Evaluation of Awareness and Attitudes Towards Eating Disorders and The Female Athlete Triad Among Orthopaedic Surgeons

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BACKGROUND: Eating disorders (EDs) and the Female Athlete Triad are both prevalent in female athletes and contribute to an increased injury risk. These patients are likely to present to orthopaedic surgeons. Therefore, it is important to evaluate surgeon awareness and attitudes towards these conditions. We hypothesized that awareness and attitudes would be poor overall, would improve with education and comfort recognizing symptoms, and would vary by surgeon demographic characteristics.
METHODS: An anonymous survey was sent via email to Maryland members of the American Academy of Orthopaedic Surgeons and circulated via social media. The survey assessed demographics, awareness, behaviors, and attitudes surrounding EDs and the Female Athlete Triad. Attitudes towards anorexia nervosa (AN) and binge eating disorder (BED) were assessed using a clinically validated scale, the Medical Condition Regard Scale (MCRS).
RESULTS: Fifty-two surgeons completed the survey. 69% of surgeons reported being aware of or receiving didactic training on EDs, and 87% reported being aware of or receiving didactic training on the Female Athlete Triad. The mean levels of comfort with recognizing the symptoms of AN, bulimia nervosa (BN), and BED were 3.4 ± 1.1, 3.1 ± 1.1, and 2.9 ± 1.0 out of 5.0, respectively. Receiving didactic training was significantly associated with comfort recognizing the symptoms of AN, BN, and BED ($p=0.01$ for all), likelihood of screening for eating disorders ($p=0.04$), and number of components of the Female Athlete Triad identified ($p<0.001$). Comfort asking patients about behaviors increased with comfort recognizing the symptoms of AN, BN, and BED ($p=0.001$, $p=0.01$, and $p=0.03$, respectively). Likelihood of counseling on risks associated with EDs increased with comfort asking questions about eating behaviors ($p=0.004$). The average MCRS score for AN was 49.9 ± 10.6 and the average MCRS score for BED was 48.4 ± 10.9. Surgeons who were "extremely comfortable" discussing behaviors had significantly higher MCRS scores for AN and BED than those who were "extremely uncomfortable" ($p=0.02$ and $p=0.01$, respectively).
CONCLUSION: The results of this study demonstrate moderate levels of awareness and attitudes towards patients with EDs and the Female Athlete Triad. Effective management of these patients is grounded in thorough screening and formation of a positive therapeutic relationship, both of which are shown to relate to targeted didactic training. In order to improve care for patients with EDs and the Female Athlete Triad, didactic training that focuses on improving awareness, comfort, and attitudes should be implemented into orthopaedic surgery educational curricula.

INTRODUCTION

Eating disorders (EDs) are common among elite female athletes. The most common EDs are anorexia nervosa (AN), which involves persistent caloric restriction, bulimia nervosa (BN), which involves a pattern of binge eating and compensatory

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behaviors such as purging, and binge eating disorder (BED), which involves persistent binge eating. Studies estimate prevalence rates of EDs at 13-62%, with some attributing the variation to the emphasis of an individual's sport on aesthetics.[1–4] Also prevalent among female athletes is the Female Athlete Triad, a term coined by the American College of Sports Medicine in 1992, which is comprised of low energy availability (with or without disordered eating), menstrual dysfunction, and low bone mineral density (BMD).[5] More recently, this terminology has evolved to Relative Energy Deficiency in Sport (RED-S), in order to acknowledge the complexity of the syndrome, as well as its existence in male athletes.[6] EDs, particularly AN, are associated with an increased risk of injury in female athletes, most notably stress fractures. [2,7–11] This increased risk of stress fractures is likely related to the decrease in BMD accompanying amenorrhea in patients with AN and/or the Female Athlete Triad.[5,12–14] As stress fractures or other athletic injuries often result in presentation to an orthopaedic surgeon, they are likely to encounter patients with EDs or the Female Athlete Triad, and in many cases, may be the first healthcare providers in a position to recognize the signs or symptoms of the condition. However, it currently remains unclear how familiar orthopaedic surgeons are with EDs or the Female Athelete Triad, or what their attitudes are towards patients with these conditions.

To the authors' knowledge, no studies have assessed orthopaedic surgeons' awareness of EDs; however, a limited number of studies have assessed their awareness of the Female Athlete Triad.[15–17] While orthopaedic surgeons do seem to have awareness of the Female Athlete Triad, many remain relatively uncomfortable with treatment programs for these patients.[15–17] Given the relative lack of comfort with treating patients with the Triad, it is important to assess if knowledge of and comfort with eating disorders is also low. Low awareness has the potential to negatively impact outcomes, as it impairs identification of the condition, and decreases follow-up, referral, and resource provision.[18] Furthermore, it has been shown that experience of negative physician attitudes can impede patient recovery due to a lack of treatment alliance.[19] As such, it is crucial for orthopaedic surgeons to have a greater awareness of EDs, as well as attitudes that mitigate bias against patients with EDs.

The purpose of the current study is to quantify orthopaedic surgeons' awareness of the symptoms of eating disorders and the Female Athlete Triad as well as attitudes toward orthopaedic patients with these pathologies. We hypothesize that attitudes toward eating disorders will be generally poor, but will improve with training and comfort recognizing symptoms of eating disorders, and will vary by surgeon demographic characteristics.

