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Eating Disorders in Female High School Athletes

Educating Coaching Staff on Prevention, Recognition, and Intervention Strategies

Mission Statement

The primary goal of this project is to increase awareness and implementation of strategies to prevent eating disorder development and maintenance, improve recognition of disordered eating behaviors and warning signs, and increase appropriate and timely intervention in coaches of female high school athletes. This will be achieved through the creation of educational resources to be distributed to athletic directors and coaches throughout the state of Iowa.

Inspiration and Motivation

The sources of inspiration and motivation for this project are multifaceted. My initial priority when working to identify potential concepts and project ideas was to ensure that the target population included individuals from communities in which I was raised and that strongly influenced my development. Notably, having grown up in a small, rural community designated as a medically underserved area, I wanted to ensure that this project would positively impact those with similar limited access to healthcare. While not a requirement, I also felt strongly that the project focus on children and adolescents. A significant portion of my prior nonprofit work focused on improving community support and mental health in the pediatric population. I found, and continue to find, this work particularly rewarding and view the potential for significant positive impact to be unquantifiable. This will also be the population that I continue to serve as a future pediatrician.

With these things in mind, I entered core year hoping to encounter a previously unrecognized (to me) area of need that I felt passionate about addressing. Fortunately, this exact situation occurred. On day one of my child and adolescent psychiatry rotation, I assisted with the admission of an adolescent female struggling with anorexia nervosa. Over the course of the next four weeks, I spent my time getting to know her, learning about her interests, life goals, and struggles. With time, she shared some aspects of her life that she felt contributed to the development and persistence of her anorexia nervosa, one of which was her involvement in athletics. While I will not further elaborate on the specifics of her experiences out of respect for her privacy, I was taken aback by the connections she made. This individual made significant progress in her treatment, and, on my final day of the rotation, was discharged home. I will never forget the joy and confidence that she exuded and the gratitude she expressed as we both left the unit for the final time.

As someone whose younger self was partially defined by my involvement in athletics, notably volleyball, basketball, softball, and track, I feel that I have reasonable insight into the influence, both positive and negative, that involvement in sports can have on a person. Additionally, while I have not personally been diagnosed with an eating disorder, I recognized upon reflection that my involvement in athletics strongly impacted how I evaluate my body image and my nutrition.

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These things in combination, then, inspired me to attempt to improve the athletic environment for female high school athletes in the state of Iowa.

Literature Review

Background

The pathology of disordered eating can be described as a spectrum or continuum, ranging from subclinical to clinical eating disorders. Subclinical eating disorders, otherwise referred to as disordered eating, is used to describe cases in which individuals exhibit some criteria for eating disorders but do not meet full criteria for diagnosis per *The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V)* (Knapp et al., 2014). Individuals in this category may show evidence of chronic and restrictive diets, passive and active fasting and dehydration, the use of laxatives, diuretics, and diet pills, bingeing, purging, and excessive exercise (Bratland-Sanda & Sundgot-Borgen, 2013). Clinical eating disorders, then, include anorexia nervosa, bulimia nervosa, and binge eating disorder among others. The specific criteria for these diagnoses can be found in Table 1. Generally, these disorders are characterized by hyper-fixation on body image, weight, and food that results in behaviors including excessive exercise, fasting, starvation, bingeing, and purging (Bratland-Sanda & Sundgot-Borgen, 2013).

Eating disorders, notably anorexia nervosa, are associated with low energy availability and subsequent increases in morbidity and mortality (Arthur-Cameselle et al., 2017; Ravi et al., 2021). Effects including endocrinologic imbalance, decreased bone density, stress fracturing, depressed immune function, dysfunction of the gastrointestinal and cardiovascular systems, and compromised mental health result from this low availability. Additionally, a significant amount of research has been done regarding the “female athlete triad,” a term which describes the connection between low energy availability, menstrual dysfunction, and low bone mineral density observed in female athletes (Neglia, 2021). This term and concept were recently revised to include a larger scope of symptoms, notably decreased athletic performance and injury associated with low energy availability, and renamed to “relative energy deficiency in sport” (RED-S) to include all genders (Chapa et al., 2022; Neglia, 2021). Overall, eating disorders rank as psychological illnesses with the second highest mortality rate, shortly behind opioid use disorder. A diagnosis of anorexia nervosa increases mortality six-fold, while a diagnosis of bulimia nervosa doubles mortality risk (Neglia, 2021).

The prevalence of clinical eating disorders within the general population is estimated to be 5-9% (Knapp et al., 2014; Neglia, 2021). It has been identified, however, that the prevalence of eating disorders in female athletes is significantly higher than the general population. Rates of disordered eating within female high school and college athletes have been found to be up to 50% and 20-60%, respectively, while rates of clinical eating disorders have been identified at 14-32% and 6-45%, respectively (Knapp et al., 2014; Ravi et al., 2021).

Risk Factors

It is important to acknowledge that, to date, no long-term prospective studies that evaluate for risk factors for eating disorder development have been completed. However, multiple studies

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in differing formats, including cross sectional and case control studies, have identified factors that are associated with eating disorder development, a process that is likely multifactorial.

With regard to the general population, the risk factors associated with the highest risk include young age and female sex (Arthur-Cameselle et al., 2017). In particular, there is evidence demonstrating that adolescence is a high-risk period for eating disorder development. This has been attributed to increased focus on appearance in combination with uncertainties about changing bodies. Notably, while an increase in body mass index is expected in females during adolescence, this, in combination with strong internalization of body ideals, leads to increased rates of body dissatisfaction, with up to 88% of adolescent girls dissatisfied with at least one aspect of their body and 57% experimenting with disordered eating behaviors. It has been identified that a drive for thinness, described as “excessive concern with body weight and dieting, and comprising both a wish for weight loss and a fear of weight gain,” dieting behaviors, and symptoms of binge eating and purging remain stable through adolescence and into early adulthood, therefore those that develop these tendencies will likely experience persistence for many years without intervention (Verschueren et al., 2020).

Bratland-Sanda et al. further describe risk factors associated with eating disorder development as falling within three categories: predisposing, triggering, and perpetuating factors. The predisposing factors are further subcategorized as biological, psychological, and sociocultural: the biological subcategory representing genetic predisposition, age, and pubertal status (Bratland-Sanda & Sundgot-Borgen, 2013); the psychological subcategory including factors such as body dissatisfaction, negative mood states including anxiety and depression, low self-esteem, and individual personality traits including perfectionism; and the sociocultural subcategory describing societal pressure to attain a “thin ideal,” as well as peer pressure and relationships and exposure to eating disorders within the immediate family (Arthur-Cameselle et al., 2017; Bratland-Sanda & Sundgot-Borgen, 2013). Bratland-Sanda et al. describe triggering factors as incidences such as negative comments from others regarding appearance and body weight and a history of and/or recent traumatic experiences. Perpetuating factors, then, include initial “success” and indications of approval from those close to the individual (Bratland-Sanda & Sundgot-Borgen, 2013).

