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Silent Struggles: Relative Energy Deficiency in Sport (REDs) in Female Athletes

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ABSTRACT

Relative Energy Deficiency in Sport (REDs) is a condition caused by prolonged periods of reduced energy intake relative to expenditure, specifically in sport. Although estimates of prevalence vary, most of the athletic population likely suffers from REDs. This interview-based project examined the state of REDs knowledge, awareness, and practices in female athletes and those working with them. Female athletes were the primary focus given their relative absence from existing research. Results from this project suggest that most cases of REDs are caused by unintentional nutrient restriction with parents, society, and social media spreading poor nutrition information and behaviors that athletes eventually adopt. Identifying and treating REDs is complicated by the need for cooperation from athletes, who may be unaware of their inadequate fueling practices or are intentionally hiding their restrictive behaviors. Obtaining an official diagnosis is often a complex and lengthy process, with many healthcare professionals working together to exclude other potential medical conditions. Overall, this study suggests that at-large REDs education is necessary for athletes and those working with them. Additionally, implementing REDs screening practices, employing dietitians, and making support and similar resources available at sports institutions may decrease the prevalence of REDs and expedite the identification and treatment process.

Keywords: relative energy deficiency in sport, energy availability, female athletes, nutrition, sports medicine

Relative Energy Deficiency in Sport (REDs) describes a condition of impaired physiological functioning in an athlete resulting from prolonged low energy intake relative to expenditure. The International Olympic Committee (IOC) introduced this term in 2014 as an extension of the Female Athlete Triad, a "triad" of menstrual dysfunction and bone issues caused by inadequate calorie intake and, often, an eating disorder (Mountjoy et al. 2014, 1). Unlike the Triad, REDs can occur in both males and females and affects the normal functioning of nearly every bodily system. With this expanded definition to include males and a greater range of symptoms, more individuals can be diagnosed and treated. In fact, Rogers and colleagues (2021) found that 80% of surveyed athletes had one symptom associated with REDs and 37% had at least two. However, the estimated number of athletes with this condition varies greatly among studies, with estimates between 23% and 79.5% in females and between 15% and 70% in males (Mountjoy et al. 2023, 1073). Thus, more research is required to better understand exactly how widespread this condition is.

Special consideration was given to female athletes in this project given their relative absence from existing research. Although the number of studies with female or female athlete participants is increasing, they still make up only a small fraction of all research subjects (Cowley et al. 2021, 146). Females also have some notable differences in physiology compared to males, and the ability to use menstrual regularity to assess physiological function presents unique characteristics best considered separately. Finally, there are some gender differences influencing REDs onset, as well as challenges with treatment and identification, that primarily exist among women. Although sex and gender are separate categories, for the purposes of this project, females and women will be conflated. In discussing the menstrual cycle and other similar factors exclusive to female physiology, "female" refers exclusively to sex. However, in discussions about social norms, pressures, and other variables affecting women, "female athlete" refers to gender expression.

This project was intended to gauge current awareness, knowledge, and practices surrounding REDs, specifically in the context of those working with female athletes, such as coaches, athletic trainers, and dietitians at the high school, collegiate, and amateur levels. A focus was placed on the causes of REDs, the roles specific individuals play in the identification, diagnosis and treatment process, and challenges hindering identification and treatment of the condition. In this paper, I will discuss how most cases of REDs are unintentional in nature as well as participant perceptions of these causes. I will then describe the difficulties with identification and diagnosis of REDs, which prevents many athletes from receiving the care they need. Finally, I will conclude with the need for REDs education at large, especially for coaches, athletic trainers, and parents.

Background

REDs results from a prolonged period of Low Energy Availability (LEA) in the body. As an individual enters a prolonged state of expending more energy than is taken in, the body redirects energy away from processes regarded as unnecessary for immediate survival (Mountjoy et al. 2023, 1074). Eventually, this energy deficit becomes so great that LEA becomes problematic and overall health and well-being are affected, at which point the condition is called REDs (Mountjoy et al. 2023, 1074–75). Prolonged or problematic LEA can result in reproductive, skeletal, cardiovascular, gastrointestinal, endocrine, neurological, metabolic, and immune issues, as well as increased fatigue, pain interference, weakness, and thermoregulatory issues (Kroshus et al. 2018, 51-2; Langbein et al. 2021, 1559; Mountjoy et al. 2018, 688-91; Sims et al. 2023, 398). Females often present with menstrual

dysfunction or amenorrhea — a loss of menstrual cycles altogether — and many athletes experience a decrease in overall performance or training capacity. If not addressed, REDs has major implications for an athlete's health and their longevity in sport.

Athletes are predisposed to REDs due to their competitive nature and desire to improve in sport. Optimizing performance often includes attempts to modify nutrition and body composition, which can result in an athlete entering a relative energy deficient state. Social pressures may also contribute to desires to look a certain way or eat certain foods, thereby influencing nutritional behaviors that leave an athlete without adequate fuel for their endeavors. Overall, REDs awareness in athletes and those who work with them is necessary for identification and prevention of the condition.

