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Healthy Eating, Unhealthy Mind: Measuring the Rate of a Disordered Eating Pattern among University Student Athletes and Non-Athletes

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Honors Thesis

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Abstract

The present study examined the rates of Orthorexia Nervosa (ON), a disordered eating pattern characterized by an unhealthy obsession with eating healthy foods, among college athletes and non-athletes at a medium-size, Midwestern university in the U.S. The present study investigated ON using two different tools: the ORTO-15 and the Eating Habits Questionnaire (EHQ). The independent variables were athletic status and hours of exercise per week, and the dependent variables were scores on the EHQ and ORTO-15. Participants reported demographic information, including whether they were an athlete (n = 196 athletes, 105 non-athletes) and how many hours of exercise they perform weekly, and then completed both questionnaires. The results indicated that the ORTO-10 (a revised version of the ORTO-15) and the EHQ were correlated. Additionally, athletes exercised at a higher volume than non-athletes, and a greater amount of exercise was positively correlated with scores on the EHQ for the male athletes but not with scores on the EHQ for the female athletes. Results of the present research are consistent with another study comparing the EHQ and ORTO-10. In order to further address the need for a reliable test of ON, future research may seek to replicate these findings and investigate whether there is a correlation between ON symptoms and exercise habits.

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Measuring the Rate of a Disordered Eating Pattern among University Student Athletes and Non-athletes

Orthorexia Nervosa (ON) is a disordered eating pattern, that was first identified by Bratman and Knight (2000), and characterized by a preoccupation with eating healthy food. ON is distinguished from anorexia nervosa and bulimia nervosa because the individual with symptoms of ON is concerned with the quality of their food rather than the quantity, as the latter is a symptom of anorexia and bulimia. According to Bratman and Knight (2000), there is a point at which eating healthy becomes an unhealthy obsession, that begins to affect daily life, relationships, and emotional welfare. Societal influences such as social media can persuade people to improve their dietary behaviors (Rounsefell et al., 2020); while this can be beneficial, there is the potential to become less healthy, overall, if the obsession with food is extreme. Some symptoms that people with ON may exhibit are feelings of self-righteousness in regard to their eating behavior compared to the eating behaviors of others, restriction of certain foods or food groups that the affected individual perceives as unhealthy or impure, or significant time spent outside of meals planning and researching food (Koven & Abry, 2014).

Martinsen and Sundgot-Borgen (2013) concluded that athletes are more at risk for eating disorders than the general population. This research investigated the prevalence of eating disorders in high school athletes in Norway, and compared the rates to nonathlete high school students in a control condition. The researchers used both a questionnaire and a clinical interview to determine whether each student showed tendencies of an eating disorder. The researchers found that the rates of eating disorders are greater in high-level, adolescent athletes than the rates are in nonathlete adolescents. However, the research on

eating disorder prevalence among collegiate athletes is inconsistent, with studies identifying rates as low as 1.10% to as high as 49.20% (Power et al., 2020). On the other hand, the eating disorders examined in these studies focused on weight-loss behaviors attributed to the eating disorder, which is distinctly different from the goals of people with ON.

Despite these inconsistent research findings for eating disorders, collegiate athletes face a great amount of pressure due to their involvement in sport that could lead to challenges with mental health. Some of these pressures that are common for athletes, and not the general college student population, are performance in their sport, motivation and burnout, injury, and managing the expectations of coaches and parents (Sutcliffe & Greenberger, 2020). Stress, anxiety, and depression are common psychological problems for any college student, and adding the stressors of being a student athlete can exacerbate these issues. Disordered eating is common among college students (Sutcliffe & Greenberger, 2020); because of this, along with the additional pressures that athletes face in college, researchers have hypothesized that rates of ON may be greater among college student athletes. Some symptoms of ON parallel symptoms of existing disorders such as anorexia nervosa and anxiety (Brytek-Matera, 2012), and people with ON are concerned with being healthy, so college athletes could be a particularly vulnerable population.