Given the increased prevalence of eating disorders in athletes, recent research has sought to evaluate for sport specific risk factors. Per a meta-analysis of this topic conducted by Chapa et al., it has been identified that athletes participating in sports that emphasize thinness and leanness (ie. distance running, gymnastics, figure skating, dancing), have weight categories (ie. wrestling, judo), and are considered anti-gravity (ski-jumping and other jumping events) have higher levels of disordered eating. Participation in these sports was found to be associated with elevations in overall eating disorder psychopathology, including drive for thinness, restricting, and loss of control with eating (Arthur-Cameselle et al., 2017; Chapa et al., 2022; Neglia, 2021). A variety of hypotheses have been postulated to explain this pattern. One leading hypothesis describes an athlete’s desire to enhance athletic performance through weight loss, which is then perpetuated given drive for continued enhancement versus loss of control. A second describes conflicting ideal body types, notably per society and per sport, that result in

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significant, long term body dissatisfaction. A third hypothesis, focusing primarily on sports with frequent weight regulation, suspects a negative psychological impact when readiness, opportunity, and success are dependent on reaching and maintaining a specific weight (3).

Multiple additional risk factors associated with eating disorder development and maintenance in female athletes have been identified. Based on work by Arthur-Cameselle et al., female athletes have a significantly higher prevalence of low self-worth, which encompassed negative comparisons to peers and a generalized feeling of inadequacy. Additionally, a greater prevalence of perfectionism and desire for control was seen in female athletes than a control population. Overcompensation of disordered eating behaviors in response to illness and injury was also appreciated. A final risk factor identified by Arthur-Cameselle et al. describes performance pressure and a continued drive for advancement (Arthur-Cameselle et al., 2017). Bratland-Sanda et al. also report early involvement in sport specific training and unique personality traits, including overcompliance, high achievement orientation, and obsessive compulsive tendencies, as female athlete specific risk factors (Bratland-Sanda & Sundgot-Borgen, 2013).

Given evidence that close relationships can impact the development of eating disorders, research has been conducted to evaluate the athlete-coach relationship in this context. This work has demonstrated that interactions with coaching staff can influence the onset and maintenance of eating disorders. Notably, actions by coaches that emphasize a lean body shape including encouragement to pursue weight loss strategies without appropriate safety information and support to do so, criticism of appearance and weight, regular monitoring of weight and nutritional intake, and assignment of high value on weight for performance can result in increased body awareness, the development of disordered eating and clinical eating disorders, and perpetuation of existing illness (Jones et al., 2005; Plateau et al., 2015). In addition, athletes who report poor quality relationships with coaching staff associated with conflict and inadequate support have been found to have a higher prevalence of disordered eating psychopathology (Plateau et al., 2015). Given the high frequency and intensity of contact, the athlete-coach relationship can play an important role in the development of disordered eating (Martinsen et al., 2015).

Diagnostic Criteria for Eating Disorders Per the DSM-V	
Anorexia Nervosa	“A. Restriction of energy intake relative to requirements, leading to a significantly low body weight in the context of age, sex, developmental trajectory, and physical health. Significantly low weight is defined as a weight that is less than minimally normal or, for children and adolescents, less than that minimally expected. B. Intense fear of gaining weight or of becoming fat, or persistent behavior that interferes with weight gain, even though at a significantly low weight. C. Disturbance in the way in which one’s body weight or shape is experienced, undue influence of body weight or shape on self-

	evaluation, or persistent lack of recognition of the seriousness of the current low body weight. “
Bulimia Nervosa	<p>“A. Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following: 1. Eating, in a discrete period of time (e.g., within any 2-hour period), an amount of food that is definitely larger than what most individuals would eat in a similar period of time under similar circumstances. 2. A sense of lack of control over-eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating).</p> <p>B. Recurrent inappropriate compensatory behavior in order to prevent weight gain, such as self induced vomiting; misuse of laxatives, diuretics, or other medications; fasting; or excessive exercise.</p> <p>C. The binge eating and inappropriate compensatory behaviors both occur, on average, at least once a week for 3 months.</p> <p>D. Self-evaluation is unduly influenced by body shape and weight.</p> <p>E. The disturbance does not occur exclusively during episodes of anorexia nervosa.”</p>
Binge-Eating Disorder	<p>“A. Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following: 1. Eating, in a discrete period of time (e.g., within any 2-hour period), an amount of food that is definitely larger than what most people would eat in a similar period of time under similar circumstances. 2. A sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating).</p> <p>B. The binge-eating episodes are associated with three (or more) of the following: 1. Eating much more rapidly than normal. 2. Eating until feeling uncomfortably full. 3. Eating large amounts of food when not feeling physically hungry. 4. Eating alone because of feeling embarrassed by how much one is eating. 5. Feeling disgusted with oneself, depressed, or very guilty afterward.</p> <p>C. Marked distress regarding binge eating is present.</p> <p>D. The binge eating occurs, on average, at least once a week for 3 months.</p> <p>E. The binge eating is not associated with the recurrent use of inappropriate compensatory behavior as in bulimia nervosa and does not occur exclusively during the course of bulimia nervosa or anorexia nervosa.</p>

Table 1: Diagnostic criteria of anorexia nervosa, bulimia nervosa, and binge-eating disorder per *The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V)* (*Diagnostic and statistical manual of mental disorders : DSM-5, 2013*).

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Screening Tools and Signs and Symptoms

Multiple studies have been conducted regarding the creation and subsequent validity and reliability of self-reported eating disorder questionnaires. Given this, Knapp et al. conducted a review of existing questionnaires to identify those relevant to the general population and those that would be most appropriate for female athletes. They report that, given that athletes may demonstrate characteristics and behaviors that overlap with those of disordered eating but may not be pathologic in the context of sport, unique and specific screening tools may be required. With regard to the general population, the Eating Attitudes Test (EAT-26), the Eating Disorder Examination Questionnaire (EDE-Q), and the Eating Disorder Inventory (EDI) have been found to be reliable and valid screening tools, with the EDE-Q serving as the gold standard for eating disorder diagnosis. However, given the concern for non-pathologic behaviors in the context of sport and lack of validity within the female athlete population, these tools are of limited value (Knapp et al., 2014).

Knapp et al. then reviewed the screening tools identified by the National Athletic Trainer Association to be specific to female athletes. These tools included the Female Athlete Screening Tool (FAST), the Athletic Milieu Direct Questionnaire (AMDQ), the Physiologic Screening Test, the Survey of Eating Disorders Among Athletes (SEDA), the Health, Weight, Dieting, and Menstrual History Questionnaire, the College Health-Related Information Survey (CHRIS-73), and the Brief Eating Disorders in Athletes Questionnaire (BEDA-Q). Of these tools, the AMDQ, BEDA-Q, and FAST tools have been validated for the female athlete population and, therefore, serve as potential options. However, it is important to note that only the FAST has been validated for identification of subclinical eating disorders. Given these findings, Knapp et al. recommend the addition of a screening questionnaire, notably the FAST, with pre-participation forms (Knapp et al., 2014).