Because REDs is a relatively new concept, it is not surprising that there is a widespread lack of knowledge and awareness of the condition (Kroshus et al. 2018, 54). In the last five years, however, there have been about 200 original research studies published on LEA/REDs and REDs knowledge among those working with athletes has increased (Lodge et al. 2022, 387-88; Mountjoy et al. 2023, 1073). This accelerated pace of research is promising, but there is still work to be done, especially in terms of education for those not in the research community.

Methodology

This project was designed to investigate issues I noticed as a female athlete competing at the high school and collegiate levels. Many of my teammates and competitors, as well as professional athletes and similar public figures, have struggled with REDs. These individuals suffered from injuries, burnout, and mental health issues, and too many quit the sport they loved because they had so many health and performance issues that seemed unexplainable. Only recently, with an increased focus on REDs in media and literature, has awareness of this condition and its prevalence begun to grow. In hopes of learning more about and emphasizing the need for REDs education, I chose to focus on this topic for my senior capstone project.

Seven participants were interviewed for this project: an athletic trainer at a college in western NY, a track and field coach at a college in Ohio, an assistant softball coach and eating disorder mentor at a college in western NY, three registered dietitians in western NY, and a sports medicine physician based in Massachusetts who works primarily with female athletes and conducted athlete-related research. All participants were female except for the track and field coach. Four of the interviews took place in person, and three were conducted virtually due to distance constraints. Three out of the four in-person interviews were conducted in the office where the individual worked, and the fourth interview took place in a reserved conference room at the library of the college where the dietitian lectured.

One participant was introduced to me in person through a contact at my institution, two individuals were referred to me via a shared email, and most other individuals were referred to me by participants in this project. One participant was contacted via information provided from a research paper she co-authored on female athletes and REDs. All participants not recruited in person were first contacted via email, and all communication regarding project information was also sent via email. At the time, no participants were affiliated with my institution or were individuals I had worked with in the past.

Each participant received one questionnaire via email after they had agreed to partake in an interview. This questionnaire consisted of five questions: a description of their occupation, the length of time they had worked at their current location, how their job put them into contact with female athletes, whether they had heard about REDs prior to this project, and if they had any additional questions or comments for me. Participants were informed that the questionnaire and all questions were optional; the length of their responses was also for them to decide. Three participants did not send in questionnaires with two saying they had forgotten to send them back.

Each interview was semi-structured, the most common qualitative interview style in health-related research (DeJonckheere and Vaughn 2019, 1). This structure allowed for an

adherence to desired themes while allowing for flexibility and adaptability depending on participants' responses (Ruslin et al. 2022, 2). Semi-structured interviews were also chosen because they are the preferred method for investigating the unique thoughts, beliefs, and experiences of individuals, the primary goal of this project (Adeoye-Olatunde and Olenik 2021, 1360; DeJonckheere and Vaughn 2019, 1). A short interview guide was developed and memorized prior to starting the interviews to ensure the desired topics were discussed with each participant.

Each interview addressed several common themes: a more detailed explanation of the job and responsibilities, estimated prevalence of REDs in athletes that participants work or interact with, what the participant recognized as REDs symptoms and related behaviors, familiarity with treatment, difficulties that could arise during the identification and treatment process, and resources available to athletes that directly or indirectly related to REDs. Each participant was also asked questions specific to their field, such as coaches and REDs risk among athletes, dietitians and nutrition myths and difficulties dispelling them, and the sports medicine physician and medical questions about the diagnostic and treatment process for REDs. Ultimately, the goal was to develop a general understanding of the awareness of different professionals about REDs, their thoughts on their diagnosis and treatment, and why some athletes struggle with the condition. Subsequently, I hoped to be able to recognize any patterns between participants' experiences and compare this to existing literature. The semi-structured interview structure allowed new ideas and themes to emerge and to adapt for participants who did not want to address certain topics or were unfamiliar with them.

Following the interviews, each conversation was summarized, transcribed, and sorted according to major topics: participant REDs knowledge, prevalence, diagnosis, treatment, nutrition, and other common issues. All participant responses to the prepared questions were summarized, and the most relevant quotations were extracted and listed below the topic. Following analysis of individual interviews, participants were grouped according to occupation to analyze trends in major themes, with comparisons made within and across occupations. Then, the themes themselves were analyzed for patterns or inconsistencies and compared to information found in the literature.

Missing from the project are direct perspectives from female athletes who have REDs or have experienced it in the past. This demographic proved particularly difficult to find and recruit, as individuals needed to be open and vocal about their condition. Instead, recruited participants were asked to recount what they had been told by female athletes to try to address this shortcoming.

Fieldwork and Findings

Unintentional Nutrient Restriction

Nearly all participants agreed that most cases of REDs developed from unintentional nutrient restriction. Participants were asked whether they thought most cases of REDs or poor nutritional behaviors were intentional or unintentional, and there was a unanimous consensus that many of their athletes were misinformed or unaware of their nutritional needs.