There is great pressure for athletes to maintain a healthy lifestyle in order to optimize performance in their sport (Sarkar & Fletcher, 2014). However, athletes who play an organized sport may not be the only ones at risk of developing disordered eating. While athletes on sport teams may face pressure from their coaches, teammates, or trainers to be healthy, Western culture influences the general population to be healthy

through avenues such as social media (Rounsefell et al., 2020). The basic narrative on how to achieve optimal health includes both diet and exercise, so studies have examined the prevalence of ON among people who exercise in high volumes. One such study by Almeida et al. (2018), conducted among Portuguese fitness participants, found that younger age, physical appearance, and frequency of exercise were all associated with ON. This research was conducted using a Portuguese translation of the ORTO-15 (Donini et al., 2005), a diagnostic tool developed to measure ON.

A pilot study by Clifford and Blyth (2019), of the prevalence of ON among university athletes versus nonathletes in the United Kingdom, also used the ORTO-15 (2005). The results of the study did not show a significant difference between the ON levels of athletes compared to nonathletes; however, there was a statistically significant correlation between ON tendencies and people who self-reported exercising 10 or more hours per week. This result suggests that a higher volume of exercise may be a risk factor for developing ON. A study by Oberle et al. (2018) found a statistically significant correlation between exercise addiction and ON, similar to the study by Almeida et al. (2018). The population of interest was students, not athletes, on a college campus, and they self-reported their exercise habits and then completed a questionnaire to measure ON. However, the study by Oberle et al. used a different diagnostic tool called the Eating Habits Questionnaire (EHQ; Gleaves et al., 2013) to measure ON.

Unlike anorexia nervosa and bulimia nervosa, ON is not contained in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-5; American Psychiatric Association, 2013). Some researchers argue that ON should not be listed as an eating disorder in the DSM because it may be better explained by Obsessive-

Compulsive Disorder (OCD; Brytek-Matera, 2012). Another reason why ON is not in the DSM, yet, is because there is no agreed-upon diagnostic tool to predict ON (Valente et al., 2019). The most widely used tool for measuring ON in studies to date is the ORTO-15 (Donini et al., 2005). The ORTO-15 has questionable validity and reliability because the prevalence rates of ON using the ORTO-15 have been as high as 90% and as low as 1% (Valente et al., 2019). However, a relatively small amount of research has used this questionnaire, and several studies have translated it into other languages, which could affect the reliability of the tool. It was originally proposed in Italian (Donini et al., 2005), and has since been translated into Turkish, Portuguese, English, and Spanish (Valente et al., 2019). Finding results consistent with other studies using the same translation of the ORTO-15 will add to its reliability. If results continue to be inconsistent, then an argument for the creation of a new diagnostic tool can be made.

At this time, five studies have used another tool to measure ON, the EHQ (Gleaves et al., 2013). So far, only five studies have used the EHQ to measure ON, and three of these studies focused on a population of students; one of the other two studies looked at vegetarian and vegan populations, and the other was a case study of ON and comorbid depression (Valente et al., 2019). The only criticism of the EHQ is a lack of criterion-related validity, but this could be improved if further research shows a correlation between the EHQ and a standard tool to measure ON.

The Present Research

The present study sought to determine whether the rate of incidence of ON is different for college student athletes than for college nonathletes. The research examining ON has been preliminary thus far because it is a relatively new phenomenon. The present

study adds to the growing body of research with a focus on student athletes, a population that has been the focus of several other studies of ON.

The ORTO-15 (Donini et al., 2005) and the EHQ (Gleaves et al., 2013) were used in the present study, but they are not the only two tools that exist to measure ON. Valente et al. (2019) conducted a literature review that evaluated six different tools, each with different diagnostic criteria for ON. It is evident that there is disagreement about the definition and symptoms of ON, however only one study to date has compared the ORTO-15 and the EHQ directly to see if rates of ON are the same between them for the same population (Halim et al., 2020). Halim et al. had a participant sample of women who completed both the ORTO-15 and the EHQ to see if rates of ON were similar for the two tools, since they both purport to measure the same thing. The present study similarly compared results from the ORTO-15 and the EHQ to evaluate their validity and reliability. The study by Oberle et al. (2018) that used the EHQ showed a significant correlation between exercise volume and ON among university students; the study by Clifford and Blyth (2019) used the ORTO-15 and found the same results. The present study compared athletes and nonathletes at a medium-size, midwestern university to see if the rates of ON are similar between the ORTO-15 and the EHQ. The present study also sought to determine whether the rates of ON are consistent with other studies that suggest that higher exercise volume is associated with greater tendencies for ON.