In addition to questionnaires, there are multiple signs that could indicate the development or presence of subclinical and clinical eating disorders. Thoughts and behaviors including viewing foods as “good” or “bad,” having a lack of trust in oneself when around specific foods, and experiencing a constant preoccupation with thoughts of food have been associated with eating disorders. Additionally, having unrealistic expectations of one’s appearance, experiencing body dysmorphia, demonstrating an immense fear of weight gain, dieting frequently, choosing low calorie and sugar free options to “save calories,” demonstrating highly restrictive eating or refusal to eat, and experiencing a compulsive need to exercise serve as warning signs. Symptoms of eating disorders that may be appreciated include, but are not limited to, amenorrhea, hair loss, increase in facial and body hair, sensitivity to the cold, binge eating, frequently using the restroom after meals, experiencing guilt and shame after eating, and withdrawing from social circles (Neglia, 2021).

As early recognition of subclinical and clinical eating disorders improves prognoses and increases the likelihood of success of treatment, the screening questionnaires and observation for warning signs and symptoms serve as methods for decreasing the impact of disordered eating (Bratland-Sanda & Sundgot-Borgen, 2013; Neglia, 2021).

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Prevention

The prevention of eating disorders in adolescence has been heavily researched. While education and mental exercises challenging baseline thought processes appear to be the unifying approach, the specifics of the prevention strategies vary by study.

Simon Wilkish conducted a controlled trial in which the intervention group underwent an eight lesson, school-based media literacy program (Media Smart, not further described) for high school students. Results demonstrate that following the literacy program, individuals from the intervention group experienced significantly lower shape and weight concern scores at 6 month and 2.5 year follow up (Wilksch, 2010). Similarly, Jones et al. conducted a nonrandomized trial in which ninth graders underwent a 12-session program (Staying Fit) focused on building healthy habits and a positive body image using online modules with associated reflection questions, food and meal size logs, a physical activity log, a weight log, a hunger and fullness rating scale, and a discussion board. Parent and teacher materials were also available. The results of this study demonstrated reduced weight and shape concerns in those with an elevated risk for disordered eating. Jones et al. emphasize that, based on the study results and of those that preceded it, an ideal universal prevention approach would be one that provides anonymity, acknowledges and challenges cultural norms and policies, encourages healthy weight related behaviors and positive body image, and works to mitigate the stigma, shame, and bullying surrounding disordered eating. They also note that addressing barriers to care through the use of internet based programs may be particularly beneficial (Jones et al., 2005).

Two studies have also been conducted evaluating the use of dissonance-based prevention programs in female high schoolers. The first, conducted by Stice et al., had participants voluntarily participate in a four-hour program in which they critiqued the “thin ideal.” Of note, the program was led by high school nurses and counselors trained on the intervention. When compared to the control group, who received education in the form of a brochure, the intervention group demonstrated significant decreases in body dissatisfaction at two year follow up and significant decreases in eating disorder symptoms at 3 year follow up (Stice et al., 2011). Similarly, Ciao et al. found that ninth grade girls who underwent two 1.5 hour long, peer-led dissonance based intervention sessions had significantly decreased measurements of body dissatisfaction and dietary restraint when compared to baseline (Stice et al., 2011).

To evaluate for prevention strategies in female athletes specifically, Martinsen et al. conducted a randomized control trial in which first year students at elite sport high schools in Norway underwent a one-year intervention program aimed at enhancing self-esteem, strengthening self-efficacy, and emphasizing the importance of internal strength with decreased influence of performance results. The program also included education on nutrition and adolescent development. Over the course of one year, students participated in lectures, teamwork exercises, and multiple assignments. Participants also received communication from renowned Norwegian athletes regarding self-esteem, self-efficacy, and mental training via email and a closed Facebook group. Of note, dialog was initiated between research staff and school staff, and parents and coaches received booklets and attended seminars on disordered eating in athletes. This is further described below. Results of this study were notable for a 90% reduction

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in eating disorder prevalence in the intervention group and a prevention of eating disorder development through the use of a year long intervention program. Additionally, individuals from the intervention group had a lower likelihood of reporting symptoms associated with eating disorders and lower likelihood of dieting behaviors (Martinsen et al., 2014).

The studies described above demonstrate that intervention programs aimed at educating adolescents and athletes on healthy practices and disordered eating behaviors and challenging preconceived notions can prevent and reduced the prevalence of disordered eating in these populations.

The Role of Coaches

As described in the risk factors section of this proposal, the athlete-coach relationship can negatively influence the development and maintenance of disordered eating and clinical eating disorders (Jones et al., 2005; Martinsen et al., 2015; Plateau et al., 2015). Evidence also suggests, however, that increased support and encouragement from coaching staff can serve as a key motivator for athletes connecting with support services (Plateau et al., 2015). When individuals diagnosed with clinical eating disorders were surveyed post-recovery, they reported that intervention by coaching staff and subsequent nonnegotiable reductions in training regimen were beneficial and promoted help seeking behaviors (Arthur-Cameselle & Baltzell, 2012). The potential for this positive influence is supported by well-founded theories that suggest individuals will demonstrate an increased motivation and greater likelihood of taking action if they believe significant individuals in their life want them to perform a specific behavior (Martinsen et al., 2015).

Macpherson et al. and Turk et al. set out to evaluate the baseline understanding of eating disorders in coaching populations, given the potential for significant influence. Macpherson et al. utilized a survey containing vignettes of athletes with various eating disorder diagnoses to evaluate their ability to recognize and appropriately respond. Results demonstrated that coaches were no more likely to correctly identify anorexia nervosa and bulimia nervosa when compared to the control group. However, coaches, notably those with more years of experience and higher mental health literacy, were significantly more likely to recommend professional treatment. Therefore, Macpherson et al. recommended early and targeted education of disordered eating in coaching staff (Macpherson et al., 2022). Similarly, Turk et al. utilized a questionnaire distributed to 258 National Collegiate Athletics Association coaches to evaluate for underlying knowledge of eating disorders and correctness of associated responses. Turk et al. found that only 44.5% of coaches reported attending an educational program regarding disordered eating and <38% of coaches were aware of a variety of educational resources (videos, literature, outside programs) despite having them provided by the association. Results also demonstrated an average score of 73.4% (range of 68.5% to 80.0%) for domains evaluating knowledge of risk factors, etiology, recognition of signs and symptoms, management and treatment, and education and prevention. Ultimately, Turk et al. concluded that significant benefit could be had through education of all domains in coaching staff (Turk et al., 1999).

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Research has also been conducted evaluating the method of response to disordered eating in athletes by coaching staff. Utilizing a single interview and subsequent analysis, Plateau et al. identified three styles utilized in approaching individuals with concern for disordered eating behaviors: supportive, avoidant, and confrontational. The supportive approach was used to describe a proactive strategy defined by resourcefulness, working in partnership with the athlete, moderating training, and utilizing clear signposting. The avoidant approach was used to describe a lack of strategic approach defined by denial of the presence of disordered eating, unwillingness to take responsibility, and concern for exacerbating the situation. The confrontational style, then, consisted of the utilization of rules and conditions, battles and conflicts, and the use of scare tactics. However, it was noted that the themes identified in this study were not mutually exclusive. The value of each strategy was not further evaluated or described. The interviews also provided insight into challenges that coaches face regarding intervening when concern for disordered eating arises. These challenges including minimal availability and accessibility of support for athletes and difficulty persuading athletes to seek treatment (Plateau et al., 2015).