Sports medicine physician Dr. Wiley explained that many of the female athletes she sees exhibit a "lack of knowledge of how to eat for sport, and once they get the proper knowledge, they kind of recover really quickly." Most of this knowledge comes from social media, which provides information that is often false or misleading and rarely evidence based. This misinformation eventually contributes to energy imbalances and physical issues in athletes.

Both coaches agreed that many of their athletes do not understand their nutritional needs and frequently fail to meet them. When asked about his experiences with athletes, Robert, a collegiate track and field coach at a Division III university, said, "I would even say more people are restricting calories in a damaging way unintentionally than intentionally, but there is absolutely an intentional calorie restriction group who I have to pay closer attention to." Assistant softball coach Taylor, who also works at a division III college and who mentors female athletes with eating disorders, believes that many athletes

fail to eat enough unintentionally. She explained, "I don't think a lot of people understand that we all need adequate fats, proteins, carbohydrates, and I think, with athletes especially, they don't realize how much their bodies are burning, calorie-wise… it doesn't always have to be this 'pure,' 'clean' food." Athletes often try to eat a healthy diet, although a preoccupation with eating the "right" foods may be detrimental because of how difficult it can be to obtain sufficient calories from high-fiber items such as fruits, vegetables, and whole grains.

Jamie, an assistant athletic trainer and eating disorder mentor, presented her own thoughts on why most cases of REDs in female athletes are unintentional: "they just don't understand how to eat properly because their parents pretty much have done everything for them," and sometimes "they just forget to eat or forget to pack stuff for them throughout the day." Many of these athletes improve their nutrition behavior and, by extension, their REDs symptoms, once someone brings awareness to their inadequate fueling practices.

All three dietitians echoed these ideas of poor nutrition knowledge and related misconceptions, saying that many of their clients need to be educated on their specific nutritional needs as female athletes. Aubrey, a registered dietitian working at a larger orthopedic clinic, discussed the impact of social media on nutrition misinformation: "coming from the world of TikTok, there is so many… at least anecdotal evidence of, 'oh, if you eat this way, these are the results.' That's not how it works for all bodies." Kara, a registered dietitian for over 23 years who recently opened her own practice, discussed female athletes comparing themselves to "standards in the media" regarding what they should be eating. These individuals are "just not aware of how much they really need," and many of them consequently develop REDs.

Similarly, Emma, a registered dietitian with a female athlete-focused business, discussed how social media influences poor nutrition behaviors. Many clients "emulate professional athletes," trying to both look and train like them, which can be problematic because "there's the pressures to be like them if you want to perform well, but you also don't know what's going on behind the scenes." These snapshots of a successful athlete's life may motivate others to train and eat like that individual, but this does not mean that a celebrity's lifestyle should be copied: "some bodies are going to be more resilient to stress than others, and they'll be able to run 80-mile weeks and not eat enough for a longer time because they have some genetic predispositions to have more resiliency." For many athletes, especially those still developing, adopting this high volume of training while limiting food intake can lead to severe health consequences. Following what others are doing on social media also contributes to the issue of how "people aren't taught to listen to their body's feedback," which frequently results in undereating.

An individual's environment and misinformation from family members also contribute to poor nutritional intake and unfamiliarity with one's nutritional needs. Some common issues in Aubrey's clients include dieting messages from parents, grandparents, and overall society. There is a prevalent misconception that as female athletes, "we've got to be thin. We've got to be lean […] the less we eat, the less we weigh. The less we weigh, the faster we are, the more fit and more healthy we are." Sometimes, parents are dieting or have done so for a prolonged period, and this habit of restrictive eating often becomes instilled in their children. Emma explained that parents' relationships with food and culture contribute to food choices, and Kara described how many parents are focused on feeding their children "clean, healthy eating and organic foods and things like that that it can certainly predispose kids to wanting to focus on that so much that they're just really not even able to get the energy that they need." Not only is this problematic for growing, active children or adolescents, but once these individuals leave home or must feed themselves, they often model their nutrition on childhood patterns. In collegiate athletes, this may further predispose them to REDs, if they have not already developed the condition. Thus, even well-intentioned parents may adversely affect their children's health if they are not cognizant of their athletes' high energy requirements.

Sports-related pressures may also contribute to behaviors initially perceived as harmless ways to improve performance but that ultimately cause health issues and performance declines. When prompted to discuss some of the misunderstandings among athletes surrounding sport and nutrition, Robert described "the women's team who are under social pressures to be, 'smaller, smaller, smaller.'" This desire to be smaller can lead to restriction and potentially even an eating disorder, especially if others with problematic eating behaviors are used as models. Robert mentioned another "misconception that, 'oh, protein is taking care of all your recovery needs,'" further suggesting a lack of sports nutrition knowledge in athletes.

