reported demographic and anthropometric measurements are in Table 1. Overall, 34.8% (n=16) were within normal BMI, 2.2% (n=1) low, 44.4% (n=20) overweight, 20% (n=9) were considered obese. When assessing body fat recommendations, 43.5% (n=20) were within normal limits, 17.4% (n=8) elevated, and 39.1% (n=18) high. Overall, 15.2% of ATs did not exercise, 23.9% exercised 1-2 times/week, 32.6% 3-4 times/week, and 28.2% >5 times/week. Self-reported alcohol consumption demonstrated 91.3% (n=43) drank alcohol, with the majority (34.8%, n=16) consuming alcohol at least 1 day/week, 17.4% (n=8) 2 days/week, 21.7% (n=10) 3 days/week, 13.0% (n=6) 4 days/week, and 4.2% (n=2) >4 days/week.

**Energy Assessment**

Over 80% of ATs exhibited negative EB. No significant differences were found within sex-job status and sex-job setting for EB. However, significant differences were found within female ATs’ EB and job status ($X^2(1, n=46)=4.44, P=.035$), with 100% (n=11) of female PT-ATs demonstrating negative EB. Comparatively, 34.8% (n=8) of FT-ATs displayed negative EB and 17.4% (n=4) positive EB. Males showed 43.5% (n=10) of PT-ATs and 39.1% (n=9) of FT-ATs showed negative EB, whereas 8.7% (n=2) PT-ATs and 8.7% (n=2) FT-ATs demonstrated positive EB. Significant differences were found between sex for RMR ($F(1,45)=16.48, P=.001$), EI ($F(1,45)=12.01, P=.001$), TDEE ($F(1,45)=40.36, P<.001$), and
EEE ($F(1,38)=5.353, P = .026$). No significant differences were found for sex and job status and job setting for RMR, EI, TDEE, EB, EEE, protein, CHO, and fat (Table 2). Significant differences were found for sex and macronutrient intake for CHO ($F(1,45)=6.32, P = .016$), proteins ($F(1,45)=22.5, P < .001$), and fat ($F(1,45)=5.21, P < .027$), with males displaying greater number of grams consumed. No other significant differences were found for energy needs and macronutrients for job status and job setting (Tables 2 and 3).

**Eating Disordered Risk & Pathogenetic Behaviors**

Overall, 84.8% (n=39) of ATs presented with ED risk with no significant difference between ED risk and sex-job status and sex-job setting. Male ED risk was 82.6% (n=19/23), females 87.0% (n=20/23), FT-ATs 91.3% (n=21/23), PT-ATs 78.3% (n=18/23), CU 81.3% (n=15/19), HS 84.7% (n=18/21), and NT 72.7% (n=8/11). Pathogenic behaviors revealed 26.1% (n=12) engaging in at least 1 pathogenic behavior, 50% (n=23) in 2 pathogenic behaviors, and 10.8% (n=5) in >2 pathogenic behaviors. Several ATs were categorized in “typical clinical” and “elevated clinical” ranges for subscales (Table 4). Overall, 78.3% (n=36) exhibited dieting behaviors. No significant differences were found between sex and dieting ($X^2(1,46)=.511, P = 0.475$). A significant difference was found between dieting and job status ($X^2(1,46)=4.6, P = 0.032$), with the highest risk in FT-ATs (45.7%; n=21) compared to PT-ATs (32.6%; n=15). Within females, dieting risk was highest in FT-ATs (52.2%; n=12) compared to PT-ATs (30.4%; n=7; $X^2(1,46)=5.28, P = .022$). There were no significant differences between the percent of time ATs exercised to lose weight ($X^2(1,46)=.517, P = 0.27$) and sex. However, 21.7% (n=10) exercised >50% of the time to lose weight, 56.6% (n=26) exercised to lose weight <25%-50% of the time, and 21.7% never used exercise to lose weight. No significant differences were found for pathogenic behaviors and sex (Table 5) and between job status. Table 6 provides a list of all definitions for the ED and pathogenic risk sections.

**DISCUSSION**

Our study extends the literature by focusing on ATs’ EB, macronutrient needs, and ED risk and pathogenic behaviors. Our free-living environment (real time) study, where we estimated TDEE and EI,
captured ATs’ work environment throughout 1-week. ACSM recommends healthy adults engage in moderate intensity, aerobic activity for a minimum of 30 min a day 5 days/week or vigorous intensity, aerobic activity for a minimum of 20 min a day 3 days/week.\textsuperscript{23} Regardless of sex, job status and job settings, \textasciitilde{60}\% of ATs met ACSM’s minimum PA recommendations\textsuperscript{23}, which is higher than self-reported PA data from previous studies.\textsuperscript{6,7} Athletic trainers’ long work hours can explain why they do not exercise or engage in more PA. Although a large portion of our ATs presented as moderately active, more than half presented as overweight/obese based on both BMI and body fat percent. This leads to the importance of examining diet, PA, and psychosocial constructs related to eating behaviors to better understand why a large portion of ATs still report overweight/obese.