METHODS

Survey Population

A survey was disseminated to the Maryland members of the American Academy of Orthopaedic Surgeons (AAOS) via email, as well as via social media (Twitter). Participation was voluntary and informed consent was obtained prior to participation. The survey included three sections that assessed: 1) participant demographics; 2) awareness of EDs and the Female Athlete Triad; and, 3) attitudes towards EDs and the Female Athlete Triad using the the Medical Condition Regard Scale (MCRS) (Appendix 1).[20] The MCRS is a clinically validated instrument, composed of 11 items, that assesses physician attitudes towards medical conditions.[20]

Outcomes of Interest

Demographic information was obtained including age, sex, race/ethnicity, years in practice, subspecialty, and primary practice setting. The second segment of the survey included questions assessing awareness and engagement with EDs and the Female Athlete Triad. Finally, individual MCRS items were evaluated for patients with AN and patients with BED, with each participant ranking each item on a Likert scale between 1 (strongly disagree) and 7 (strongly agree) (Appendix 1). Total MCRS scores for AN and BED were calculated by summing up the scores for each of the 11 individual scale items. Given a maximum MCRS score of 77, we considered the lowest third (0-26) to be negative regard, the middle third (26-51) to be moderate regard, and the highest third (51-77) to be positive regard. The MCRS was not evaluated for BN in order to minimize the number of times participants filled out the same scale.

Statistical Analysis

Descriptive statistics were utilized for participant demographic characteristics. Differences in responses to various survey

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questions were analyzed using the two-tailed t-test. Differences in MCRS by surgeon characteristics or survey response elements were analyzed by univariate chi-square or t-test analysis. Linear regression analyses were also conducted to determine coefficients for continuous outcome variables, including likelihoods, comfort levels, or MCRS scores.

Data were analyzed using Stata Statistical Software: Release 17; 2021 (StataCorp; College Station, TX). A p-value of <0.05 was considered statistically significant.

RESULTS

Participant Demographics

Fifty-two orthopaedic surgeons completed the survey, with 12 of the 64 total respondents beginning but not completing the survey, for a completion rate of 81%. As the survey was partially distributed through social media, the response rate was unable to be precisely determined. However, based on the total members of the Maryland AAOS listserv who received the email distribution (392), a response rate of 13.3% may be estimated. The mean age of respondents was 43.5 ± 14.2 years old, with a range from 26 to 77 years; 69% of respondents were male, 29% female, and 79% of respondents were White. The full summary of surgeon characteristics is presented in Table 1.

Table 1. Characteristics of survey respondents

Characteristic	*N (%) or Average (SD)*
Number of respondents	52
Age	43.5 ± 14.2
Sex	
Male	36 (69.2%)
Female	15 (28.9%)
Non-binary/third gender	0 (0.0%
Prefer not to say	1 (1.9%)
Race/Ethnicity	
White	41 (78.9%)
African America	1 (1.9%)
Hispanic	2 (3.9%)
Asian	5 (9.6%)
Native American	0 (0.0%)
Pacific Islander	0 (0.0%)
Other	1 (1.9%)
Prefer not to say	2 (3.9%)
Years in Practice	
Resident	17 (32.7%)
<5 years post-residency/fellowship	8 (15.4%)
5-15 years post-residency/fellowship	9 (17.3%)
>15 years post-residency/fellowship	18 (34.6%)
Subspecialty	
Sports Medicine	10 (19.2%)
Foot & Ankle	3 (5.8%)
Hand	4 (7.7%)
Shoulder & Elbow	3 (5.8%)
Arthroplasty	4 (7.7%)
Spine	2 (3.9%)
Pediatrics	5 (9.6%)
Trauma	2 (3.9%)
Oncology	3 (5.8%)
General Practice	9 (17.3%)

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Other	6 (11.5%)
Prefer not to say	1 (1.9%)
Primary Practice Setting	
Community/private practice	11 (21.2%)
Public university	7 (13.5%)
Private university	17 (32.7%)
Military	16 (30.8%)
Prefer not to say	1 (1.9%)

Awareness of and Behaviors toward Eating Disorders and the Female Athlete Triad

Responses to survey items regarding awareness of EDs and the Female Athlete Triad are presented in Appendix 2. Sixty-nine percent of surgeons reported being aware of or receiving didactic training on EDs during training (Figure 1A), and 87% reported being aware of or receiving didactic training on the Female Athlete Triad (Figure 1B). The most frequently cited barriers to treatment of patients with EDs were fear of saying the wrong thing (54%), lack of formal training (46%), and difficulty recognizing symptoms (40%), with the least cited being lack of knowledge or access to outside resources (35%) and lack of access to additional specialists (30%) (Appendix 2).

Only 42% of surgeons were able to correctly identify all three components of the Female Athlete Triad, with 8% identifying none of the three (Figure 1C). Thirty five percent of respondents incorrectly indicated an eating disorder as a component of the Female Athlete Triad (Appendix 2). Receiving prior didactic training on the topic was significantly associated with the number of components of the Female Athlete Triad identified ($p<0.001$).