Taylor, another coach, explained that "sometimes, the pressures of sports themselves and the pressures that some coaches can put on athletes of performance" contribute to poor nutrition behaviors, usually in the form of calorie restriction. Restrictive behaviors are difficult to work with because distinguishing between the effects of poor nutrition knowledge and disordered eating patterns can be difficult, with the former sometimes causing the latter. Because of misinformation and pressures put on athletes by influential individuals, an athlete may follow others' recommendations with a false sense that what they are doing is healthy, or they may experience disordered eating thoughts. Determining what is contributing to inadequate food intake is complicated, especially since both types of problems can be present and act synergistically.

Deducing whether unintentional nutrient restriction, such as that caused by poor nutrition knowledge, is the reason for REDs often involves educating the athlete on proper fueling behaviors and subsequently following up to see if their symptoms have improved. Those who only lack knowledge are often easier to help and experience a more rapid recovery, but, according to Kara, "sometimes, if you're trying to work through more disordered eating patterns or some athletes might be fearful of what changes will happen if they do start adding more fuel," it can become a more complicated process. Dr. Wiley also explained that "individuals who have had REDs for a long amount of time have [an] underlying eating disorder or disordered eating associated with it or have more severe energy deficiency," and "sometimes, they need a lot of support." Duration should therefore also be considered when trying to figure out the cause(s) of REDs in an athlete. Because knowing whether an energy deficit has developed intentionally or unintentionally can lead to more effective treatment and faster recovery; it is advantageous to determine why an athlete is struggling with nutrition in the first place.

Finally, the possibility of food insecurity should be addressed. Aubrey brought this issue to my attention with her consideration of "does this person actually have access to food?" while working with under-fueled athletes. Financial or environmental constraints were not mentioned by other participants so this may not be a common issue in the female athlete population, at least in those individuals these participants encounter. However, those who cannot afford food or those with access to limited foods will deal with the same health consequences from REDs. Although these individuals will need different types of support, the possibility of food insecurity should be explored.

Difficulties with Identification and Diagnosis

Identifying athletes with REDs is difficult because, medically, it is a diagnosis of exclusion. Dr. Wiley offered some insight into the evaluation of an athlete with potential REDs: "laboratory testing to exclude a lot of different things and make sure that the labs look consistent with REDs. We usually get a DEXA scan to look at bone health, so bone mineral density, and then we look at body composition along with that." If results are consistent with another medical issue, additional testing is performed to determine whether that condition is responsible for the athlete's symptoms. Only once all other conditions are ruled out — anything from relatively common issues like polycystic ovarian syndrome to rare brain tumors — a physician may then diagnose an athlete with REDs. However, the possibility of overtraining remains because "clinically, it's probably hard to distinguish one thing from the other thing clearly." At this point, a registered

dietitian usually gets involved given that "you have to rule out REDs to say, 'okay, we think this is overtraining,' because you need to exclude that people are under-fueling."

By the time an athlete has received an official diagnosis, they will likely have seen multiple health professionals and spent a fair amount of time and money. With the diagnosis process being so complex and lengthy, initially consulting with a dietitian to prevent or identify REDs may be a worthwhile decision, a statement most participants supported. Aubrey suggested that, for athletes suspected of having REDs, it is "best to refer to a dietitian because they're more adept at assessing" for this energy deficiency. Kara expanded on this idea, saying, "I'm not really sure that a lot of physicians yet would pick up on it as well as we would as dietitians because we are so focused on what you're eating and kind of crunching the numbers to see if it makes sense based on your workload." Both dietitians proposed that others take advantage of their knowledge and training, which focuses on assessing an individual's nutrition status, comparing it to their needs, and then educating and guiding them towards meeting their goals. That way, an athlete can more quickly discover if they are in a relative energy deficit, regardless of their symptom severity.

Dietitians are also vital additions to collaborative care teams which Aubrey regarded as necessary for best patient outcomes. She described the potential of such an integrative team, saying, "after my first encounter with someone who's either struggling with relative energy deficiency or disordered eating or even a diagnosed eating disorder, I try to make it a point to [...] call their primary care and say, 'hey, here's who I am. Here's what we're working on.'" Throughout our conversation, she repeatedly emphasized the value of collaborating with other health professionals, especially with those with the insight a registered dietitian could provide, "if I thought it was more of like an anorexia nervosa or an OSFED situation, I would collaborate with their doctor a little bit more to actually get that diagnosis, because that allows us to, if needed, further their care." Dietitians can supply a patient's care team with important information, which may improve that individual's care and expedite diagnosis. In Aubrey's opinion, "being integrative, I think, is the way to go and I think gives doctors a little break too." Dr. Wiley presented a similar idea. Registered dietitians, especially sport dietitians, are well-equipped to analyze nutrition status, and making them part of medical care teams, at least for REDs diagnosis, can save everyone valuable resources and time.

Kara, similarly, does not hesitate to refer athletes out to other professionals if she suspects that a client requires care she cannot adequately provide. For her, "a lot of injuries, the period stuff, and mood and things like that, and just- like I said, just struggling to kind of follow through on suggestions. Those would be things that would spur me to ask for more help from others." Such symptoms are usually associated with more pressing health concerns and may indicate the presence of other health conditions, whether related to REDs or not. Regardless, early recognition of these warning signs will lead to faster recovery and better prognosis for the athlete. Consequently, even if medical professionals are not in continuous communication with a dietitian, having an athlete consult with one can lead to earlier identification and treatment of health issues such as REDs.