Consistent with previous literature, males in the current study presented with higher RMR, EI, TDEE, and EEE.\textsuperscript{31} However, there was no significant difference between sex and EB, which may be attributed to females’ efficiency at conserving energy storing fat and having lower RMRs.\textsuperscript{31} When examining both males and females, EI was slightly higher than RMR. However, their total daily EI was less than their TDEE, leading to most ATs being negative balanced. It is alarming the majority of ATs who presented with a negative EB, especially since occupational activity has been declining over the last five decades while EI increased.\textsuperscript{32} Negative EB can lead to a multitude of negative health outcomes, such as a decline in metabolism, poor physical performance, decreases in thyroid hormones, and reduced concentration.\textsuperscript{33} This illuminates a possibility that ATs’ occupational demands could be higher than the general population, but further research needs to investigate the occupation energy expenditure demands. The high number of ATs who reported dieting in this study may suggest they use pathogenic behaviors to lose weight. It may seem counterintuitive that a population can be in negative EB, suggesting weight loss, but not meet ACSM or general body fat percentage guidelines.\textsuperscript{23} This may be due to the metabolic state, since the body does not receive enough energy to sustain itself, it will then begin to burn glycogen stores. Glycogen stores are the most readily available nutrient the body can use for energy, and if the body is in an extended state of needing this glycogen to function, then it may lead to decreased muscle mass and increased body fat percentage.
No significant differences were found between EB and sex, job status, and job setting. Despite these findings, there was a significant difference within females’ job status. All female PT-ATs reported negative EB compared to 34.8% of female FT-ATs, and EI for female PT-ATs was less than female FT-ATs. Female PT-ATs’ may have strain on their dietary habits and exercise profile due to financial stress and work-life balance with academic responsibilities and other duties deemed necessary by their graduate assistant positions. ATs with negative EB are similar to other healthcare professionals and shift workers who do not balance their PA, diet, and have more than half their population overweight/obese. Shift work is associated with increased BMI and has demonstrated a potential clash with diurnal dietary and exercise behaviors. Athletic trainers who work non-traditional hours may reduce meal frequency but increase snacking throughout their workday or late at night.

When examining macronutrient profiles, ~40% of ATs consumed below DRI recommendations for CHO consumption. Despite ‘low carb’ fad diet trends, CHO are the body’s primary fuel source and a necessary component of an individual’s macronutrient profile. All ATs were within the DRI recommendation for protein, suggesting ATs had appropriate knowledge of their macronutrient requirements. Most ATs were within the DRI recommendations for fat consumption; however, more than a third were consuming more than the recommendation. Overall, the majority of ATs were consuming within the DRI recommendations for all three macronutrients, which is consistent with the previous literature stating ATs have appropriate nutrition knowledge.

**Eating Disorder Risk and Pathogenic Behaviors**

To better understand eating behaviors, it is critical to also assess comorbid psychosocial constructs and pathogenic behaviors. ED risk in ATs was primarily attributed to comorbid psychosocial constructs observed and/or the use of pathogenic behaviors. Our study used a multidimensional approach to assess traditional and comorbid psychosocial components related to EDs. This approach is meaningful for those with EDs as well as those with subclinical variants, which was very important in our study because many ATs did not primarily display traditional ED psychological risks. Athletic trainers have a duty to optimize health and wellness for their patient populations; however, their high ED risk does not
Portray good stewardship of personal health and wellness. While males are at risk for ED and are commonly underdiagnosed, undertreated, and misunderstood, literature establishes females at higher risk, and we hypothesized there would be a significant difference between sex and ED risk, with female ATs having increased risk. Contrary to our hypothesis, our findings suggest males and females are at similar ED risk.

Although most ATs in our study did not experience traditional ED risk (i.e., drive for thinness, body image dissatisfaction, bulimia), when examining comorbid psychosocial risks, ATs were most prevalent for interpersonal insecurity, interpersonal alienation, emotional dysregulation, perfectionism, and maturity fear. Despite these other factors primarily attributing to increased ED risk, there was still a minimal risk for bulimia and body dissatisfaction in ATs. Interpersonal insecurity assessed discomfort, apprehension, and silence in social situation; expressing personal thoughts and feelings to others; and the tendency to withdraw and isolate from others. Most commonly, people worry about interpersonal rejection or hurt. This hurt is not only caused by social rejection or exclusion but due to lack of support, trust, or protection. For ATs this may be due to several factors: 1) not feeling part of a team, 2) difficulty gaining trust from patients, peers, coaches, and other healthcare providers, and 3) frequently educating people on the AT’s role.

Interpersonal alienation assessed disappointment, distance, estrangement, and a lack of trust in relationships or between a group of people in a work environment, implying a strong tendency of feeling trapped in relationships. Depending on the job setting and medical model ATs are providing services under, ATs may have a difficult time establishing themselves in an environment where there is no trust and medical oversight is at the athletic director or coach’s discretion. This may possibly lead to ATs feeling underappreciated and not valued, and in turn ATs feel emotionally exhausted. These behaviors may lead to emotional dysregulation which may lead to mood instability, impulsivity, recklessness, anger, and self-destructiveness. An internal or external event may occur that provokes an experience which triggers an emotional and physiological response (e.g., increase heart rate), followed by a risky behavior (e.g., drugs, alcohol, avoidance, physical action, etc.). In our study, a significant number of ATs
consumed alcohol on a regular basis, which may be partially due to a reactive response to their emotional dysregulation.

Typical and elevated clinical perfectionism scores are reflected when high demands are placed on achieving the highest possible standards and a subsequent failure to meet these standards, coupled with self-criticism. Considering ATs are historically socialized into the profession by athletics participation, it is reasonable to assume perfectionism is a by-product of their athletic careers. Maturity fear is the desire to return to the security of childhood, is associated with a strong preference to avoid developmental demands, and is seen in those trying to return to the lighter weight from childhood or adolescents. Maturity fears in almost two-thirds of ATs in our study can be linked to their desire for weight loss and both sexes demonstrating a negative value for mental weight (perceived weight if they did not try to control their weight). A negative value signifies ATs believed they would weigh more than they currently do if they did not try to control their weight.