In an attempt to identify evidence-based strategies for improving coaches' ability to prevent, identify, and intervene when concern for disordered eating arises, Martinsen et al. and Selenius et al. have created and evaluated possible educational programs. More specifically, Martinsen et al. recruited 125 high school coaches who underwent a one-year intervention program focused on education on mental training, self-esteem, self-efficacy, body composition, weight, and athletic nutrition, as well as strategies for preventing, detecting, and managing eating disorders in athletes. Included in the program were two seminars, multiple workshops, and a coach's guide. Following this one-year intervention, coaches were found to have higher index scores on eating disorders, weight regulation, and total knowledge and also had a subjectively higher evaluation of their knowledge, supporting the use of similar intervention programs (Martinsen et al., 2015). Selenius et al. utilized an alternate intervention, the I Care program, which is an online program consisting of three parts (videos, interactive cases, and quizzes) that focus on disordered eating signs, symptoms, and myths, strategies for healthy leadership, and approaches to addressing concerns with individuals with concerning behaviors. Following the intervention, Selenius et al. found that coaches had significantly improved attitudes regarding body weight, shape, and exercise and were less likely to discuss these topics in problematic ways. Coaches also demonstrated increased confidence in recognition of disordered eating behaviors and strategies for approaching individuals with concerning behaviors (Selenius et al., 2022). These findings further support the use of educational programs within the coaching population.

Arthur-Cameselle et al. utilized an alternate approach to identify strategies that coaches could enact to support individuals with disordered eating behaviors and clinical eating disorders. They interviewed 16 females, age 18-26 and diagnosed with anorexia nervosa, bulimia nervosa, or an alternate eating disorder, and inquired about what advice they would give to coaches of female athletes. The athletes recommendations included increasing education and awareness of the diagnoses, encouraging proper nutrition, emphasizing skill with regard to performance goals instead of weight, avoiding singling out athletes based on their appearance or weight,

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addressing and confronting athletes with concerns, providing emotional support, referring the patient to professionals, and prohibiting participation in athletics if concerned for overall health (Arthur-Cameselle & Baltzell, 2012). Other recommendations for coaches working with athletes provided by Adena Neglia include instilling hope and consideration of targeting behaviors such as weight gain and minimizing purges. She emphasizes that treatment with relevant professionals should be of utmost importance and that delays in treatment should be avoided to ensure proper care and increase the likelihood of treatment success (Neglia, 2021).

Given the extensive research on disordered eating in female athletes, a portion of which has been summarized above, the International Olympic Committee, American College of Sports Medicine, and National Athletic Trainer Association have position stands regarding the prevention, early identification, and treatment in this population (Bratland-Sanda & Sundgot-Borgen, 2013; Knapp et al., 2014). Notably, the stand taken by the International Olympic Committee states that “individuals involved in health maintenance and performance enhancement of athletes should receive targeted education and develop problem solving skills to better prevent, detect, and manage extreme dieting, disordered eating, and the female triad components (Martinsen et al., 2015).

Methods

At the start of this project, the author had made connections with individuals from the Iowa Girls High School Athletic Union IGHSAU and had a meeting scheduled with the executive director. However, this meeting fell through, and a formal partnership was not able to be established. Given this, the methods for this project were adjusted as noted below.

Needs Assessment

A needs assessment was created to evaluate and better understand the demographics, education level, and baseline knowledge of, experience with, and comfort with eating disorders within the coaching population. It was also utilized to evaluate for coaches’ preferred format for educational materials.

The needs assessment was created in Qualtrics and distributed via email and social media, with the goal of obtaining feedback from coaches from all sports (volleyball, swimming and diving, cross country, basketball, bowling, wrestling, soccer, golf, track and field, tennis, and softball) and coaching classes within the IGHSAU. Unfortunately, given the lack of formal partnership with the IGHSAU, the needs assessment was unable to be distributed by the union itself. Instead, many individuals with connections to the union and multiple coaches offered to assist with distribution to their network and to encourage additional dissemination. The needs survey was also posted to the author’s Twitter, Instagram, and Facebook accounts. To encourage participation in the needs assessment, participants who completed the survey prior to a set deadline were entered to win one of four \$50 Amazon Gift Cards.

The questions included in the needs assessment are noted below.

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The purpose of this survey is to evaluate the current understanding of disordered eating behaviors and clinical eating disorders, as well as associated practices, in coaches of female high school athletes. The information obtained in this survey will then be utilized by a medical student at the University of Iowa Carver College of Medicine (and former IGHSAU athlete) to guide the creation of resources intended to be utilized by coaching staff to improve prevention and recognition of and intervention for disordered eating behaviors in athletes.

Responses to this survey will remain anonymous and will not be submitted to the IGHSAU. While it would be most helpful to have all questions answered, no single question is required. Therefore, you may choose to leave any answers blank. You may also choose to close the survey prior to submission, and all answers will not be recorded. Any data you provide is valuable. Thank you in advance for your time and involvement in this project. It is greatly appreciated.

Should questions or concerns arise, please reach out to elyse-kerian@uiowa.edu.

Demographics and Basic Information

- 1. Age*
 - a. <20*
 - b. 20-30*
 - c. 31-40*
 - d. 41-50*
 - e. 51-60*
 - f. 60+*
- 2. Gender identity*
 - a. Male*
 - b. Female*
 - c. Nonbinary*
 - d. Prefer not to disclose*
- 3. Coaching sport*
 - a. Volleyball*
 - b. Swimming & Diving*
 - c. Cross Country*
 - d. Basketball*
 - e. Bowling*
 - f. Wrestling*
 - g. Soccer*
 - h. Golf*
 - i. Track & Field*
 - j. Tennis*
 - k. Softball*
- 4. Coaching class*
 - a. 1A*
 - b. 2A*
 - c. 3A*

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- d. 4A
- e. 5A

Education

1. *What is the highest degree or level of education you have completed?*
 - a. *Some high school*
 - b. *High school degree*
 - c. *Some higher education*
 - d. *Associate degree*
 - e. *Bachelor's degree*
 - f. *Master's degree*
 - g. *Doctorate or higher*
 - h. *Trade school*
 - i. *Other*
2. *Coaching education*
 - a. *Coaching endorsement*
 - b. *Coaching authorization*
 - c. *Other*
3. *Throughout your education, did you receive training on mental health?*
 - a. *Yes*
 - b. *No*
4. *If yes, did you receive education on eating disorders (ie. anorexia nervosa, bulimia nervosa, binge eating disorder)?*
 - a. *Yes*
 - b. *No*
5. *Have you received any education on mental health through the IGHSAU?*
 - a. *Yes*
 - b. *No*
6. *Are you aware of any mental health resources available to you through the IGHSAU?*
 - a. *Yes*
 - b. *No*
7. *Have you received any education on eating disorders through the IGHSAU?*
 - a. *Yes*
 - b. *No*
8. *Are you aware of any resources on eating disorders available to you through the IGHSAU?*
 - a. *Yes*
 - b. *No*