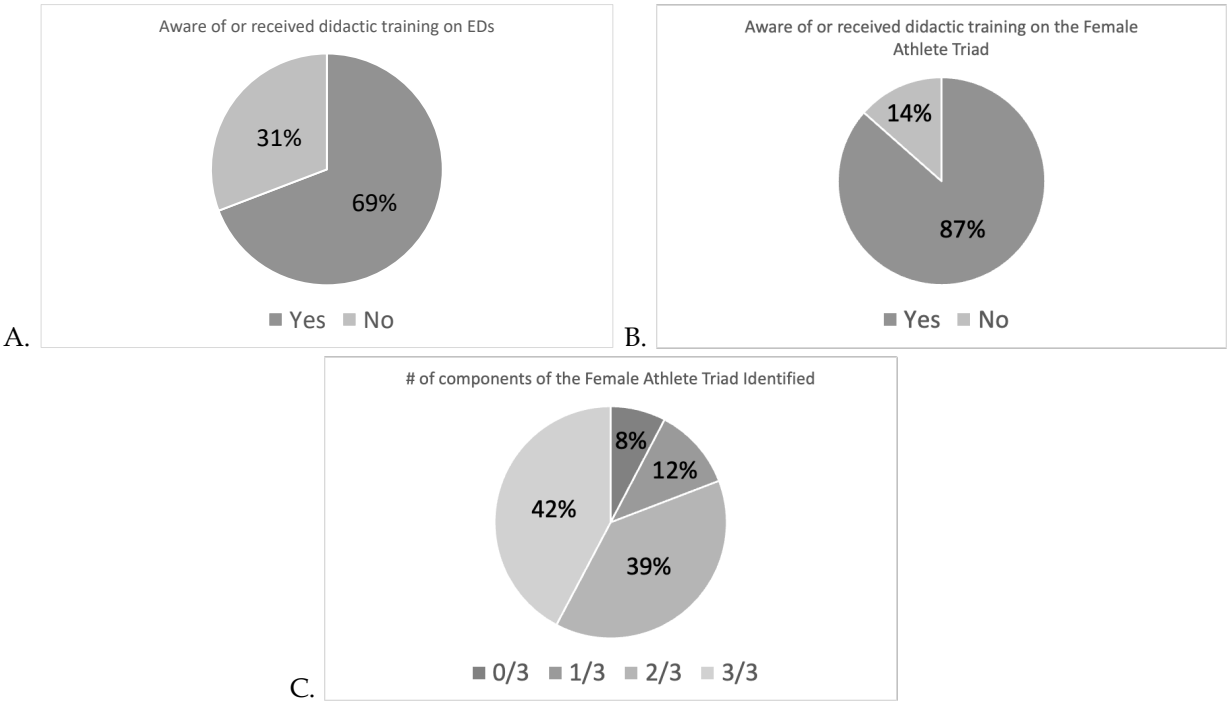

Figure 1. (A) Percent of respondents who were aware of or had received didactic training on EDs; (B) Percent of respondents who were aware of or had received didactic training on the Female Athlete Triad; (C) Breakdown of the number of components of the Female Athlete Triad respondents were able to identify *(ED, eating disoders)*

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Table 3. Comfort recognizing the symptoms of AN, BN, and BED based on whether or not respondents had received didactic training on EDs *(AN, anorexia nervosa; BN, bulimia nervosa; BED, binge eating disorder; ED, eating disorder)*

	Comfort recognizing symptoms of AN			***Comfort recognizing symptoms of BN***			***Comfort recognizing symptoms of BED***		
	β	95% CI	P-value	β	95% CI	P-value	β	95% CI	P-value
Received didactic training on EDs	0.89	0.24-1.53	0.01	0.81	0.18-1.43	0.01	0.76	0.20-1.33	0.01

The mean levels of comfort with recognizing the symptoms of AN, BN, and BED were 3.4 ± 1.1, 3.1 ± 1.1, and 2.9 ± 1.0 out of 5.0, respectively, indicating surgeons were generally neither comfortable nor uncomfortable recognizing the symptoms of eating disorders. Surgeons were significantly more comfortable recognizing the symptoms of AN than BN or BED (p=0.002 and p<0.001, respectively). Comfort with recognizing the symptoms of AN, BN, and BED increased with having received didactic training on EDs (p=0.01 for all) (Table 3). Surgeons were significantly less likely to screen for EDs than for anxiety/depression (p<0.001). Likelihood of screening for EDs increased with previous didactic training on EDs (p=0.04), comfort recognizing the symptoms of AN, BN, and BED (p<0.001, p<0.001, and p=0.004, respectively), and comfort with inquiring about eating behaviors (p=0.01) (Table 4).

Comfort levels asking patients about behaviors increased with comfort levels recognizing the symptoms of AN, BN, and BED (p=0.001, p=0.01, and p=0.03, respectively), and with sports medicine specialty training (p=0.02). Likelihood of counseling patients on health risks increased with comfort recognizing the symptoms of AN (p=0.03), but not the symptoms of BN or BED. Likelihood of counseling also increased with comfort asking questions about eating behaviors (p=0.004) and with sports medicine specialty training (p=0.004) (Table 4).

Medical Condition Regard Scale

The average MCRS score for AN was 49.9 ± 10.6 and the average MCRS score for BED was 48.4 ± 10.9. The mean MCRS score did not vary significantly between AN and BED (p=0.07) (Table 5), but scores on specific items, which are presented in Appendix 3, varied significantly. Surgeons indicated they were more likely to enjoy giving extra time to patients with AN than BED (p=0.03), less likely to mind getting up on call nights to care for patients with AN than BED (p=0.002), and more likely to feel especially compassionate towards patients with AN than BED (p=0.02) (Appendix 3).