When assessing pathogenic behaviors, we found males engaged in binge eating more frequently than females, correlating with previous research. A desire to achieve a lighter weight was observed through the significant number of ATs dieting, which is concerning given the majority were identified as being in a negative EB. A large portion of females and males associated exercise to control their weight rather than exercise for health and wellness. Given their exercise habits, this may also be associated with the overall high negative EB prevalence. Athletic trainers also used diet pills to control their weight, which can lead to negative health outcomes (e.g., increased heart rate, high blood pressure, kidney problems, liver damage, etc.).

**Limitations to the Study**

Although this study revealed EB concerns and increased ED risk for ATs, the following limitations should be recognized. We assume all self-reported information and questionnaires were completed entirely with accurate and honest answers. This is especially true when exploring food log validity, where respondents have the potential to adjust the log to fit social norms. There is potential of diet hypersensitivity during the 7-day reporting period, due to the delicate nature of ED/DE risk. Our
sample was limited to ATs working in the southeastern United States; energy need profiles and ED risk may vary by geographic region and should be examined. Future research should explore the number of hours worked and PA levels throughout the duration of work.

**CONCLUSION**

Health care professionals have the responsibility to maintain their own health and wellness. In this study, regardless of job status and setting, most ATs presented with negative EB and substantial ED risk overall. Athletic trainers’ ED risk was not prevalent due to traditional factors (e.g., body image dissatisfaction, bulimia) but revealed by high prevalence of comorbid psychosocial constructs and pathogenic behaviors. Combined, this may have influenced behaviors that reflected poorly on diet and exercise leading to a negative EB. The long-term consequences for physical and mental health should raise concerns for ATs’ longevity in the profession, preluding to burnout and a decline in the workforce, as well as their inability to be good stewards of health and wellness. Medical conditions associated with negative EB and additional psychosocial constructs related to diet may be associated with AT role strain and burnout. The American Medical Association designed prevention and intervention wellness programs for physicians to improve health and wellness, job satisfaction, burnout, and enhance the quality of patient care. The AT profession should examine integrating similar policy and wellness programs for ATs.
REFERENCES

1. Oglesby LW, Gallucci AR, Wynveen CJ. Athletic trainer burnout: a systematic review of the literature. J Athl Train. 2020;55(4):416-430.

2. Kania ML, Meyer BB, Ebersole KT. Personal and environmental characteristics predicting burnout among certified athletic trainers at National Collegiate Athletic Association institutions. J Athl Train. 2009;44(1):58-66.

3. Helfand BK, Mukamal KJ. Healthcare and lifestyle practices of healthcare workers: do healthcare workers practice what they preach? JAMA Intern Med. 2013;173(3):242-244.

4. Naugle KE, Behar-Horenstein LS, Dodd VJ, Tillman MD, Borsa PA. Perceptions of wellness and burnout among certified athletic trainers: sex differences. J Athl Train. 2013;48(3):424-430.

5. Mazerolle SM, Monsma E, Dixon C, Mensch J. An assessment of burnout in graduate assistant certified athletic trainers. J Athl Train. 2012;47(3):320-328.

6. Groth JJ, Ayers SF, Miller MG, Arbogast WD. Self-reported health and fitness habits of certified athletic trainers. J Athl Train. 2008;43(6):617-623.

7. Winkelmann Z, Shea M, Granger K, Eberman L, Games K. Health Behaviors of Athletic Trainers. J Sport Med Allied Health Sci: Journal of the Ohio Athletic Trainers Association.: 2019;5(2).

8. Torres-McGehee TM, Pritchett KL, Zippel D, Minton DM, Cellamare A, Sibilia M. Sports nutrition knowledge among collegiate athletes, coaches, athletic trainers, and strength and conditioning specialists. J Athl Train. 2012;47(2):205-211.

9. Bazargan M, Makar M, Bazargan-Hejazi S, Ani C, Wolf KE. Preventive, lifestyle, and personal health behaviors among physicians. Acad Psychiatry. 2009;33(4):289-295.

10. Bakhshi S, Sun F, Murrells T, While A. Nurses' health behaviours and physical activity-related health-promotion practices. Br J Community Nurs. 2015;20(6):289-296.

11. (US) NioH. NIH Curriculum Supplement: Series Biological Sciences Curriculum Study. Bethesda (MD: National Institutes of Health (US); 2007.

12. Gruca RA, Przybeck TR, Clominger CR. Prevalence and correlates of binge eating disorder in a community sample. Compr Psychiatry. 2007;48(2):124-131.

13. Hudson JI, Hiripi E, Pope HG, Jr., Kessler RC. The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. Biol Psychiatry. 2007;61(3):348-358.

14. Uzogara S. Underweight, the less discussed type of unhealthy weight and its implications: a review. Amer J Food Sci Nutr Res. 2016;3:126-142.

15. Hill JO, Wyatt HR, Peters JC. The Importance of Energy Balance. Eur Endocrinol. 2013;9(2):111-115.

16. Kurpad AV, Muthayya S, Vaz M. Consequences of inadequate food energy and negative energy balance in humans. Public Health Nutr. 2005;8(7a):1053-1076.

17. Chu DT, Minh Nguyen NT, Nga VT, et al. An update on obesity: Mental consequences and psychological interventions. Diabetes Metab Syndr. 2019;13(1):155-160.

18. Brytek-Matera A, Czepczor K. Models of eating disorders: a theoretical investigation of abnormal eating patterns and body image disturbance. Archives of Psychiatry and Psychotherapy. 2017;1:16-26.