Baseline Knowledge of, Experience with, and Comfort Surrounding Eating Disorders in Female High School Athletes

1. *I have heard of anorexia nervosa and have a basic understanding of the diagnosis.*
 - a. *Agree*
 - b. *Disagree*

2. *I have heard of bulimia nervosa and have a basic understanding of the diagnosis.*
 - a. *Agree*
 - b. *Disagree*
3. *I have heard of binge eating disorder and have a basic understanding of the diagnosis.*
 - a. *Agree*
 - b. *Disagree*
4. *I have coached players with one or more of the above diagnoses, as confirmed by a professional.*
 - a. *Agree*
 - b. *Disagree*
5. *I believe that I have coached players with disordered eating tendencies and/or one of the above diagnoses NOT confirmed by a professional and/or not communicated to me.*
 - a. *Agree*
 - b. *Disagree*
6. *I feel that part of my responsibility as a coach is to have a basic understanding of disordered eating, take action to prevent this in my athletes, observe for indications of disordered eating in my athletes, and intervene when necessary.*
 - a. *Agree*
 - b. *Disagree*
7. *I actively utilize strategies for prevention of disordered eating in my athletes.*
 - a. *Agree*
 - b. *Disagree*
8. *I am aware of risk factors for the development and maintenance of disordered eating.*
 - a. *Agree*
 - b. *Disagree*
9. *If agree, please indicate the level to which you think about and look for these risk factors in your athletes.*
 - a. *Not at all*
 - b. *Once per season or less*
 - c. *Approximately monthly*
 - d. *Approximately weekly*
 - e. *Approximately daily*
 - f. *Other*
10. *I am aware of signs and symptoms of disordered eating.*
 - a. *Agree*
 - b. *Disagree*
11. *If agree, please indicate the level to which you think about and look for these signs and symptoms in your athletes.*
 - a. *Not at all*
 - b. *Once a season or less*
 - c. *Approximately monthly*
 - d. *Approximately weekly*
 - e. *Approximately daily*
 - f. *Other*

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12. *I feel comfortable intervening, should I recognize signs and symptoms of disordered eating in one or more of my athletes.*
- Agree*
 - Disagree*

Preferred Format of Educational Resources

- How likely are you to utilize a resource on disordered eating that is easily accessible to you, if not required.*
 - Never*
 - Once*
 - Yearly*
 - Each season*
 - Monthly*
 - Weekly*
 - Daily*
 - Other*
- What would you define as a reasonable and practical amount of time that you would spend reviewing a resource on disordered eating behaviors and clinical eating disorders?*
 - Less than 5 minutes*
 - 5-10 minutes*
 - 11-15 minutes*
 - 16-20 minutes*
 - 21-30 minutes*
 - 31-45 minutes*
 - 46-60 minutes*
 - Greater than 60 minutes*
- What format(s) of educational materials would you be MOST likely to utilize?*
 - A brochure (physical)*
 - A brochure (electronic)*
 - A 1-to-2-page flyer or handout (physical)*
 - A 1-to-2-page flyer or handout (electronic)*
 - A written report*
 - A self-guided module (online)*
 - An interactive module (online)*
 - A pre-recorded video (online)*
 - An in-person presentation at a conference or summit*
 - An in-person breakout session at a conference or summit*
 - Other*
- If other, please briefly specify.*
- The location of education resources that would be most readily accessible to me would be*
 - Physical mail*
 - Email*
 - IGHSAU website*

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- d. A common website (ie. Youtube)
 - e. A cloud-based storage site (ie. Google Drive, Microsoft 365, etc.)
 - f. Other
6. If other, please briefly explain.

Thank you for completing the survey!

If you would like to be entered into a randomized drawing for one of four \$50 Amazon gift cards, please enter your email here.

As a reminder, all survey responses will be kept anonymous, and your email will only be utilized for raffle purposes.

Creation and Distribution of Educational Resources

A literature review was conducted to evaluate for the current understanding of disordered eating and the influence of involvement in athletics and interactions with coaches on disordered eating behaviors. This was done via InfoHawk+. Additionally, the books Unpack Your Eating Disorder: The Journey to Recovery for Adolescents in Treatment for Anorexia Nervosa and Atypical Anorexia Nervosa by Maria Ganci and Dr. Linsey Atkins, Help Your Teenager Beat an Eating Disorder by Dr. James Lock and Dr. Daniel Le Grange, and When Your Teen Has an Eating Disorder: Practical Strategies to Help Your Teen Recover From Anorexia, Bulimia, & Binge Eating by Dr. Lauren Muhlheim were reviewed. A summary of this literature review can be found above.

The format of the educational resources was determined based on the results of the needs assessment. In brief, coaches identified that they would be most likely to utilize a 1-2 page flyer or brochure and a self-guided module with a time commitment of 20-30 minutes. Utilizing the knowledge gained in the literature review, these resources were then created in Canva. The educational materials contained sections on background and importance, risk factors, signs and symptoms, and the role of coaches, with the self-guided module containing a higher level of detail. The resources were reviewed and approved by Dr. Chantal Rozmus, former child and adolescent psychiatry fellow at University of Iowa Hospitals and Clinics and current psychiatrist with Unity Point. The final products were then transformed into websites for ease of distribution. Please see links for final products.

Fast facts document: <https://eatingdisordersinfemalehs.my.canva.site/>

Self-guided module: https://www.canva.com/design/DAF5zuz9fS4/2CzOj4rXP-FwpX323Tnw/view?utm_content=DAF5zuz9fS4&utm_campaign=designshare&utm_medium=link&utm_source=editor

The links to the final products were shared via email with those who completed the needs assessment and submitted their email address, pre-existing connections to the IGSAU, all current athletic directors per gobound.com/ia/schools, the IGSAU general email account, and the executive and associate directors of the IGSAU.

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Assessing Outcomes

To evaluate for perceived accessibility, usefulness, and impact of the educational resources, a Qualtrics survey containing the questions listed below was created. This was attached to the end of each resource in the form of a QR code. Informal, anecdotal feedback was also accepted.

1. *Which resource(s) did you utilize?*
 - a. *Quick facts sheet*
 - b. *Self-guided module*
2. *I found the resource(s) I utilized to be useful.*
 - a. *Strongly agree*
 - b. *Somewhat agree*
 - c. *Neither agree nor disagree*
 - d. *Somewhat disagree*
 - e. *Strongly disagree*
3. *I have a better understanding of disordered eating after utilizing the resource(s).*
 - a. *Strongly agree*
 - b. *Somewhat agree*
 - c. *Neither agree nor disagree*
 - d. *Somewhat disagree*
 - e. *Strongly disagree*
4. *I am more likely to utilize prevention, recognition, and intervention strategies after utilizing the resource(s).*
 - a. *Strongly agree*
 - b. *Somewhat agree*
 - c. *Neither agree nor disagree*
 - d. *Somewhat disagree*
 - e. *Strongly disagree*
5. *Additional feedback, thoughts, questions, comments, and concerns.*

Institutional Review Board Approval

Of note, the proposal for this project was submitted to the University of Iowa Human Subjects Office for human subjects research determination. Based on this determination, institutional review board approval was not indicated.