Method

Participants

The participants in the present study were college athletes from a private, medium-size, midwestern university. For the purposes of this study, an athlete was

defined as someone who is on a university sport team, either varsity or club level. A non-athlete group consisted of students who did not meet these qualifications. There were 372 varsity athletes invited to participate in this study. The number of club athletes invited is unknown because the questionnaire was distributed to them through a campus recreation center, which oversees club sports. Out of all the athletes, club or varsity, invited to participate, 309 responded. There were 122 responses discarded from the total of athlete responses (club or varsity) due to incompletion of the questionnaire, vague answers, or excessive amount of time spent to complete the questionnaire. A total of 187 responses was used to evaluate athlete rates of ON. Non-athletes were recruited through a campus research participation sign-up system, as well as through word of mouth. There were 55 responses discarded from the total of non-athlete responses due to participants' failure to follow directions or spending an excessive amount of time completing the questionnaire. The number of remaining responses that were evaluated for ON in the non-athlete group was 105.

Materials

The research questionnaire consisted of three parts: a demographic section, the ORTO-15 questionnaire (Donini et al., 2005) and the EHQ questionnaire (Gleaves et al., 2013). An example of a question asked on the ORTO-15 is, "Does the thought of food worry you for more than 3 hours a day?" An example of a question asked on the EHQ is, "I am more informed than others about healthy eating." Approval to use these questionnaires was given by each of their authors. The demographic questionnaire consisted of questions about participants' age, gender, year in school, whether or not they

play a sport, which sport(s) they play, how many hours they exercise per week on average, and if they have any dietary restrictions.

Procedure

Participants accessed the questionnaire either through a link that was emailed to them or through the research participation sign-up system. There were two different links used for the questionnaire for athletes and non-athletes. The only difference between the two questionnaires was the informed consent, which had different wording for the athlete group and the non-athlete group. The informed consent for the non-athlete group explained that they were given compensation in the form of credit toward research participation, if they were enrolled in an introductory psychology course. The athlete informed consent said that participants would not be compensated. Other than this, both the athlete and non-athlete questionnaires were the same. All participants completed the informed consent, demographic section, ORTO-15, and EHQ, in that order. Participants were given an unlimited amount of time to complete the questionnaire, and it took 6 minutes, on average, to complete.

Results

The dependent variables in the present study are scores on the ORTO-10 and scores on the EHQ. Following the procedure of the only other study comparing the EHQ and ORTO-15 (Halim et al., 2020), our analyses were conducted using a 10-item version of the 15-item ORTO questionnaire. Questions 1, 2, 8, 9, and 13 were not included in the analyses because removing those items increased the internal consistency, as found by Halim et al. (2020) using Cronbach's α, from α =.50 for the 15-item questionnaire to α

=.76 for the 10-item version. For the present study, all results including ON scores from this tool are reported as scores from the ORTO-10.

The original ORTO-15 is scored on a four-point scale, with answer choices being *always* (1)*, often* (2)*, sometimes* (3)*,* or *never* (4; Donini et al., 2005). An example of a question from this proposed diagnostic tool is, "Does the thought of food worry you for more than three hours a day?" Lower scores on this assessment indicate greater ON tendencies.

The EHQ is a 21-item questionnaire, and it is also scored on a four-point scale, with answer choices being *false, not at all true* (1)*, slightly true* (2)*, mostly true* (3)*,* or *very true* (4; Gleaves et al., 2013). An example of a question from this measure is, "I am more informed than others about healthy eating." Higher scores on this assessment indicate greater ON tendencies.