19. Udo T, Grilo CM. Psychiatric and medical correlates of DSM-5 eating disorders in a nationally representative sample of adults in the United States. Int J Eat Disord. 2019;52(1):42-50.
20. APA. Diagnostic and Statistical Manual of Mental Disorders. In: *Diagnostic and Statistical Manual of Mental Disorders*. Vol DSM-5. DSM-5 ed.: American Psychiatric Publishing; 2013:329-354.

21. Gillen MM, Markey CN, Markey PM. An examination of dieting behaviors among adults: links with depression. *Eat Behav.* 2012;13(2):88-93.

22. Elran-Barak R, Segel-Karpas D. Dieting for weight-control among older adults: The role of perceived health and perceived overweight status. *Eat Behav.* 2020;36:101368.

23. ACSM. Health-Related Physical Fitness Testing and Interpretation. In: *ACSM’s guidelines for exercise testing and prescription*. 9th ed.: Wolters Kluwer; 2014:8, 60-74.

24. McDoniel SO. A systematic review on use of a handheld indirect calorimeter to assess energy needs in adults and children. *Int J Sport Nutr Exerc Metab.* 2007;17(5):491-500.

25. Ortega RM, Pérez-Rodrigo C, López-Sobaler AM. Dietary assessment methods: dietary records. *Nutr Hosp.* 2015;31(3):38-45.

26. Lupton JR, Brooks J, Butte N, Caballero B, Flatt J, Fried S. Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids. *National Academy Press: Washington, DC, USA.* 2002;5:589-768.

27. St-Onge M, Mignault D, Allison DB, Rabasa-Lhoret R. Evaluation of a portable device to measure daily energy expenditure in free-living adults. *Am J Clin Nutr.* 2007;85(3):742-749.

28. Ainsworth BE, Haskell WL, Whitt MC, et al. Compendium of physical activities: an update of activity codes and MET intensities. *Med Sci Sports Exerc.* 2000;32(9 Suppl):S498-504.

29. Gibson AL, Wagner D, Heyward V. Designing Cardiorespiratory Exercise Programs. In: *Advanced Fitness Assessment and Exercise Prescription*. 8th ed.: Human kinetics; 2019:233.

30. Garner DM. *EDI-3, Eating Disorder Inventory-3: Professional manual*. Psychological Assessment Resources, Incorporated; 2004.

31. Wu BN, O'Sullivan AJ. Sex differences in energy metabolism need to be considered with lifestyle modifications in humans. *J Nutr Metab.* 2011;2011.

32. Church TS, Thomas DM, Tudor-Locke C, et al. Trends over 5 decades in US occupation-related physical activity and their associations with obesity. *PloS one.* 2011;6(5):e19657.

33. Hall KD, Heymsfield SB, Kemnitz JW, Klein S, Schoeller DA, Speakman JR. Energy balance and its components: implications for body weight regulation. *Am J Clin Nutr.* 2012;95(4):989-994.

34. Atkinson G, Fullick S, Grindley C, Maclaren D. Exercise, energy balance and the shift worker. *Sports Med.* 2008;38(8):671-685.

35. Strother E, Lemberg R, Stanford SC, Turberville D. Eating disorders in men: underdiagnosed, undertreated, and misunderstood. *Eat Disord.* 2012;20(5):346-355.

36. Stanford SC, Lemberg R. A clinical comparison of men and women on the eating disorder inventory-3 (EDI-3) and the eating disorder assessment for men (EDAM). *Eat Disord.* 2012;20(5):379-394.

37. Zhang H CD, Teng F, Zhang D. Sense of interpersonal security and preference for harsh actions against others: the role of dehumanization. *J Exp Soc Psychol.* 2015;56:165-171.

38. Tanofsky MB, Wilfley DE, Spurrell EB, Welch R, Brownell KD. Comparison of men and women with binge eating disorder. *Int J Eat Disord.* 1997;21(1):49-54.
39. Berg FM. Health risks associated with weight loss and obesity treatment programs. *J Soc Issues*. 1999;55(2):277-297.
| Table 1. Participant Demographics (Mean ± Standard Deviation) |
|---------------------------------------------------------------|
| | Males (n=23) | Females (n=23) | P-Value |
| | Age, y | 29.0 ± 7.9 | 29.1 ± 7.9 | 28.9 ± 8.0 | 23.5 ± 0.68 | 33.9 ± 8.3 | .927 |
| | Part-Time | Full-Time | Part-Time | Full-Time | Part-Time | Full-Time | |
| Height, cm | 172.1 ± 10.5 | 182.2 ± 6.2 | 177.8 ± 8.1 | 164.8 ± 5.9 | 163.6 ± 6.6 | <.001 |
| | Self-Reported | Measured | Self-Reported | Measured | Self-Reported | Measured | |
| Weight, kg | 78.7 ± 16.4 | 91.7 ± 13.3 | 89.7 ± 10.2 | 59.2 ± 5.4 | 73.4 ± 9.2 | <.001 |
| | Self-Reported | Measured | Highest | 84.2 ± 18.7 | 98.5 ± 18.8 | 96.2 ± 9.1 | 62.7 ± 6.8 | 78.5 ± 9.3 | <.001 |
| | Lowest | 69.6 ± 13.6 | 82.4 ± 7.6 | 76.9 ± 11.5 | 54.9 ± 4.9 | 63.7 ± 8.5 | <.001 |
| | Mental* | 81.3 ± 18.3 | 96.0 ± 16.3 | 92.2 ± 11.0 | 59.5 ± 5.8 | 76.5 ± 10.5 | <.001 |
| | Ideal | 73.5 ± 13.9 | 88.3 ± 6.7 | 81.6 ± 8.0 | 57.9 ± 3.7 | 65.7 ± 7.7 | <.001 |
| | Self-Reported – Ideal | 5.17 ± 6.8 | 3.4 ± 8.2 | 8.1 ± 6.7 | 1.4 ± 3.6 | 7.7 ± 6.0 | .625 |
| | Measured – Ideal | 3.9 ± 9.0 | 3.0 ± 9.4 | 3.4 ± 13.7 | 1.4 ± 3.6 | 7.6 ± 6.3 | .605 |
| | Self-reported – Menta | -2.9 ± 4.6 | -4.3 ± 5.3 | -2.5 ± 4.8 | -0.3 ± 2.4 | -3.1 ± 7.8 | .215 |
| | Measured – Menta | -3.9 ± 9.1 | -4.7 ± 4.6 | -7.2 ± 6.9 | -0.3 ± 2.3 | -3.2 ± 4.9 | .130 |
| BMI, kg/m² | 26.4 ± 4.3 | 27.7 ± 4.6 | 28.5 ± 3.8 | 21.8 ± 2.0 | 27.5 ± 3.3 | .009 |
| | Self-Reported | Measured | Body Fat Percent | 26.4 ± 4.4 | 27.9 ± 4.9 | 28.4 ± 3.3 | 21.9 ± 2.4 | 27.5 ± 3.5 | .009 |
| | DEXA (%) | 29.2 ± 8.5 | 23.9 ± 8.7 | 27.8 ± 8.6 | 29.6 ± 5.9 | 35.4 ± 7.0 | .005 |