The total MCRS for AN and BED also varied by several surgeon characteristics, which are presented in Appendix 4. Surgeons who had been in practice <5 years post-residency/fellowship had the highest MCRS scores for both AN and BED. Surgeons who were extremely comfortable recognizing BED symptoms or asking abut eating behaviors had significantly higher MCRS scores for BED than surgeons who were extremely uncomfortable (p=0.01 for both). Surgeons who were extremely comfortable asking about eating behaviors also had significantly higher MCRS scores for AN than surgeons who were extremely uncomfortable (p=0.02) (Appendix 4).

DISCUSSION

It is of the utmost importance that orthopaedic surgeons treating female athletes are aware of, experienced with, and unbiased towards patients with EDs and the Female Athlete Triad. The results of this study demonstrate that orthopaedic surgeons may possess only a moderate awareness of EDs and the Female Athlete Triad, and that awareness, engagement, and attitudes may vary across a number of surgeon characteristics.

Awareness and Engagement

Survey responses varied widely, but generally showed only moderate levels of awareness, comfort, and engagement with patients with EDs. Although nearly 90% of surgeons reported having received didactic training on the Female Athlete Triad, approximately two-thirds of surgeons

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Table 4. Influence of surgeon characteristics on likelihood of screening for eating disorders, likelihood of counseling on fracture risk, likelihood of providing resources, comfort asking about eating behaviors, and MCRS scores for AN and BED *(MCRS, Medical Condition Regard Scale ; AN, anorexia nervosa; BED, binge eating disorder)*

	Likelihood of screening			***Likelihood of counseling on fracture risk***			***Comfort asking about eating behaviors***		
	β	95% CI	P-value	β	95% CI	P-value	β	95% CI	P-value
Age	0.002	(0.01) – 0.02	0.76	0.01	(0.003) – 0.02	0.13	0.01	(0.01) – 0.03	0.22
Female Sex	(0.13)	(0.60) – 0.35	0.59	(0.17)	(0.60) – 0.25	0.42	(0.69)	(1.3) – (0.07)	0.03
Non-White Race/ Ethnicity	(0.01)	(0.53) – 0.51	0.97	(0.09)	(0.56) – 0.38	0.71	(0.75)	(1.4) – (0.06)	0.03
Sports Medicine Specialty	0.46	(0.06) – 0.99	0.08	0.68	0.23 – 1.1	0.004	0.82	0.11 – 1.5	0.02
Years in Practice	0.06	(0.11) – 0.23	0.49	0.13	(0.01) – 0.28	0.08	0.14	(0.09) – 0.37	0.24
Comfort recognizing AN symptoms	0.34	0.17 – 0.50	<0.001	0.19	0.02 – 0.35	0.03	0.40	0.16 – 0.64	0.001
Comfort recognizing BN symptoms	0.34	0.16 – 0.51	<0.001	0.15	(0.02) – 0.32	0.08	0.36	0.10 – 0.61	0.01
Comfort recognizing BED symptoms	0.30	0.10 – 0.50	0.004	0.12	(0.07) – 0.32	0.20	0.31	0.02 – 0.60	0.03
Comfort asking about eating behaviors	0.27	0.08 – 0.46	0.01	0.25	0.08 – 0.42	0.004			
Received didactic training on EDs	0.47	0.03 – 0.92	0.04	0.27	(0.14) – 0.68	0.19	0.28	(0.35) – 0.92	0.37
Received didactic training on Female Athlete Triad	0.13	(0.49) – 0.76	0.68	(0.04)	(0.60) – 0.52	0.88	0.32	(0.54) – 1.2	0.46

* *Grey shading indicates p<0.05*

Table 5. Total MCRS score for patients with AN and patients with BED
(MCRS, Medical Condition Regard Scale ; AN, anorexia nervosa; BED, binge eating disorder)

	Patients with AN	***Patients with BED***	***P-value***
Total MCRS Score	49.92 ± 10.63	48.41 ± 10.92	0.07

reported having received didactic training on EDs specifically. Interestingly, despite 90% having received didactic training, only 42% were able to correctly identify all three components of the Female Athlete Triad, and approximately one-third indicated an eating disorder as a component, reflecting that this didactic training may not have been updated to reflect the newer definition of the Triad components implemented in 2007.[21]

Surgeons must be able to distinguish between the Female Athlete Triad and EDs, as treatment approaches differ based on the underlying

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diagnosis. A key difference between EDs and the Female Athlete Triad is the presence of psychopathology. The Female Athlete Triad encompasses physically identifiable features, while eating disorders are psychiatric diagnoses that involve not only behavioral and physical symptoms, but also substantial psychosocial distress. Therefore, although registered dietician referrals may be useful in both, referrals to psychotherapy may be indicated in the cases of patients with eating disorders.[22]

The results of this study also demonstrated that didactic training is related to increased comfort level with recognizing symptoms, comfort level with asking patients about their eating behaviors, and likelihood of screening for eating disorders, which in turn, increases the likelihood of counseling patients on the musculoskeletal risks associated with their EDs. As such, it is critical that surgeons receive high quality didactic training on EDs in order to better identify patients with this pathology and to understand how to incorporate promotion of recovery into a comprehensive orthopaedic treatment plan. This training should include not only the signs, symptoms, and diagnostic criteria for EDs, but should also extend to training aimed at improving comfort and reducing the most cited barrier to treating these patients: fear of saying the wrong thing.