Resources and Support

The following resources and support persons were utilized during project execution.

1. References as below, identified via InfoHawk+
2. Books listed above, recommended and provided by Kari Dudley, Behavioral and Mental Health Social Worker at University of Iowa Hospitals and Clinics
3. Samantha Ziemba, Service Distinction Track Director
4. Andrea Weber, MD, MME, Clinical Associate Professor of Psychiatry, Clinical Associate Professor of Internal Medicine at University of Iowa Hospitals and Clinics
5. Chantal Rozmus, DO, Board Certified Psychiatrist at UnityPoint Health

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6. Barb Schwamman, Iowa High School Athletic Association Board of Control Member, Superintendent of Osage and Riceville Community School Districts
7. Katherine Priske, City High girls Cross Country Assistant Coach, Writing Program Director at Carver College of Medicine
8. John and Eloise Mountain Wright Mini-Grant for Service to the Community
9. Kelly O’Berry, BS, CIP of the Human Subjects Office at University of Iowa
10. Jean Berger, Executive Director of the Iowa Girls High School Athletic Union
11. Ighsau.com
12. Gobound.com/ia
13. Qualtrics
14. Canva
15. Social media sites including Twitter, Facebook, and Instagram

Findings

Needs Assessment Results

There were 108 responses to the needs assessment survey. A wide distribution in age was appreciated, with all age groups represented and 53% of respondents falling between 31 and 40 years of age. 56% of respondents identified as male.

All coaching sports and classes were represented. Please see *figures 1 and 2* for distribution.

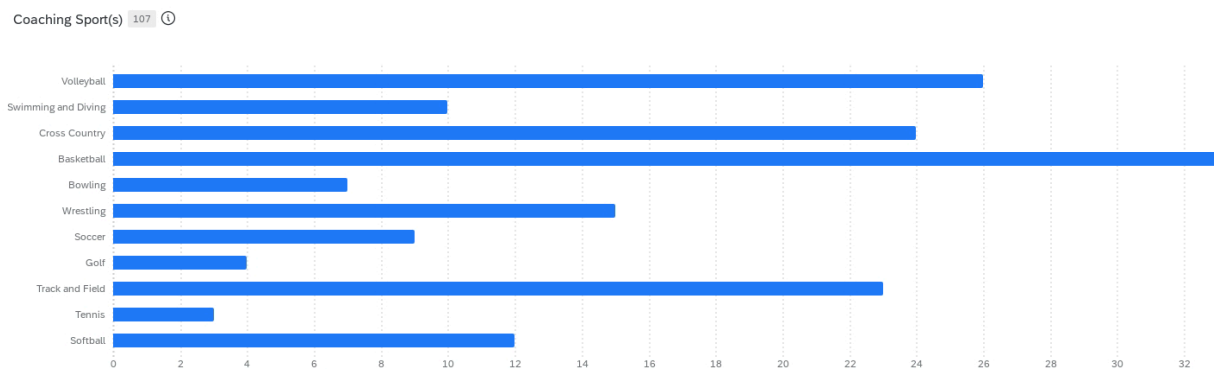
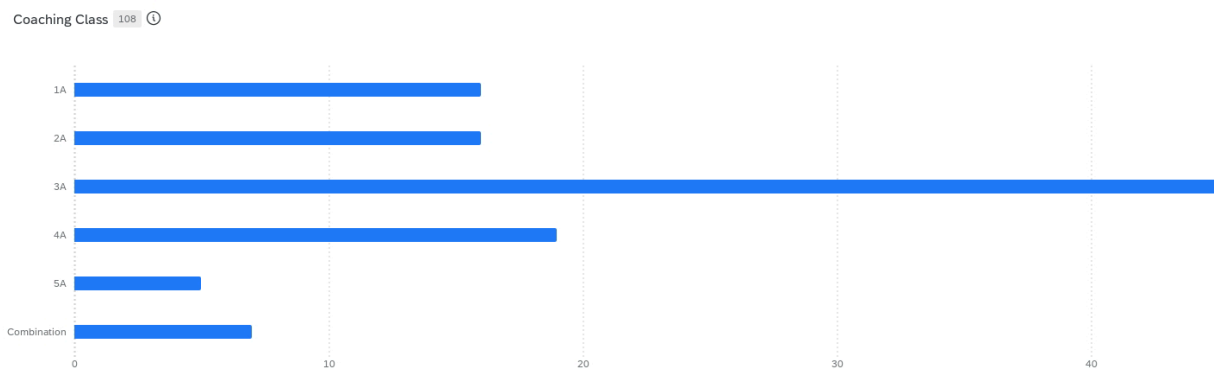


Figure 1: Distribution of Coaching Sport per Needs Assessment



A majority of respondents (90%) reported their highest level of education as completion of an associate degree, bachelor's degree, or master's degree. 53% of coaches held a coaching endorsement, while 46% held a coaching authorization.

82% of respondents reported receiving mental health training at some point during their education, with 65% receiving education on eating disorders specifically. Of the 108 coaches, 49% and 51% reported receiving education on mental health and eating disorders, respectively, through the IGHSAU, and 60% and 46% were aware of mental health and eating disorder resources, respectively, available to them through the IGHSAU.

With regard to specific eating disorders, coaches reported awareness of and basic understanding of anorexia nervosa (88%), bulimia nervosa (85%), and binge eating disorder (85%). 72% of coaches reported a history of coaching a player with one or more of these diagnoses as confirmed by a professional, and 79% of coaches reported believing that they have coached players with a clinical eating disorder that had not been confirmed by a professional.

87% of respondents agreed that they felt it was part of their responsibility as a coach to have a basic understanding of disordered eating, take action to prevent this in their athletes, observe for indications of disordered eating, and intervene when necessary. 75% reported utilizing prevention strategies, 92% reported knowledge of risk factors for disordered eating, and 91% reported awareness of signs and symptoms. Please see figures 3 and 4 for the frequency with which coaches evaluate for these indicators. 91% of coaches reported comfort with intervening, should concerns for disordered eating arise.