Notes: P-value is representative of comparison of anthropometric measures and sex.

*Mental Weight: Perceived weight if one did not consciously try to control weight.
| Energy Needs | All (Mean ± SD) | Males (n=23) | Females (n=23) | Sex P-Value |
|-------------|----------------|--------------|----------------|-------------|
| RMR, kcals  | 1933.0 ± 359.8 | 1704.5 ± 228.2 | 1704.5 ± 228.2 | <.001       |
| EI, kcals   | 2223.1 ± 469.4 | 2142.5 ± 334.0 | 2142.5 ± 334.0 | <.001       |
| TDE, kcals  | 2737.7 ± 260.1 | 2633.1 ± 294.4 | 2633.1 ± 294.4 | <.001       |
| EB, kcals   | -455.1 ± 491.5 | -427.7 ± 605.9 | -427.7 ± 605.9 | .193        |
| EEE, kcals  | 584.2 ± 284.7  | 686.1 ± 368.9  | 686.1 ± 368.9  | .026        |

Macronutrients

| Energy Needs | College/Univ | High School | Non-Trad | College/Univ | High School | Non-Trad | Job Setting P-Value |
|-------------|--------------|-------------|----------|--------------|-------------|----------|---------------------|
| RMR, kcals  | 1922.2 ± 322.2 | 1861.8 ± 410.1 | 2226.7 ± 101.2 | 1638.6 ± 327.2 | 1562.5 ± 304.7 | 1415.0 ± 278.9 | .575                |
| EI, kcals   | 2317.7 ± 402.6 | 2145.6 ± 581.1 | 2223.6 ± 120.1 | 1982.3 ± 516.3 | 1661.3 ± 634.5 | 1486.9 ± 447.7 | .549                |
| TDE, kcals  | 2637.1 ± 334.2 | 2772.9 ± 198.9 | 2909.9 ± 52.7  | 2370.2 ± 128.1 | 2408.8 ± 123.8 | 2284.8 ± 112.3 | .279                |
| EB, kcals   | -319.4 ± 353.8 | -593.1 ± 558.1 | -356.0 ± 629.5 | -387.9 ± 593.7 | -747.6 ± 568.6 | -797.9 ± 474.9 | .144                |
| EEE, kcals  | 546.1 ± 122.1  | 603.9 ± 381.5  | 618.9 ± 208.7  | 364.0 ± 546.1  | 460.6 ± 452.5  | 342.9 ± 90.7   | .406                |

Macronutrients

| Energy Needs | College/Univ | High School | Non-Trad | College/Univ | High School | Non-Trad | Job Setting P-Value |
|-------------|--------------|-------------|----------|--------------|-------------|----------|---------------------|
| Proteins, g | 107.2 ± 28.9 | 174.6 ± 31.6 | 96.0 ± 21.7 | 70.7 ± 22.9  | 64.4 ± 21.3  | 76.4 ± 23.7  | <.001                |
| CHO, g      | 257.5 ± 86.3 | 258.8 ± 75.9 | 256.2 ± 10.2 | 201.2 ± 64.0 | 183.2 ± 53.5 | 217.6 ± 70.6 | .016                |
| Fats, g     | 81.7 ± 22.6  | 82.9 ± 17.5  | 80.4 ± 28.0  | 66.1 ± 23.3  | 57.0 ± 17.1  | 74.4 ± 26.6  | .027                |

Note: No significant differences between part-time ATs and all variables.
Table 3: Distribution of Micronutrients (Percent and Sample Size)

| Macronutrient | All  | Males (n=23) | Female (n=23) |
|---------------|------|--------------|---------------|
|               | %    | P-value      | %     | P-value | %    | P-value |
| **CHO**       |      |              |       |         |      |         |
| Below Recommendation | 39.1 (18) | .533 | 47.8 (11) | .565 | 30.4 (7) | .221 |
| Within Recommendation | 58.7 (27) | | 47.8 (11) | | 69.6 (16) | |
| Above Recommendation | 2.2 (1) | | 4.3 (1) | | 0 (0) | |
| **Proteins**  |      |              |       |         |      |         |
| Below Recommendation | 0 (0) | -- | 0 (0) | -- | 0 (0) | -- |
| Within Recommendation | 100 (46) | | 100 (23) | | 100 (23) | |
| Above Recommendation | 0 (0) | | 0 (0) | | 0 (0) | |
| **Fats**      |      |              |       |         |      |         |
| Below Recommendation | 0 (0) | .765 | 0 (0) | .110 | 0 (0) | .292 |
| Within Recommendation | 58.7 (27) | | 65.2 (15) | | 52.2 (12) | |
| Above Recommendation | 41.3 (19) | | 34.8 (8) | | 47.8 (11) | |