EHQ and ORTO-10 Comparison

To compare the results of the ORTO-10 and EHQ, Pearson's correlation coefficients were computed for four groups: male athletes (n = 90), female athletes (n = 106), male non-athletes (n = 31), and female non-athletes (n = 74). The results of the comparison of EHQ and ORTO-10 scores for each of the four groups are shown in Table 1. For both the male and female athletes, there was a significant linear relationship between the two sets of ON scores; for male athletes, r = -.597, p < .001, and for female athletes, r = -.290, p = .003. Female non-athletes showed a significant linear relationship, r = -.445, p < .001, but male non-athletes did not, r = -.084, p = .653.

Table 1

Means (SDs) and Correlation Coefficients from Analyses of EHQ and ORTO-10 Scores

Student type	Measure	*M*	*SD*	*n*	*r*
Male athlete	EHQ	41.54	9.95	90	-.597*
	ORTO-10	24.48	3.64		
Female athlete	EHQ	41.25	10.24	106	-.290*
	ORTO-10	23.36	4.05		
Male non-athlete	EHQ	37.13	9.63	31	-.084
	ORTO-10	25.74	4.33		
Female non-athlete	EHQ	40.00	10.34	74	-.445*
	ORTO-10	23.43	4.34		

*$p < 0.05$

Exercise Volume and Score on ORTO-10 and EHQ Comparison

Based on the conclusions from other studies that higher exercise volume led to higher indications of ON (Clifford & Blyth, 2019; Oberle et al., 2018; Almeida et al., 2018), a Pearson's analysis examined whether mean amount of exercise per week was correlated with scores on the EHQ and ORTO-10. This was performed including all participants, and then for each of the four groups: male athletes, female athletes, male non-athletes, and female non-athletes. For male athletes, the average amount of exercise was 11.58 hours per week (*SD* = 7.21). For female athletes, the average amount of exercise was 11.62 hours per week (*SD* = 8.86). For male non-athletes, the average amount of exercise was 4.13 hours per week (*SD* = 2.38). For female non-athletes, the

average amount of exercise was 4.07 hours per week (*SD* = 2.56). In this sample, athletes exercised an average of 7.45 hours more per week than non-athletes.

The results of the Pearson correlation analyses to assess the relationship between hours of exercise per week and scores on the EHQ and ORTO-10 are shown in Table 2. For the entire sample, a significant positive correlation was found between hours of exercise (*M* = 8.94, *SD* = 7.61) and EHQ score (*M* = 40.53, *SD* = 10.18), $r(299) = .226$, $p < .001$. There was no significant correlation found between hours of exercise and ORTO-10 score (*M* = 23.91, *SD* = 4.16), $r(299) = -.058$, $p = .316$. The same analysis was

Table 2

Means (SDs) and Correlation Coefficients from Analyses of Hours of Exercise, EHQ, and ORTO-10 Scores

	Hours of exercise		EHQ			ORTO-10		
Sample group	*M*	*SD*	*M*	*SD*	r^a	*M*	*SD*	r^b
Entire sample (*n* = 301)	8.94	7.61	40.53	10.18	.226*	23.91	4.16	-.058
Male athletes (*n* = 90)	11.58	7.21	41.54	9.95	.358*	24.48	3.64	-.096
Female athletes (*n* = 106)	11.62	8.86	41.25	10.24	.116	23.36	4.05	-.095
Male non-athletes (*n* = 31)	4.13	2.38	37.13	9.63	.513*	25.74	4.33	-.158
Female non-athletes (*n* = 74)	4.07	2.56	40.00	10.34	.118	23.43	4.34	.123

[a]Correlation coefficient for EHQ and hours of exercise

[b]Correlation coefficient for ORTO-10 and hours of exercise

*$p < 0.05$

performed for the four subgroups within the sample. None of the groups showed a significant correlation between hours of exercise and ORTO-10 score. There was a significant correlation between hours of exercise and EHQ score for male athletes, $r(88) = .358$, $p = .001$, and male non-athletes, $r(29) = .513$, $p = .003$. However, neither female athletes nor female non-athletes showed a significant correlation between hours of exercise and EHQ score.