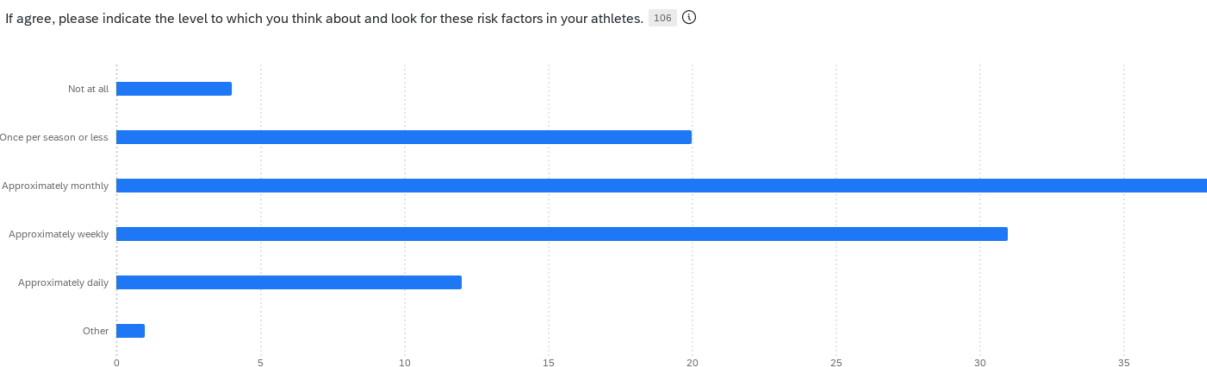


Figure 3: Frequency of Evaluation for Risk Factors of Disordered Eating

If agree, please indicate the level to which you think about and look for these signs and symptoms in your athletes. 108

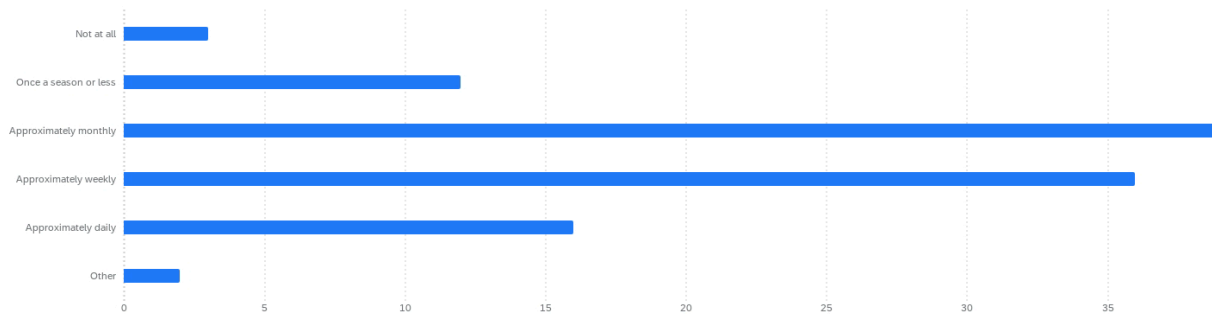


Figure 4: Frequency of Evaluation for Signs and Symptoms of Disordered Eating

With regard to the use of educational resources, a majority of coaches (92%) reported that they would utilize an educational resource on eating disorders at least yearly, with 32% reporting each season, 23% reporting monthly, and 15% reporting weekly. The amount of time that coaches felt appropriate to spend on such a resource varied widely, with a mode of 21-30 minutes. Please see *figure 5* for distribution. Similarly, the preference for format of educational materials varied, though a 1-2 page flyer or handout in electronic form and a self-guided module were most commonly chosen. Coaches communicated preference for resources to be distributed via email (68%) or via the IGHSAU website (41%).

What would you define as a reasonable and practical amount of time that you would spend reviewing a resource on disordered eating behaviors and clinical eating disorders? 108

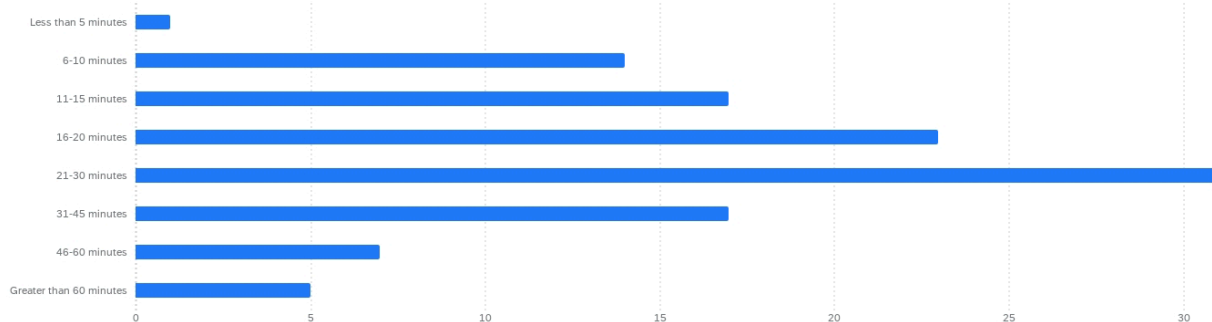


Figure 5: Amount of Time Deemed Appropriate to Spend on an Educational Resource on Disordered Eating

Resource Feedback

Unfortunately, despite allowing two months for resource utilization and feedback submission, no formal feedback was provided via the Qualtrics survey. However, informal feedback was provided to the author via email and via word of mouth. Feedback included thanks and positive praise for identifying a gap in coaches' knowledge, concern for the recent addition of wrestling to the IGHSAU sport list and associated risk of eating disorder development without proper prevention strategies, sharing of personal stories and how the resources will improve similar situations, notification that the resources will be utilized during staff meetings, and requests for in-person presentations to students at high schools within the state.

Analysis

Needs Assessment

The needs assessment successfully obtained insight from coaches of all sports and classes. When comparing the results of the needs assessment with the data identified via literature search, a larger portion coaches that completed the assessment reported knowledge of risk factors, signs, and symptoms of disordered eating. However, coaches reported similar exposure to educational programs on disordered eating and awareness of relevant resources available to them when compared to the results of the study conducted by Turk et al (Turk et al., 1999). Notably, less than half of respondents had knowledge of resources on eating disorders accessible to them through the IGSAU, demonstrating a gap in support.

A significant majority of respondents reported experience coaching individuals with eating disorders as confirmed by a professional, as well as belief of coaching players with undiagnosed eating disorder. These findings indicate the high prevalence of eating disorders in female athletes in the state and the need for staff with understanding of disordered eating that can work to improve the mental and physical safety of these individuals. Coaches' use of prevention strategies, evaluation of risk factors, signs, and symptoms, and comfort with intervening was significantly higher than expected. The percentage of coaches who reported taking these actions was higher than the number of coaches reporting familiarity with each clinical eating disorder and completion of training on mental health during their education. While the reasoning for this discrepancy is unclear, it is likely that response bias influenced the results.

With 87% of coaches agreeing that they felt responsible for having a basic understanding of disordered eating, taking action to prevent this, observing for indications, and intervening, in addition to 92% of coaches reporting that they would utilize an educational resource regularly, the need for and utility of educational resources is demonstrated.

It is also important to acknowledge that the method for dissemination of needs assessment (via personal network and social media) likely introduced additional bias, including sampling bias and nonresponse bias.

Resource Feedback

Given the lack of formal feedback, it is not possible to draw concrete conclusions about the usefulness and impact of the educational resources. However, a positive impact on the community can be appreciated based on the informal feedback. Acknowledgement of addressing gaps in knowledge from coaches themselves, notification of the educational resources being utilized in formats other than independent learning (ie. staff meetings), and inquiries for additional education in the form of formal presentations indicates that this project provided education in critical areas that were otherwise lacking and that the target population is utilizing the resources and seeking to further develop their understanding of the topic. Given these things, the author would feel comfortable deducing that coaches are utilizing and learning from the resources created and deeming this project a success.