Note: P-value is representative of comparison of DRI recommendations measures for all ATs and within male ATs and pathogenic behaviors and within female ATs.
| Eating Disorders Risk Scales                  | Males (n=23) | Females (n=23) |
|---------------------------------------------|--------------|----------------|
| **Drive for Thinness (DT)**                 |              |                |
| Raw Score Mean (SD)                         | 4.9 (3.2)    | 6.1 (4.1)      |
| Low Clinical % (n)                          | 50.0 (23)    | 47.8 (22)      |
| Typical Clinical % (n)                      | 0 (0)        | 0 (0)          |
| Elevated Clinical % (n)                     | 0 (0)        | 2.2 (1)        |
| Bulimia (B)                                 | 1.5 (2.1)    | 2.2 (4.1)      |
| Raw Score Mean (SD)                         | 45.7 (21)    | 45.7 (21)      |
| Low Clinical % (n)                          | 45.7 (21)    | 50.0 (23)      |
| Typical Clinical % (n)                      | 4.3 (2)      | 2.2 (1)        |
| Elevated Clinical % (n)                     | 0 (0)        | 2.2 (1)        |
| Body Dissatisfaction (BD)                   | 10.2 (7.5)   | 13.3 (9.2)     |
| Raw Score Mean (SD)                         | 45.7 (21)    | 41.3 (19)      |
| Low Clinical % (n)                          | 45.7 (21)    | 8.7 (4)        |
| Typical Clinical % (n)                      | 4.3 (2)      | 0 (0)          |
| Elevated Clinical % (n)                     | 0 (0)        | 0 (0)          |

**Psychological Scales**

|                          | Males (n=23) | Females (n=23) |
|--------------------------|--------------|----------------|
| Low Self-Esteem (LSE)    | 1.6 (2.4)    | 1.9 (2.6)      |
|                          | 47.8 (22)    | 47.8 (22)      |
|                          | 2.2 (1)      | 2.2 (1)        |
|                          | 0 (0)        | 0 (0)          |
| Personal Alienation (PA) | 2.5 (2.3)    | 2.9 (2.5)      |
|                          | 47.8 (22)    | 50.0 (23)      |
|                          | 2.2 (1)      | 0 (0)          |
|                          | 0 (0)        | 0 (0)          |
| Interpersonal Insecurity (II) | 7.1 (6.0) | 5.4 (4.7)      |
|                          | 26.1 (12)    | 32.6 (15)      |
|                          | 15.2 (7)     | 15.2 (7)       |
|                          | 8.7 (4)      | 32.6 (15)      |
| Interpersonal Alienation (IA) | 5.0 (3.6) | 4.4 (3.4)      |
|                          | 32.6 (15)    | 17.4 (8)       |
|                          | 15.2 (7)     | 0 (0)          |
|                          | 2.2 (1)      | 0 (0)          |
| Interceptive Deficits (ID) | 3.2 (3.8)   | 2.7 (3.9)      |
|                          | 45.7 (21)    | 47.8 (22)      |
|                          | 4.3 (2)      | 2.2 (1)        |
|                          | 0 (0)        | 0 (0)          |
| Emotional Dysregulation (ED) | 2.8 (3.1)   | 2.3 (2.3)      |
|                          | 34.8 (16)    | 39.1 (18)      |
|                          | 13.0 (6)     | 10.9 (5)       |
|                          | 2.2 (1)      | 0 (0)          |
| Perfectionism (P)        | 13.7 (4.8)   | 12.9 (4.8)     |
|                          | 13.0 (6)     | 13.0 (6)       |
|                          | 23.9 (11)    | 28.3 (13)      |
|                          | 13.0 (6)     | 8.7 (4)        |
| Asceticism (A)           | 3.7 (2.9)    | 4.0 (2.4)      |
|                          | 45.7 (21)    | 45.7 (21)      |
|                          | 2.2 (1)      | 4.3 (2)        |
|                          | 0 (0)        | 0 (0)          |
| Maturity Fears (MF)      | 5.0 (3.6)    | 5.6 (4.5)      |
|                          | 32.6 (15)    | 28.3 (13)      |
|                          | 15.2 (7)     | 17.4 (8)       |
|                          | 2.2 (1)      | 4.3 (2)        |