Attitudes

Responses to the MCRS for AN and BED demonstrated moderate, but not necessarily negative, attitudes toward patients with EDs. Surgeons had more positive attitudes towards patients with AN than those with BED on specific scale items. This may stem from the presenting physical characteristics of these two disorders: that patients with BED are more likely to be obese, whereas patients with AN tend to be underweight and potentially more recognizable.[22] In the general population, as well as among heatlthcare professionals, numerous studies on implicit bias have shown that individuals are significantly biased against overweight and obese people.[23–25] This may account for the differences on specific MCRS items, despite an overall non-significant difference in total scores. Furthermore, in orthopaedic surgery specifically, countless studies have shown the adverse effects of obesity on surgical outcomes, with a more limited number of studies investigating this in patients who are underweight.[26–31] It is therefore plausible that orthopaedic surgeons have an implicit bias against overweight and obese patients, as there may be a greater degree of concern regarding poor outcomes in this patient population.

Our analysis of MCRS responses demonstrates that surgeons who were >15 years post-residency/fellowship with less didactic training had more negative attitudes towards patients with eating disorders compared to early career surgeons with more didactic training. Therefore, increased training may not only lead to improved awareness, comfort level, and screening of patients, but may also result in more positive attitudes towards patients. Attitudes towards patients with underlying comorbidities, particularly psychological disorders such as EDs, can have a significant impact on the therapeutic relationship.[18-19] Increased trust in one's surgeon may lead to improved patient outcomes, promote follow-up, and increase the likelihood of a patient following a surgeon's recommendation to pursue a more comprehensive treatment plan for their entire clinical presentation, including their ED, potentially resulting in greater improvements in health outcomes.

Implications

Orthopaedic surgeons may be the sole healthcare practitioners with whom patients with EDs or the Female Athlete Triad engage, particularly following an injury. Therefore orthopaedic surgeons may be uniquely situated to impact the course of these patients' illnesses. Despite this, the results of this and other studies suggest that orthopaedic surgeons do not sufficiently engage with ED and Female Athlete Triad patients.[32-34] One study showed that although orthopaedic sports medicine surgeons suspect eating disorders in up to 59% of their patients who are athletes, less than 1/3 discuss eating disorders with their patients.[35] Similarly, one study showed that 80% of orthopaedic surgeons had heard of the Female Athlete Triad,[15] and another showed that while 63% of orthopaedic surgeons were able to identify all three components of the Triad, only 17% felt comfortable with treatment programs.[16] Given the results of this study demonstrating a link between didactic training and awareness, comfort, behaviors, and attitudes, there remains a need for additional advocacy for increased training on EDs for orthopaedic surgeons.

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The results of this study further corroborate theories postulated in the literature regarding the source of orthopaedic surgeons' difficulty addressing psychosocial concerns.[36-37] We found that half of survey respondents cited "fear of saying the wrong thing" as a barrier to treating patients with EDs, with other frequently cited barriers being lack of formal training and difficulty recognizing symptoms. However, it has been demonstrated that orthopaedic patients want their mental health addressed in the development of their orthopaedic care plan.[38] The challenge is therefore to understand how barriers to addressing psychosocial concerns can be addressed. Furthermore, several recent studies have examined potential strategies and blueprints for implementing psychosocial care in orthopaedic surgery clinics, for example establishing Trauma Collaborative Care programs, obtaining buy-in from leadership, educating providers, integrating automated screening questions, designating "mental health champions," and addressing stigma.[38–40] Taken together, the results of our study suggest that implementation of didactic training, as well as initiatives aimed at improving surgeon comfort and confidence, may improve care and orthopaedic outcomes for patients with EDs and the Female Athlete Triad.

Strengths and Limitations

Strengths of this study included that there was a diversity of respondents and that the analysis utilized a clinically validated scale. Furthermore, this study was the first of its kind, to our knowledge, to investigate orthopaedic surgeons' awareness of EDs, as well as attitudes toward EDs and the Female Athlete Triad.

The results of this study represent a valuable addition to the sparse literature in this area, but the study's limitations must be acknowledged. First, only 52 responses were submitted to the survey. Although we are unable to calculate an exact response rate given that the survey was circulated using social media, a 13% response rate was estimated based on the number of members within the Maryland AAOS listserv. Furthermore, 52 complete responses still represents a small sample, impacting the power of our study. Second, the survey respondents may not be representative of the general orthopaedic surgeon population, representing the impact of sampling bias on the generalizability of our results. For example, women comprised approximately 30% of our respondents, despite making up only 7.6% of orthopaedic surgeons in the United States.[41] Similarly, surgeons practicing in a military setting comprised approximately 30% of our respondents, despite making up only 2% of orthopaedic surgeons in the United States.[41]

This sampling bias may also have translated into overstatement of awareness and attitudes, as those with greater awareness or more positive outcomes may have been more likely to fill out the survey. Similarly, the responses may have been affected by social desirability bias, meaning that respondents may have been likely to answer certain MCRS items in a way they believe would be viewed as "socially acceptable."[42] In addition, although the MCRS has been validated and used in primary care, psychiatry, and addiction medicine settings, it has not been validated or used previously in an orthopaedic surgery setting. [20,43] The MCRS may thus fail to translate to certain features of surgical practice, including attitudes regarding operating on surgical patients, which may differ from clinic interactions with patients in the primary care setting. Finally, although we are able to comment on specific items of the MCRS and how they are impacted by various surgeon characteristics, we cannot comment on the relative positivity or negativity of the overall MCRS scores, as no reference MCRS for patients without eating disorders among orthopaedic surgeons is available.