Discussion

The present study examined whether there was a correlation between two existing tools to measure ON, the ORTO-15 (adjusted to the ORTO-10 for analysis) and the EHQ. The results indicate that there is a statistically significant negative correlation between scores on the ORTO-10 and scores on the EHQ. A negative correlation was expected because the tools are scored opposite of each other; on the EHQ, a higher score indicates greater ON tendencies (Gleaves et al., 2013), and on the ORTO-15 (therefore, the ORTO-10 as well), a lower score indicates higher ON tendencies (Donini et al., 2005). All of the groups except for male non-athletes had a Pearson's *r* that was statistically significant.

The present study also examined whether athletes have higher tendencies for ON than non-athletes. The results indicate that athletes, on average, exercise at a higher volume per week than non-athletes. Furthermore, results from the whole sample show a statistically significant positive correlation between exercise volume and scores on the EHQ. This result indicates that higher exercise volume may be correlated with greater tendencies for ON. When the sample was analyzed by groups, only the male participants (both athletes and non-athletes) showed a statistically significant positive correlation between hours of exercise and EHQ score. There was no statistically significant

correlation found when computing Pearson's *r* for hours of exercise and ORTO-10 score for any of the analyses.

The first hypothesis in this study was that performances on the EHQ and the ORTO-10 would be correlated. This hypothesis was supported by the data, with three out of the four groups showing a strong statistically significant correlation between the two tools. The male non-athletes did not show a significant correlation; however, this may be attributed to a small sample size ($n = 31$) as compared to the size of the other groups. This correlation found in the present study adds to the validity of the EHQ. Relatively few studies have been done of ON using the EHQ, and while these studies have reported high reliability, validity of the EHQ has not been established (Valente et al., 2019). The results from this study are also consistent with the results from Halim et al. (2020), the only other research that has been published comparing the EHQ and ORTO-15 (in any form). Similar to the present study, these researchers found a statistically significant negative correlation between the EHQ and ORTO-10. These consistent results across two different studies imply greater validity of the EHQ. However, Halim et al. (2020) discuss the limitations of their finding, referencing the low reliability and validity of the ORTO-15. While the EHQ and ORTO-10 show a correlation, the ORTO-15 had to be adjusted in order to raise its internal consistency. If the EHQ is being compared to a tool that is flawed in itself, the correlation between them may not be generally significant. The same limitations exist in the present study. Further research should be done comparing the tools to see if similar results are obtained for different populations.

The second hypothesis in this study was that higher exercise volume would be correlated with greater ON tendencies, and that athletes exercise more than non-athletes;

consequently, athletes would show greater tendencies for ON. The results indicated that athletes do exercise at a higher volume than non-athletes, so this part of the hypothesis was supported. When the Pearson correlation analysis was performed on the overall sample to see if exercise volume was correlated with higher tendencies for ON from the EHQ and ORTO-10, the results indicated that higher exercise volume was correlated with higher scores on the EHQ. These results are consistent with the results of Oberle et al. (2018), who concluded that greater amounts of time spent exercising positively predicted ON symptoms using the EHQ.

However, the analyses in the present study on each of the four groups showed inconsistencies with the results of Oberle et al. (2018). In the present study, female participants did not show a statistically significant correlation between EHQ score and exercise volume, as male participants did. Oberle et al. (2018) found a significant correlation between EHQ score and exercise volume for both men and women. Their study was not focused on athletes specifically, but evaluated rates of exercise addiction as they relate to ON in undergraduate students. The present research expanded upon this by investigating ON tendencies for athletes, however the results indicate that gender is a more important factor than athletic status in predicting ON tendencies from volume of exercise. This was an unexpected result obtained from the data. These results could be attributed to motivations for exercise between gender in college students. A study by Kilpatrick et al. (2005) found that female college students are motivated to exercise for weight management significantly more than male college students, whereas male students were more likely to be motivated to exercise by “performance and ego-related factors, such as challenge, strength and endurance, competition, and social recognition…”