**Composite**

|                          | Males (n=23) | Females (n=23) |
|--------------------------|--------------|----------------|
| ED Risk Composite (EDRC) | 96.3 (12.2)  | 101.5 (20.1)   |
|                          | 50.0 (23)    | 47.8 (22)      |
|                          | 0 (0)        | 2.2 (1)        |
|                          | 0 (0)        | 0 (0)          |
| Ineffectiveness Composite (IC) | 63.3 (7.1) | 64.3 (7.6)     |
|                          | 47.8 (22)    | 50.0 (23)      |
|                          | 2.2 (1)      | 0 (0)          |
|                          | 0 (0)        | 0 (0)          |
| Interpersonal Problems Composite (IPC) | 83.0 (15.2) | 79.2 (12.5) |
|                          | 37.0 (17)    | 34.8 (16)      |
|                          | 8.7 (4)      | 15.2 (7)       |
|                          | 4.3 (2)      | 0 (0)          |
|                          | 72.0 (7.1)   | 47.8 (22)      |
| Affective Problems Composite (APC) | 73.5 (9.1) | 72.0 (7.1) |
|                          | 45.7 (21)    | 47.8 (22)      |
|                          | 4.3 (2)      | 2.2 (1)        |
|                          | 0 (0)        | 0 (0)          |
| Over control Composite (OC) | 83.0 (11.4) | 83.3 (8.8)    |
|                          | 34.8 (16)    | 34.8 (16)      |
|                          | 13.0 (6)     | 15.2 (7)       |
|                          | 2.2 (1)      | 0 (0)          |
| General Psychological Maladjustment (GPMC) | 544.5 (33.6) | 341.2 (30.1) |
|                          | 45.7 (21)    | 50 (0)         |
|                          | 4.3 (2)      | 0 (0)          |
|                          | 0 (0)        | 0 (0)          |
|                          | 0 (0)        | 0 (0)          |
Table 5: Pathogenic Behaviors “At Risk” for Associated Behavior (Percent and Sample Size)

| Pathogenic Behaviors | Males (n=23) |          |          |          |          |          |          |          |          |          |          |          |          |          |
|----------------------|--------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
|                      | All          | Part-Time| Full-Time| P-value  | All       | Part-Time| Full-Time| P-value  | All       | Part-Time| Full-Time| P-value  |          |          |
| Dieting              | 73.9 (17)    | 34.8 (8) | 39.1 (9) | .365     | 82.6 (19) | 30.4 (7) | 52.2 (12) | .037     | 82.6 (19) | 30.4 (7) | 52.2 (12) | .037     |          |          |
| Binge Eating         | 13.0 (3)     | 4.3 (1)  | 8.7 (2)  | .484     | 4.3 (1)   | 0 (0)    | 4.3 (1)   | .328     | 4.3 (1)   | 0 (0)    | 4.3 (1)   | .328     |          |          |
| Purging              | 0 (0)        | 0 (0)    | 0 (0)    | ---      | 0 (0)     | 0 (0)    | 0 (0)     | ---      | 0 (0)     | 0 (0)    | 0 (0)     | ---      |          |          |
| Laxatives            | 8.7 (2)      | 4.3 (1)  | 4.3 (1)  | .949     | 8.7 (2)   | 4.3 (1)  | 1.3 (1)   | .949     | 8.7 (2)   | 4.3 (1)  | 1.3 (1)   | .949     |          |          |
| Diet Pills           | 17.4 (4)     | 13.0 (3) | 4.3 (1)  | .315     | 13.0 (3)  | 4.3 (1)  | 8.7 (2)   | .590     | 13.0 (3)  | 4.3 (1)  | 8.7 (2)   | .590     |          |          |
| Diuretics            | 0 (0)        | 0 (0)    | 0 (0)    | ---      | 0 (0)     | 0 (0)    | 0 (0)     | ---      | 0 (0)     | 0 (0)    | 0 (0)     | ---      |          |          |

| Exercise to Control Weight |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
|----------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 0% of time                 | 30.4 (7) | 17.4 (4) | 13.0 (23)|          | 13.0 (3) | 8.7 (2)  | 4.3 (1)  |          |          |          |          |          |          |          |
| <25% of time               | 39.1 (9) | 21.7 (5) | 17.4 (4) |          | 17.4 (4) | 13.0 (3) | 4.3 (1)  |          |          |          |          |          |          |          |
| 25%-50% of time            | 13.0 (3) | 13.0 (3) | 0.0 (0)  |          | 43.5 (10)| 17.4 (4) | 26.1 (6) |          |          |          |          |          |          |          |
| >75% of time               | 8.7 (2)  | 0.0 (0)  | 8.7 (2)  |          | 26.1 (6) | 8.7 (2)  | 17.4 (4) |          |          |          |          |          |          |          |
| 100% of time               | 8.7 (2)  | 0.0 (0)  | 8.7 (2)  |          | 0.0 (0)  | 0.0 (0)  | 0.0 (0)  |          |          |          |          |          |          |          |

Notes: P-value is representative of comparison of pathogenic behaviors measures within male ATs and pathogenic behaviors and within female ATs.
| Table 6: Description of Common Terminology |
|-------------------------------------------|
| **Term** | **Brief Description** | **Examples** |
| **Eating Disorder Risk Scale** | | |
| Body Dissatisfaction | Assessment of one’s discontentment with overall shape and size of physical appearance of the body with concern to eating disorders | Concerns with overall shape and size of body (i.e., stomach, hips, thighs, buttocks). |
| Bulimia | Assessment of tendency to think about, and engage in, bouts of uncontrollable overeating and then engaging some form of purging method | Binge eating and followed by purging episodes (i.e., self-induced vomiting, excessive exercise) |
| Drive for Thinness | Assessment of preoccupation with restrictive dieting, concern with dieting, and fear of weight gain | Terrified about gaining weight and preoccupied with desire to be thin. Spends an inordinate amount of time thinking about dieting. |
| **Psychological Scales** | | |
| Ascetism | Assessment of the tendency to seek virtue through pursuit of spiritual ideals such as self-discipline, self-denial, self-sacrifice, & control of bodily urges. | Strong tendency to place positive connotations on achieving virtue through self-restraint. There is also considerable guilt and shame surrounding the experience of pleasure. |
| Emotional Dysregulation | Assessment of tendency toward mood instability, impulsivity, recklessness, anger, and self-destructiveness. | Poor impulse regulation, mood intolerance, and self-harm. May be associated to problems with substance abuse involving alcohol, drugs, or both. |
| Interpersonal Alienation | Assessment of disappointment, distance, estrangement, and a lack of trust in relationships. | Strong tendency to feel trapped in relationships as well as the failure to experience understanding and love from others. |
| Interceptive Deficits | Assessment of confusion related to accurately recognizing and responding to emotional states. | Intense fear and mistrust of certain emotions when they are too strong or experienced as out of control. Emotions are evaluated to determine if they are “valid”, “appropriate,” or “justified”, or “legitimate, rather than simply accepted. |
| Interpersonal Insecurity | Assessment of discomfort, apprehension, and reticence in social situations. | Feelings of not being loved, protected, trusted, supported, or cared for by others. |
| Low Self-Esteem | Assessment of negative self-evaluation with questions tapping into feelings of insecurity, inadequacy, ineffectiveness, and lack of personal worth. | Persistent negative self-perception of being unable to achieve personal standards. |
| Maturity Fears | Assessment of the desire to return to the security of childhood. | Weight loss becomes a mechanism for avoiding adolescent turmoil, conflicts, and |
developmental expectations because it results in a return to prepubertal appearance and hormonal status. One who needs to be the best at doing things, achieve goals, and avoid disappointing others. Failure to achieve goals results in self-criticism. One withdraws or becomes isolated from their environment or from other people, and often reject loved ones or society.