CONCLUSIONS

In summary, the results of this study demonstrated modest awareness of and attitudes toward EDs and the Female Athlete Triad. Didactic training on EDs was associated with increased comfort recognizing eating disorder symptoms and likelihood of screening, which, in turn, had positive effects on attitudes, comfort discussing eating behaviors with patients, and likelihood of counseling patients on risks. Given the high prevalence of EDs in the female athletic population, orthopaedic surgery programs should incorporate didactic training on EDs into residency and/or fellowship training to promote positive therapeutic relationships, appropriate management, and improved outcomes in patients with EDs.

Conflict of Interest Statement

The authors report no conflict of interest with the contents of this manuscript.

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Appendix 1: Survey questions

Part I: Demographics

1. What is your age?
2. What is your sex?
    a. Male
    b. Female
    c. Prefer not to answer
3. What is your race?
    a. White/Caucasian
    b. African American
    c. Hispanic
    d. Asian
    e. Native American
    f. Pacific Islander
    g. Other
    h. Prefer not to answer
4. Years in practice?
    a. <5 years post-residency/fellowship
    b. 5-15 years post-residency/fellowship
    c. >15 years post-residency/fellowship
    d. Prefer not to answer
    e. N/A - Resident
5. What is your subspecialty?
    a. Sports Medicine
    b. Foot & Ankle
    c. Hand
    d. Shoulder & Elbow
    e. Arthroplasty
    f. Spine
    g. Pediatrics
    h. Trauma
    i. Oncology
    j. None – General Practice
    k. N/A
6. Please characterize your primary practice setting:
    a. Community/Private Practice
    b. Public University
    c. Private University
    d. Military

Part II: Awareness/Engagement

7. Are you aware of or have you ever received any didactic education regarding *eating disorders*? (Y/N)
8. Are you aware of or have you ever received any didactic education regarding the *female athlete triad*? (Y/N)
9. How comfortable do you feel recognizing the symptoms of *anorexia nervosa* in a patient? (1, Extremely Uncomfortable – 5, Extremely Comfortable)
10. How comfortable do you feel recognizing the symptoms of *bulimia nervosa* in a patient? (1, Extremely Uncomfortable – 5, Extremely Comfortable)
11. How comfortable do you feel recognizing the symptoms of *binge eating disorder* in a patient? (1, Extremely Uncomfortable – 5, Extremely Comfortable)
12. What are the 3 components of the f*emale athlete triad*? (free response)
13. How often do you screen for *eating disorders* in your patients?
    a. Always
    b. Often
    c. Sometimes
    d. Infrequently
    e. Never
14. How often do you screen for *anxiety* or *depression* in your patients?
    a. Always
    b. Often
    c. Sometimes
    d. Infrequently
    e. Never
15. How comfortable do you feel asking patients questions about eating behaviors? (1, Extremely Uncomfortable – 5, Extremely Comfortable)
16. If you notice symptoms of an *eating disorder* in patients, how often do you counsel patients on health risks such as heightened fracture risk?
    a. Always
    b. Sometimes
    c. Never
17. If you notice symptoms of an *eating disorder* in patients, how often do you provide referrals or resources?
    a. Always
    b. Sometimes
    c. Never
18. Do you have access to a nutritionist to help manage patients with eating disorders? (Y/N)
19. Do you have access to an endocrinologist to help manage patients with eating disorders? (Y/N)

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20. Do you have access to a therapist to help manage patients with eating disorders? (Y/N)
21. If so, is this person affiliated with your institution? (Y/N)
22. What are the barriers to treating patients with eating disorders? (select all that apply)
    a. Access to additional specialists for referrals
    b. Difficulty recognizing patients' symptoms
    c. Lack of formal training on treating patients with eating disorders
    d. Lack of knowledge of outside resources
    e. Fear of saying the wrong thing
    f. Other (free response)

Part III: Attitudes

The Medical Condition Regard Scale

Please answer the following 11 questions with regard to *orthopaedic patients with comorbid anorexia nervosa* and *orthopaedic patients with comorbid binge eating disorder*:

			Strongly Disagree						Strongly Agree
1.	Working with patients like this is satisfying	N/A	1	2	3	4	5	6	7
2.	Insurance plans should cover patients like this to the same degree that they cover patients with other conditions	N/A	1	2	3	4	5	6	7
3.	There is little I can do to help patients like this	N/A	1	2	3	4	5	6	7
4.	I feel especially compassionate towards patients like this	N/A	1	2	3	4	5	6	7
5.	Patients like this irritate me	N/A	1	2	3	4	5	6	7
6.	I wouldn't mind getting up on call nights to care for patients like this	N/A	1	2	3	4	5	6	7
7.	Treating patients like this is a waste of medical dollars	N/A	1	2	3	4	5	6	7
8.	Patients like this are particularly difficult for me to work with	N/A	1	2	3	4	5	6	7
9.	I can usually find something that helps patients like this feel better	N/A	1	2	3	4	5	6	7
10.	I enjoy giving extra time to patients like this	N/A	1	2	3	4	5	6	7
11.	I prefer not to work with patients like this	N/A	1	2	3	4	5	6	7

Adapted from Christison GW, Haviland MG, Riggs ML. The medical condition regard scale: measuring reactions to diagnoses. Academic Medicine. 2002 Mar 1;77(3):257-62.