Some athletes actively hide problematic behaviors, further hindering identification of REDs. Emma described how some athletes "hide certain behaviors or hide issues that they're struggling with that they might not be open about." There are different reasons for this, many motivated by fear of change or of speaking to others about their concerns. "Are you going to tell a male coach that you don't have your period? Hit or miss. Are you going to tell a male coach, or even a female coach, that you're struggling with disordered thoughts or a full-blown eating disorder?" Such questions expose potential difficulties faced by athletes, with power dynamics dissuading them from talking about their personal struggles to authority figures such as coaches. Emma's point also brings awareness to how female athletes may feel less comfortable speaking to male coaches, who occupy most coaching positions. Overall, refusing to acknowledge or speak

about psychological and/or physiological issues results from a lack of "willingness and readiness to make changes because, if there's any resistance and they're not there, it doesn't matter if it's the best dietitian or doctor or coach; it's hard. You really can't force people to really make those changes."

Because of my conversation with Emma, I asked subsequent participants whether they experienced athletes hiding certain behaviors. Kara explained that some athletes have trouble implementing necessary changes to recover from REDs, complicating both identification and treatment. For such individuals, "maybe it's just that they don't want to gain weight or feel like they ate too much or feel bloated or… Yeah, just a whole host of things, I guess. And yeah, there can be hiding, for sure."

Jamie described how she approaches athletes who may have a fueling issue: "I have a lot of kids food-journal if I think that they're having a problem. And, usually, the kids that don't want to do it for me or the kids that I have to worry a little bit more about because they're actively, like, hiding what they're doing." Here, Jamie first raised the concern of athletes actively hiding their restrictive eating habits, further suggesting that this was a relatively common issue. Jamie offered a specific example of a female athlete who did not want to address her disordered eating behaviors. After a collaborative effort was made by the eating disorder committee to speak to the athlete, "she ended up transferring and it was just because she knew that there was going to be limitations on her, and she didn't want to deal with them." Prior to transferring, she had multiple severe stress fractures, "and when we put her in a walking boot for her one leg, I would go into our fitness center later in the day and I would see her studying on a stationary bike just so she could get some cardio in." Her psychological struggles contributed to a more severe case of REDs while also hindering treatment because of her refusal to discuss limiting thoughts and behaviors. Whether this resulted from a fear of having to stop or modify participation in sport or of what might happen if she started to eat more, such internal conflicts could make both identification and treatment difficult, especially when an athlete is not closely monitored.

There may also be gender differences for hiding behaviors or reasons why athletes hesitate to seek help. For Aubrey, "I think female athletes a lot of times, yes, there is that functional focus, but it's a little too internalized, right? Like, 'I won't be faster unless I'm thinner,' or 'I won't be this skilled unless I am like hyper-focused on my nutrition,'" whereas the focus for male athletes is "I want to be functioning better." This relates to societal pressures and expectations on women to be thinner, which can lead to an internalization of these ideas until an athlete eventually fears confronting this narrative. Jamie described similar experiences, "I definitely have just little offhanded comments, especially by some of my females that are just, 'Oh, well, so and so's so pretty, she's so skinny,' and 'Blah blah blah, well, I'm so fat, so I'm just not going to eat for the day.'" She also mentioned that male athletes express less such internalized behavior.

Conversely, Kara noticed that hiding-related behavior in her clients is "highly individualized." She explained, "I've had girls kind of come to me and I think they see it in themselves, but they're also very open to kind of talking about it and getting help." Generally, many of her clients are willing to work on changing their behaviors, but there are "some that are a little bit more… I think they recognize that it's an issue, but don't necessarily- are afraid and really scared to do what's necessary to kind of start to get them through the other side of that." Those actively seeking help may be more willing to share their internal struggles than someone who was reluctantly brought in which may explain some of the differences.

Weight stigma in healthcare providers also needs to be addressed as it prevents certain individuals from receiving the care they need. Dr. Wiley emphasized that "you don't have to look thin or look undernourished to have relative energy deficiency in sport." She acknowledged that "there used to be a lot of thought that if someone looked a normal weight or had a normal body mass index, or BMI — which is one way of assessing someone's in a normal weight range — that if that was normal, there's no way they could have this and that's just not true." Aubrey also noted the issue of "weight bias still in our medical system." As

part of her work, "I do a lot of counseling for people who, based on their weight and height, their BMI, would be classified as obese, right? So, a lot of times our first assumption is, 'oh, that person is overeating.' And I would say probably 80% of the time, that is absolutely not the case." Although this example is not specific to female athletes, it does highlight the importance of not judging someone based on their size. Aubrey further explained that "maybe that person has dieted so many times, or maybe they've just been told 'Oh, you're overweight, so you should eat less,' right? And now they're eating so much less that their metabolism can't even respond right to nutrition," leaving them suffering with the effects of both REDs and weight stigma. Kara commented that beyond medical professionals, most "would associate REDs based on what people read the clinical signs and symptoms are to be in a very young or underweight athlete, which is not always the case for sure." Consequently, care should be taken to avoid dismissing a REDs diagnosis based solely on an athlete's weight, as all body types can be affected by nutrient restriction.