| Composites for EDI-3                  |                                                                                                           |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Perfectionism                        | Assesment of the extent to which a person places a premium on achieving goals and the highest possible standards for personal achievement. One who needs to be the best at doing things, achieve goals, and avoid disappointing others. Failure to achieve goals results in self-criticism. One withdraws or becomes isolated from their environment or from other people, and often reject loved ones or society. |
| Personal Alienation                  | Overlaps with low self-esteem, however it assesses a broader domain of feelings pertaining to a pervasive sense of emotional emptiness and aloneness and poor sense of self-understanding. One withdraws or becomes isolated from their environment or from other people, and often reject loved ones or society. |
| Composites for EDI-3                 |                                                                                                           |
| Eating Disorder Risk                 | Provides a global measurement of eating and weight concerns. Composed of Drive for Thinness, Bulimia and Body Dissatisfaction scales. One has eating and weight concerns that consists of fear of weight gain, desire to be thinner, binge eating tendencies and body dissatisfaction. |
| Ineffectiveness                      | Provides deficit in self-concept that involves extreme and pervasive feelings of emotional emptiness and aloneness and a poor sense of self-understanding. Composed of Low Self-Esteem and Personal Alienation scales. One reflects both a low self-evaluation and the sense of emotional emptiness that reflects a basic deficit in personal identity. |
| Interpersonal Problems               | Provides one’s experience that social relationships are tense, insecure, disappointing, and generally of poor quality. Composed of Interpersonal Insecurity and Interpersonal Alienation scales. Social self-doubt, and insecurity, along with overall distrust in relationships. |
| Affective Problems                   | Assesses the ability to correctly identify, understand, or respond to emotional states. Composed of Interceptive Deficits and Emotional Dysregulation scales. Can be reflected by problems identifying emotions or by responding with fear, confusion, or mistrust. One has mood instability, intolerance, impulsivity, recklessness, anger, self-destruction, and the misuse of substances to control mood. |
| Overcontrol                          | Provides an indication of that one places a premium on achieving a high standard of personal achievement, as well as the belief that it is virtuous to engage in self-denial, self-sacrifice, and suffering. Composed of Perfectionism and Asceticism scales. One believes there is shame around personal weaknesses and a wish to rigidly control bodily urges. |
| General Psychological Maladjustment  | Composed of all 9 psychological scales. Indicates high level of distress across a wide range of psychological constructs including low |
self-esteem, personal alienation, interpersonal insecurity, interpersonal alienation interoceptive deficits, emotional dysregulation, perfectionism, asceticism, and majority fears.

### Pathogenic Behaviors

| Behavior       | Description                                                                 | Example                                                                 |
|----------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Binge Eating   | Consuming large quantities of food very quickly, even when not physically hungry, and to the point of being uncomfortably full. | Eating a larger than normal amount of food over a short period of time and not having a sense of control. |
| Dieting        | Restricting oneself to small amounts or special kinds of food to lose weight | Paleo Diet, Vegan Diet, South Beach Diet, Zone Diet, Keto Diet, Mediterranean Diet, Raw Food Diet, Atkins Diet, Intermittent Fasting, etc. |
| Diet Pills/Drugs | Utilizing diet pills (appetite suppressants or thermogenics), or thyroid medication as an attempt to control weight. | Keto Pills, Garcinia Cambogia Extract, Hydroxycut, Orlistat, Glucomannan, Meratrim, Conjugated Linoleic Acid, etc. |
| Diuretics      | Utilizing diuretics to facilitate the body’s removal of excess fluid         | Thiazide Diuretics, Loop Diuretics, Potassium-Sparing Diuretics, Water pills, Nigella Sativa, Hibiscus, Alcohol, Caffeine, |
| Laxatives      | Utilizing laxatives to aid the body in removing excess water through stool excretion | Detox and Colon Cleanse, Miralax, Metamucil, Colace, Senokot, PediaLax, etc. |
| Purging        | Ridding the body of food and/or calories consumed to prevent weight gain or to lose weight | Self-induced vomiting, excessive exercise, and/or fasting |

**Note:** Psychological Scales and Eating Disorder Risk Scales were assessed using the Eating Disorder Inventory-3 (EDI-3) and Pathogenic Behaviors were assessed using the Eating Disorder Inventory-3 Symptom Checklist (EDI-3SC).