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Appendix 2. Responses to survey components
(AN, anorexia nervosa; BN, bulimia nervosa; BED, binge eating disorder)

Question	N (%) or Average (SD)
Aware of/received didactic education regarding eating disorders	
Yes	36 (69.2%)
No	16 (30.8%)
Aware of/received didactic education regarding the Female Athlete Triad	
Yes	45 (86.5%)
No	7 (13.5%)
Comfort recognizing symptoms of AN in a patient	
Extremely uncomfortable	2 (3.9%)
Somewhat uncomfortable	12 (23.1%)
Neither comfortable/uncomfortable	12 (23.1%)
Somewhat comfortable	17 (32.7%)
Extremely comfortable	9 (17.3%)
Comfort recognizing symptoms of BN in a patient	
Extremely uncomfortable	4 (7.7%)
Somewhat uncomfortable	13 (25.0%)
Neither comfortable/uncomfortable	15 (28.9%)
Somewhat comfortable	16 (30.8%)
Extremely comfortable	4 (7.7%)
Comfort recognizing symptoms of BED in a patient	
Extremely uncomfortable	4 (7.7%)
Somewhat uncomfortable	14 (26.9%)
Neither comfortable/uncomfortable	19 (36.5%)
Somewhat comfortable	13 (25.0%)
Extremely comfortable	2 (2.9%)
Ability to identify the components of the Female Athlete Triad	
0/3 components	4 (7.7%)
1/3 components	6 (11.5%)
2/3 components	20 (38.5%)
3/3 components	22 (42.3%)
Listed "eating disorder" as a component of the Female Athlete Triad	18 (34.6%)
Frequency of screening for eating disorders	
Always	0 (0.0%)
Often	1 (1.9%)
Sometimes	8 (15.4%)
Infrequently	24 (46.2%)
Never	19 (36.5%)
Frequency of screening for anxiety or depression	
Always	0 (0.0%)
Often	6 (11.5%)
Sometimes	15 (28.9%)
Infrequently	18 (34.6%)

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Never	13 (25.0%)
Comfort with asking patients about eating behaviors	
Extremely uncomfortable	2 (3.9%)
Somewhat uncomfortable	15 (28.9%)
Neither comfortable/uncomfortable	13 (25.0%)
Somewhat comfortable	18 (34.6%)
Extremely comfortable	4 (7.7%)
If you notice symptoms of an ED in patients, how often do you counsel patients on health risks such as heightened fracture risk?	
Always	20 (38.5%)
Sometimes	25 (48.1%)
Never	7 (13.5%)
If you notice symptoms of an ED in patients, how often do you provide referrals or resources?	
Always	17 (32.7%)
Sometimes	26 (50.0%)
Never	9 (17.3%)
Access to a nutritionist to help manage patients with EDs	35 (67.3%)
If yes, nutritionist affiliated with your institution?	33 (94.3%)
Access to an endocrinologist to help manage patients with EDs	43 (82.7%)
If yes, endocrinologist affiliated with your institution?	38 (88.4%)
Access to a therapist to help manage patients with EDs	35 (67.3%)
If yes, therapist affiliated with your institution?	30 (85.7%)
Barriers to treating patients with eating disorders?	
Access to additional specialists	16 (30.8%)
Difficulty recognizing symptoms	21 (40.4%)
Lack of formal training	24 (46.2%)
Lack of knowledge/access to outside resources	18 (34.6%)
Fear of saying the wrong thing	28 (53.8%)
Other (none; patient not wanting treatment; not feeling like it's part of my job)	3 (5.8%)

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Appendix 3. Breakdown of items on the MCRS by AN and BED
(MCRS, Medical Condition Regard Scale ; AN, anorexia nervosa; BED, binge eating disorder)

MCRS Item	*Patients with AN*	*Patients with BED*	*P-value*
Working with Patients like this is satisfying	3.88 ± 1.40	4.00 ± 1.47	0.43
Insurance plans should cover patients like this to the same degree that they cover patients with other conditions	6.00 ± 1.55	6.00 ± 1.39	1.00
There is little I can do to help patients like this*	2.42 ± 1.41	2.73 ± 1.58	0.10
I feel especially compassionate towards patients like this	4.89 ± 1.56	4.38 ± 1.66	0.02
Patients like this irritate me*	2.11 ± 1.17	2.17 ± 1.24	0.61
I wouldn't mind getting up on call nights to care for patients like this	3.93 ± 2.16	3.56 ± 2.06	0.002
Treating patients like this is a waste of medical dollars*	1.23 ± 0.73	1.30 ± 0.72	0.26
Patients like this are particularly difficult for me to work with*	3.04 ± 1.50	3.11 ± 1.65	0.73
I can usually find something that helps patients like this feel better	4.11 ± 1.66	4.16 ± 1.63	0.76
I enjoy giving extra time to patients like this	3.94 ± 1.63	3.68 ± 1.48	0.03
I prefer not to work with patients like this*	2.91 ± 1.81	2.83 ± 1.78	0.62

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Appendix 4. Total MCRS scores by surgeon characteristics
(MCRS, Medical Condition Regard Scale ; AN, anorexia nervosa; BED, binge eating disorder)