With so many barriers hindering REDs identification and diagnosis, a protocol for diagnosing athletes would be helpful. In addressing this point, Dr. Wiley mentioned that "there's a new RED-S [*sic*] CAT2. And so, the REDs CAT2 is a clinical assessment tool to help screen for REDs, and it talks about how to do that at each level." This tool has been praised for providing more distinct criteria regarding REDs diagnosis and is promising even to dietitians. Emma was particularly excited about its potential, talking about how "the new paper and having a little bit more firm diagnostic criteria is going to be helpful to spot it in more individuals than just triathletes or runners." She further explained that "the 'green, yellow, red' kind of arrow is very helpful," referring to its REDs risk/severity categorization. The new screening protocol will likely help with identifying REDs in a greater number and variety of athletes while also providing recommendations for treatment and training modifications. However, Emma noted that "there still needs to be an MD on the team, which I think makes it challenging, like, because there's not a lot of sports MDs, there's not a lot who understand what a lot of sports dietitians do, at least in this area or who are collaborative." The need for a physician to consult with an athlete and be familiar with the diagnostic protocol can stall diagnosis, although Emma remarked that the CAT2 is "a very useful tool for, like, sports teams or maybe higher performing athletes." Although official diagnosis of REDs can only be given by a physician, and for good reason, the IOC REDs CAT2 may help others identify and refer potential REDs cases sooner.

Education is Essential

Overall, there is a general lack of knowledge on REDs. From what Dr. Wiley has seen in practice and in the research, "REDs is, we think, not well understood, often incorrectly treated, and so we're trying to create awareness within the medical community as well as the sports community." From my own fieldwork, I have also found there to be many misconceptions about REDs, both in participants and in their stories about others.

One participant was largely unfamiliar with the condition. When I asked Taylor about REDs symptoms she saw in athletes, she replied, "Because REDs- what does it stand for again?" After explaining the acronym to her, she asked, "and that used to be the Female Athlete Triad, right?" She then proceeded to explain, "so, I think that things I have been told is loss of period, lack of energy, had, like, cramping in their muscles when they were doing activities… What else…? Brain fog, tiredness… That's about it, all I can think of." From this brief exchange, it was clear that awareness of REDs was not universal, even among individuals who were well versed in eating disorders like Taylor. I then asked her why REDs may have been unfamiliar to her to which she replied, "I don't think there's been education. I don't think there's education about the Female Athlete Triad. I think unless you are interested in it, you're not going to know about it."

Taylor's lack of knowledge and subsequent reasoning was interesting because it reflected the concerns of other participants. Based on Kara's experiences, "I think that, professionally, people are more knowledgeable about it, but I think as parents and as athletes themselves, not so much." She talked specifically about the

lack of knowledge among high school coaches, likely because "many of them are volunteering, or they're doing it because their kids are playing and they're just not- might not have the time to be as up to speed on all of those other topics." Aubrey offered another possible reason for this knowledge deficit: "we get so inundated with messages for dieting that even a lot of adults don't really know how to fuel themselves," which can then lead to poor nutritional behaviors in athletes. In Jamie's opinion, particularly "with our older coaches, I don't think they understand it. And I don't think it's necessarily that they don't want to understand it, I just don't think that they get- especially, they don't understand the whole pressure of social media and stuff like that because they never grew up with it." A pressing need for REDs knowledge was also demonstrated by Dr. Wiley, who described common misconceptions about REDs:

> So, if your menstrual cycles look different than they once did, if they're spacing out, […] if your flow is decreasing, if you're missing menstrual cycles here or there, that's really something that should have a clinical evaluation. Again, there's a lot of different reasons that can occur, but REDs is one of them, and so, I think a lot of athletes, and potentially coaches, misunderstand that. And then there's been some really good research that people don't understand the association with bone health, which is one of the other things that is poorly misunderstood.

Thus, both in practice and in research, it appears that those who may benefit greatly from REDs knowledge — athletes, coaches, and others working with athletes — are also often unfamiliar with the condition and its warning signs.

A lack of widespread REDs knowledge is concerning because athletic staff, especially athletic trainers and coaches, are in a prime position to notice symptoms or changes in athletes suggestive of the condition. Kara inferred that "athletic trainers, or something like that, that are noticing a lot of injuries and things like that, might be picking up on it before a physician." In fact, Aubrey provided an example of this in practice, explaining how she had "gotten a referral from one of our athletic trainers for a female athlete who they kind of had a hunch was struggling with their nutrition in some sort of way: chronic injuries, very low energy, and maybe wasn't performing to the same level they were the previous year." That individual did ultimately have REDs. Jamie also demonstrated the value of REDs awareness, explaining how athletes she sees with the condition "start off becoming very fatigued, low energy, and their practices — it almost, like, mimics a blood sugar drop." Because these symptoms can have multiple causes, "I start asking more questions on what their eating habits are and what they're doing throughout the day or throughout the week to kind of narrow in on what I actually think that it is." These examples show how valuable REDs-educated athletic trainers can be, identifying athletes with the condition during daily treatments and observations.