Challenges

There were two significant challenges faced during the execution of this project: difficulty establishing a formal partnership with the IGHSAU and determining need for IRB approval. With regard to forming a partnership with the union, the author had a meeting scheduled with the executive director prior to the submission of the proposal. After that meeting fell through, communication ceased, and after a few weeks the author made the decision to adjust the methods with hopes to achieve the same goals. This pivot relied heavily on the author's network, which included members of the Iowa High School Athletic Association (the IGHSAU male counterpart), multiple coaches within the Iowa City area, and coaches throughout the state. Thankfully, this network was more than willing to assist with the needs assessment and helped distribute the assessment to a subset of the coaching population that successfully represented all sports and classes.

In terms of IRB approval, the author was not anticipating this to be required prior to receiving feedback on the project proposal. Following this, a human subjects research determination (HSRD) form was completed and submitted, and this initially stated that IRB approval would be needed. The author then completed principal investigator training, a requirement for IRB proposal submission that takes significant time, and began the IRB proposal. When questions regarding the proposal arose, the author reached out to the Human Subjects Office for clarification, at which time the high likelihood of the HSRD being incorrectly marked as needing IRB approval, something that had been occurring in the office as of recent, was identified. The author then re-submitted HSRD based on feedback from the office, and it was ultimately decided that IRB approval was not needed. This process resulted in a multiple month delay that was not initially anticipated, limiting the amount of time that coaches would have access to the resources and be able to provide feedback.

Another challenge faced during this project was determining how to distribute the resources created to coaches, given that the IGHSAU website was not an option and that the size of modules typically exceeds what can be attached to an email. When evaluating programs that could be utilized to create the online module, it was discovered that Canva has the ability to transition projects from PDF/document and presentation to individual web pages. This was felt to be the best option, given ease with distribution of links via email and various platforms. Additionally, it was felt that a link would be easily posted on web pages and could be utilized by the IGHSAU in the future, should the union be interested in sharing this with current and future coaches.

The last notable challenge that was faced was limiting the project based on capacity and having to say no to requests to expand the project. In an ideal world, it would have been preferred to add on an in person educational session at a coaching conference and have the capacity to say yes to requests to come and speak to students. However, given the issues clarifying need for IRB approval and time constraints, these additional projects were not attainable.

Sustainability and Future Directions

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Given that the educational materials have taken the form of websites, they are generally self-sustaining assuming accessibility is maintained. Upon distribution of the resources to the directors of the IGHSAU, the author was notified that the union is in the process of establishing a sports medicine advisory board committee. Once finalized, the directors plan on sharing the resources with the committee for evaluation and recommendation on implementation within the IGHSAU. It is hoped that the committee will approve the resources being added to the union's website, which will add to the sustainability of the project. In order to ensure that the information contained in the modules is appropriate, safe, and up to date, the modules should be reviewed annually. This may be completed by the current author (see future plans in personal reflection below) or could be passed on to another medical student in the service distinction track.

There is a myriad of potential future directions for this project. These include, but are not limited to, follow up evaluation of the impact of the educational resources, the creation of an in-person educational session to be delivered at a state-wide coaching conference, leading discussions on disordered eating for high school athletes in schools throughout the state, modification of the resources to allow utilization by the Iowa High School Athletic Union (targeting male high school athletes), the creation of a longitudinal educational curriculum for either coaches or athletes as described in the literature, the formation of an evidence-based pre-season screening tool to be utilized by the IGHSAU, and translation of these resources to organizations beyond the state of Iowa. Once again, these projects may be pursued by the author or may be handed down to another medical student. Regardless of which future directions are pursued, there is potential for significant positive change.

Personal Reflection

This project was an absolute joy to carry out. I am extremely grateful for opportunity to care for the patient that introduced me to disordered eating, exposed my interest in the topic and caring for individuals experiencing clinical eating disorders, and inspired this project. I am also thankful for the opportunity to have positively impacted athletes in the IGHSAU across the state, as this community was a large part of my identity during my high school years.

This project and the distinction track have taught me so much about myself and my role as a physician. First, I continue to be inspired and motivated by positive change occurring within the community, despite working within a system that regularly does not prioritize and share this value. No matter the challenges faced during this project, I continued to find happiness and peace in the work given the importance of the cause and the inspiration it provided. I appreciated that contributing to this work provided rejuvenation and gave me fuel to get through some of the more difficult aspects of medical education.

Second, I learned that a majority of an individual's health is determined outside of hospital walls and appreciated that the impact that interventions within the community can have. This resulted in a change in thought processes and motivation to better understand community-based initiatives and interventions, which would allow me to refer patients to appropriate services and identify gaps in support. This project would serve as an example of a community

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based intervention that addresses a gap in support and has the potential to positively impact the health of adolescents.

A relatively obvious discovery that I made during core year and throughout my time working on this project is my passion for mental health and the integration of mental health services into primary care and the community. Since this realization, I have been intentional about adding additional mental health training into my education (ie. harm reduction, X waiver training, various electives) with the goal of integrating this into my future practice.

Similarly, throughout my time with the track I have furthered my passion and commitment to care for underserved populations. I have witnessed heartbreaking, frustrating situations when working with patients from these populations (notably those without insurance, experiencing transportation barriers, with food insecurity, with financial instability, from non-dominant cultures, and experiencing discrimination within the healthcare system) that I wanted so badly to be able to fix and that I struggled to process. These experiences ultimately pushed me toward advocacy and helped me develop skills in advocating for patients both individually and systemically.

In my opinion, though, the most important realizations are those surrounding the pediatrician I hope to become. The experiences mentioned above, in addition to my time on the wards, have significantly influenced my goals for my future practice. I hope to continue my work in service, community health, and health equity and weave advocacy into this work. In an ideal world, I would spend half of my time carrying out projects and research in this realm, with the projects dictated by the needs and voices of the community in which I reside, and half of my time in the clinical setting. Weaving in a balance of volunteering, both inside and outside of the healthcare setting, will remain a priority.

In evaluating potential residency programs, I searched for institutions that demonstrated shared commitments to these areas of medicine and had formal curriculums and tracks that would allow me to continue this work. Additionally, as I hope to be a provider who takes the time to truly appreciate the social determinants of health and barriers to care at play and address them when able, I was intentional about looking for programs with formal education on this topic. I sought programs with residents that felt comfortable addressing such concerns, with resident driven community-based initiatives, and with diverse patient populations. Given my growing passion for advocacy, I also looked for programs that would provide me with foundational knowledge in this area and had opportunities to practice these skills at multiple levels. It is my intention to utilize the opportunities available to me to continue service work and to build upon the foundational skillset I have developed throughout my time in the service distinction track. In summary, I hope to be a provider who takes the time to meet patients where they are, improves patient health both in and out of the hospital, works with the community to improve the wellbeing of all children, and finds remarkable joy in doing so.

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