Characteristic	*MCRS for AN*	*P-value*	*MCRS for BED*	*P-value*
Total Sample	49.9 ± 10.6		48.4 ± 10.9	
Race/Ethnicity		0.47		0.60
White	49.3 ± 10.2		47.9 ± 10.6	
Non-White	52.4 ± 12.5		50.3 ± 12.8	
Sex		0.31		0.06
Male	50.5 ± 11.2		50.4 ± 11.6	
Female	47.6 ± 8.9		43.5 ± 7.3	
Non-binary/third gender	-		-	
Prefer not to say	64.0 ± 0.0		64.0 ± 0.0	
Years in Practice		0.13		0.10
Resident	48.2 ± 9.7		45.3 ± 8.4	
<5 years post-residency/fellowship	58.7 ± 11.0		56.6 ± 12.3	
5-15 years post-residency/fellowship	45.2 ± 9.5		44.0 ± 7.8	
>15 years post-residency/fellowship	49.9 ± 10.8		49.5 ± 12.4	
Subspecialty		0.17		0.12
Sports	51.3 ± 13.7		53.6 ± 14.6	
Foot & Ankle	46.0 ± 7.2		42.3 ± 3.1	
Hand	47.5 ± 9.1		45.3 ± 10.9	
Shoulder & Elbow	48.0 ± 12.7		44.5 ± 10.6	
Arthroplasty	47.0 ± 6.9		43.5 ± 6.4	
Spine	31.0 ± 11.3		29.5 ± 9.2	
Pediatrics	46.0 ± 4.2		46.0 ± 4.4	
Trauma	57.3 ± 2.5		54.0 ± 2.6	
Oncology	56.3 ± 8.7		53.3 ± 9.4	
General Practice	47.0 ± 8.5		44.8 ± 5.9	
Other	64.0 ± 0.0		64.0 ± 0.0	
Primary Practice Setting		0.93		0.92
Community/private practice	47.6 ± 14.0		49.3 ± 16.3	
Public university	49.0 ± 11.7		45.3 ± 10.1	
Private university	50.7 ± 4.8		48.9 ± 4.7	
Military	50.3 ± 13.7		48.7 ± 13.7	
Aware of/received didactic education regarding eating disorders		0.21		0.09
Yes	51.3 ± 11.3		50.3 ± 11.2	
No	46.5 ± 2.5		43.6 ± 8.9	
Aware of/received didactic education regarding the Female Athlete Triad		0.003		<0.001
Yes	51.8 ± 9.5		50.3 ± 9.6	
No	37.2 ± 10.1		31.8 ± 7.2	

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Comfort recognizing symptoms of AN in a patient		0.32		
Extremely uncomfortable	51.0 ± 0.0			
Somewhat uncomfortable	46.0 ± 14.5			
Neither comfortable nor uncomfortable	48.6 ± 9.6			
Somewhat comfortable	49.2 ± 10.4			
Extremely comfortable	57.4 ± 4.7			
Comfort recognizing symptoms of BED in a patient				0.13
Extremely uncomfortable			36.0 ± 18.4	
Somewhat uncomfortable			48.1 ± 13.6	
Neither comfortable nor uncomfortable			48.2 ± 8.1	
Somewhat comfortable			48.3 ± 9.9	
Extremely comfortable			64.5 ± 3.5	
Ability to identify the components of the Female Athlete Triad		0.02		0.03
0/3 components	37.0 ± 19.8		23.0 ± 0.0	
1/3 components	45.3 ± 10.6		42.8 ± 11.7	
2/3 components	47.1 ± 9.4		47.3 ± 9.3	
3/3 components	55.2 ± 8.7		52.1 ± 10.3	
Listed "eating disorder" as a component of the Female Athlete Triad		0.10		0.22
Yes	46.2 ± 10.3		45.5 ± 10.5	
No	52.0 ± 10.5		50.0 ± 11.0	
Frequency of screening for eating disorders		0.62		0.25
Always	-		-	
Often	54.0 ± 0.0		45.0 ± 0.0	
Sometimes	54.0 ± 8.0		54.7 ± 9.7	
Infrequently	50.1 ± 12.6		49.4 ± 12.4	
Never	47.0 ± 7.7		44.0 ± 7.6	
Comfort with asking patients about eating behaviors		0.07		0.048
Extremely uncomfortable	36.5 ± 3.5		33.0 ± 5.7	
Somewhat uncomfortable	54.5 ± 9.4		51.3 ± 10.3	
Neither comfortable nor uncomfortable	45.4 ± 6.8		44.6 ± 5.9	
Somewhat comfortable	49.2 ± 12.3		47.7 ± 11.6	
Extremely comfortable	58.0 ± 1.7		60.0 ± 8.2	
If you notice symptoms of an ED in patients, how often do you counsel patients on health risks such as heightened fracture risk?		0.14		0.28
Always	52.8 ± 13.2		50.8 ± 13.7	
Sometimes	48.3 ± 7.0		47.3 ± 7.7	
Never	39.0 ± 0.0		40.7 ± 3.5	

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If you notice symptoms of an ED in patients, how often do you provide referrals or resources?		0.77		0.76
Always	50.6 ± 11.3		48.4 ± 12.0	
Sometimes	50.3 ± 11.0		49.4 ± 11.3	
Never	47.0 ± 8.6		45.5 ± 7.8	
Access to a nutritionist to help manage patients with EDs		0.84		0.85
Yes	50.1 ± 10.4		48.6 ± 10.7	
No	49.4 ± 11.7		47.9 ± 12.0	
Access to an endocrinologist to help manage patients with EDs		0.55		0.57
Yes	49.4 ± 11.1		47.9 ± 11.2	
No	52.1 ± 8.3		50.6 ± 10.0	
Access to a therapist to help manage patients with EDs		0.80		0.58
Yes	49.6 ± 11.6		47.8 ± 11.4	
No	50.6 ± 8.3		50.0 ± 10.0	

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