Coaches are equally important to the identification process. Robert, who is familiar with REDs and its symptoms, explained, "I think coaching gives you opportunity to notice some early warning signs because before- for most people, before you get to any sort of like amenorrhea or bone density effect, you're just going to see delayed responses to stimuli and training." Such awareness is beneficial to both coaches and athletes, as it can prevent injuries and performance plateaus while avoiding the development of more severe health issues. Robert also noted, "I try to notice when someone gets faster really quickly, and it appears to me that it's coming from a loss of mass." Rapid weight loss is usually a sign of under-fueling and viewing it as something unsustainable with long-term consequences is a healthy perspective. Robert explained that such physical changes are "pretty noticeable to someone paying close attention, which is my literal job." The one caveat with weight changes is that he sees them primarily in distance runners, whereas other track and field athletes usually have less visible physical changes. In most cases then, paying close attention to general trends in practices and competition may be best for noticing early signs of REDs.

Because of the potential for athletic staff to notice REDs symptoms, Emma called for "better screening, better diagnostic, more, education for, if there's not a dietitian on staff, coaches, trainers, parents to be able to see the signs." Similarly, Kara emphasized that "all of the people that come in contact with athletes" should be familiar with "some of the signs and symptoms and what are some pathways that we can look to kind of help them." The importance of REDs screening was also acknowledged by Dr. Wiley and Aubrey, especially since athletes are, according to Aubrey, "usually seeing an athletic trainer or a doctor first." Awareness of REDs and implementation of screening practices increase the probability that an athlete with REDs will be identified earlier and that more athletes will be diagnosed.

Parents familiar with the condition can also prevent and identify REDs and support athletes. Because of their critical role in children's health, Aubrey explained that she does "a lot of counseling with the parent too, to help them understand, 'this is how much your kiddo needs, and here's why.'" Additionally, "parents can be great support systems because they live with the patient, right? They're kind of monitoring their care, they're providing nutrition." Such support can help an athlete overcome disordered thoughts around food and "hold them accountable" for eating properly. Consequently, parents can influence REDs treatment outcomes, whether positively or negatively. Aubrey noted that without parental support, "for a collegiate athlete, that makes it really tough," leaving the athlete to deal with struggles on their own or seek support elsewhere.

With athletes spending so much time together, REDs awareness in this population can help with prevention, identification, and support. Increased awareness through social media can also be advantageous, as evidenced through Dr. Wiley's description of how "we have a lot of high-level female athletes speaking out about creating equity in sport and focusing on things like mental health and relative energy deficiency in sport, whereas before, I feel like they used to not speak out against that." Hopefully, this shift in dialogue will prompt greater REDs familiarity throughout the athletic world.

Employing dietitians at athletic institutions will also benefit athletes and athletic staff, given their extensive nutrition knowledge and ability to recognize nutritional shortfalls in athletes. Access to a dietitian diminishes the need for athletic staff to have thorough nutrition education, and it can quell misconceptions among athletes. Robert admitted that when his athletes ask him "anything that goes beyond nutrient timing and general needs, I'm going to say, 'go to the dietitian,'" because the dietitian can provide more accurate information. He further explained that if he is "starting to see that what I expect, progress-wise, isn't kind of following the level that they're working out to, the first place we go is a meeting with our team dietitian." Such meetings can help to identify potential under-fueling and/or REDs, among other concerns. Similarly, Jamie talked how having a nutritionist on staff can be helpful, even without the specialized training of a dietitian: "we do have certain teams that understand that their teams are more prone to having issues, and they often will schedule the nutritionist to come meet with them." That way, athletes are more aware of what they need to properly fuel their bodies, decreasing the chances they develop REDs. However, the main challenge with employing a dietitian, as Taylor brought up, is the cost, particularly at small or poorly funded universities. Yet, with some education, such institutions may be convinced that a dietitian on staff is a worthwhile investment.

Finally, for ideal REDs identification and treatment outcomes, there must be a continuous line of communication between staff. Dr. Wiley said it best: "we want to collaborate because sports at the end of the day are a team-based approach." Participants unanimously advocated for increased communication between staff or healthcare providers, particularly those working at universities or integrated clinics. Robert argued that a "unified sort of communication effort between the athletic training room and the coaches can make a big difference because the athletic trainers are another person who might have the opportunity to notice" symptoms.