(Kilpatrick et al., 2005). As previously mentioned, ON is distinctly different from anorexia and bulimia because the primary motivation of people with ON is optimal health, not weight loss (Bratman & Knight, 2000). While there are some overlapping symptoms between anorexia and ON (Brytek-Matera, 2012), the proposed diagnostic tools intend to measure ON symptoms, which involve obsessions with healthy eating rather than weight loss. The present study did not inquire about exercise motivations from participants, so we cannot know if weight loss is a motivation among the women, but based on previous research on exercise motivation in college students, it could explain the lack of significance in women's ON scores compared to hours of exercise. Furthermore, men being motivated to exercise because of ego-related factors (Kilpatrick et al., 2005) could explain the significance of the EHQ and hours of exercise correlation among male participants in the present research. Previous research has found that ON tendencies could be associated with perfectionism and narcissism (Oberle et al., 2017), suggesting that competition and a feeling of superiority to others may be factors that influence both exercise motivation and ON tendencies. This is one possible explanation for the gender inconsistencies between hours of exercise and ON tendencies in our study; however, more research should be performed on ON tendencies and exercise motivations to see if these results can be replicated.

The Pearson correlation analyses performed comparing hours of exercise to the ORTO-10 did not produce any significant correlations, which is not surprising based on the inconsistency across studies using the ORTO-15 in any form (Valente et al., 2019). The only other two studies known to have used the ORTO-10 (Halim et al., 2020; Barnes & Caltabiano, 2017) did not study athletes, so this is the first study that used the ORTO-

10 to measure ON tendencies in that population. Therefore, there are no existing data to which present results could be compared. Consequently, it is recommended that future research be done using the ORTO-10 to measure ON tendencies in athletic populations to see if results are consistent with the present study.

Limitations of the Present Research and Implications for Future Research

While the results of the present study provide important contributions to the growing body of research about ON, there are several limitations to this study that should be addressed in future research. A limitation of the study by Oberle et al. (2018) and the present study alike is the underrepresentation of male participants. The small sample size could be a factor for the inconsistent results between ON tendencies and exercise volume among undergraduate students. The present study was performed with college-age students at one midwestern university in the United States. While the results can be compared to results from other studies that have used a similar population, they are not widely generalizable. The lack of research using the ORTO-10 limited the ability to analyze the significance of the results of the present study, but these results will allow future researchers to compare their results to a greater number of studies.

Future research could be done using the ORTO-10 on athletic populations to see if results are consistent with the present research. There could also be more studies performed comparing the rates of ON using existing diagnostic tools, because if existing tools to measure ON are not correlated an argument can be made that they should not be used to measure ON. Comparison of different tools could show consistencies between them, which would help in creating a new tool that can be used on any population. Research comparing the results from subscales of different tools would be a good way to

do this. Halim et al. (2020) did this and found that the Healthy Eating Cognitions subscale of the EHQ correlated most with the ORTO-10, which indicates that the questions on the ORTO-10 may be good at predicting cognitive aspects of ON. A potential future direction for the present research is a factor analysis to evaluate the rates of ON in athletes using subscales of the EHQ (Gleaves et al., 2013) compared to the ORTO-15 (Donini et al., 2005), or other tests.

To address the limitation of male underrepresentation, research could be done on male-dominated athletic populations, such as military, firefighters, or police, to see if higher volumes of exercise predict higher ON tendencies in men. Research could also be performed on professional male athletes, such as Olympic athletes, to evaluate whether ON tendencies are higher for people who are put under intense pressure to succeed in their sport. Outside of athletic populations, more research should be done on ON in populations with diversity of race, ethnicity, age, and socioeconomic status. Many studies measuring ON thus far have been performed in the United States and Europe, and several of these have focused on college students. If ON should become clinically diagnosable, more populations should be studied. Before any population can be deemed as particularly vulnerable to ON, researchers and eating disorder specialists must agree on a definition and symptomatology for ON. By comparing two existing tools, the present study took a positive step toward establishing a common tool for measuring ON. The creation of this tool will allow for better research on the phenomenon, which will increase our understanding and allow for treatment directions to be established.

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