Although HIPAA limits what can be said, general information, such as an athlete coming in more frequently for treatment or having visible issues, may alert staff about potential REDs. Jamie is in a unique position to help athletes because she is "on an eating concerns committee, so I have a very good relationship with our Health Center, and what I do is anybody that I am concerned about, I will reach out to our nutritionist on campus and the people that are in our counseling center and kind of figure out how to best approach it." Although she does not give out sensitive information, individuals with suspected REDs are flagged, allowing staff to notice symptoms that may otherwise be overlooked. Even generally, having others looking out for an athlete's well-being is important because, according to Jamie, "there have been times where I've had either teammates come to me with concerns about their eating or their coaches coming to me and saying, 'I've just noticed so and so is really struggling in practice, I'm just wondering how we can kind of deal with this.'" Thus, as Taylor concluded, "more open communication with athletes, coaches, athletic trainers, just having more awareness, having more education about it, I think would be really helpful."

Project Implications

Results suggest that most cases of REDs in female athletes result from unintentionally poor nutrition behaviors, a conclusion reached independently by all participants. Misconceptions about nutrition and sport spread through social media, parents, and society all contribute to improper knowledge about fueling practices and consequently adverse behaviors. REDs identification is further complicated by many hard-to-notice symptoms, challenges with assessing dietary intake, and hiding of restrictive dieting behaviors. Obtaining an official REDs diagnosis is also a lengthy and complex process given its status as a diagnosis of exclusion requiring the collaboration of multiple health professionals. However, the new IOC REDs CAT2, with its diagnostic criteria and risk assessment and treatment guidelines, may help to identify REDs more quickly and clearly. Finally, knowledge and awareness of REDs is still lacking, with participants and those working with athletes having varying degrees of knowledge about the condition and its symptoms. Implementation of widespread REDs education protocols will likely prompt earlier identification and prevention of the condition, especially if athletes and athletic staff are its primary targets.

Participants discussed many REDs identification challenges described by other studies. Receiving an official REDs diagnosis requires tests such as lab workups and a DEXA scan to rule out other possible conditions, which can be costly in terms of time and money. Additionally, participants referred to the lack of specific REDs biomarkers and the need for individualized attention, similar to diagnosis difficulties found by Hooper et al. (2021, 6).

No participants reported measuring exact energy balances in athletes, which may be reflective of difficulties surrounding the use of or access to such technologies (Bowler et al. 2022, 463). All registered dietitians said that they performed a nutrition assessment to determine if a patient or client had REDs, although no specific details regarding this dietary analysis were obtained. Jamie, an athletic trainer, discussed how she used food-journaling to better understand an athlete's energy intake relative to potential needs. Unlike Moore and colleagues (2022, 994)'s finding of many athletes underreporting energy intake in their food logs, the main issue in Jamie's athletes were that they deliberately hid their restrictive nutrition behaviors.

Four other participants — the three dietitians and the assistant coach — similarly described some athletes hiding restrictive thoughts or behaviors. REDs-related psychological struggles, such athletes refusing to implement recommended dietary changes, were described by Fahrenholtz and colleagues (2023, 1) and Riviere and colleagues (2021, 6). Struggles to acknowledge or change behaviors emerged from pressures to look or perform a certain way and the desire to maintain improved performance following unintentional weight loss, thereby agreeing with the literature (Langbein et al. 2021, 1558-1561; Sims et al. 2023, 398). However, one of the dietitians provided an additional reason: female athletes

are sometimes intimidated by speaking to athletic staff, especially to male coaches about menstrual issues, leading to the persistence of silent struggles.

Inadequate fueling practices are primarily caused by a poor understanding of athletes' nutritional requirements (Baker et al. 2014, 171; Klein et al. 2021, 10; Riviere et al. 2021, 7; Skinner et al. 2021, 135). Participants emphasized the influence of social media on spreading misconceptions about what or how much an athlete should be eating and what an athlete should look like, agreeing with the conclusions of Klein and colleagues (2021, 11) and Trakman and colleagues (2019, 432). The influence of the online world causes female athletes to internalize messages of eating less and being thinner, and it can cause athletes to model unhealthy eating behaviors on that of influencers, potentially developing restrictive eating behaviors in the process. Social media also promotes body standards that are unattainable and unhealthy for most and simultaneously subjects athletes to marketing ploys designed to prey on their desires to perform or look a certain way (Spencer et al., 2021, 1). Although not necessarily described by participants, such advertisement strategies can also perpetuate nutrition misconceptions and fad diets, reminders of the social pressures acting on female athletes.

Additionally, participants discussed the critical role of parents, grandparents, and one's social environment in teaching young athletes about how to approach food and nutrition. Generally, parents serve as models for dietary choices, timing, and behaviors in their children, with nonexistent or extreme restrictive behaviors strongly influencing food acceptance practices (Mahmood et al. 2021, 6). Participants similarly discussed this trend, describing how athletes who grew up in households with restrictive dieting or with only "clean" foods tended to adopt these same eating patterns, thereby setting them up for a greater risk of REDs. However, some athletes also grow up experiencing food insecurity, resulting in food restriction because of financial reasons.

The idea that closely monitoring and restricting food is a necessary component of the discipline surrounding sport is also intricately connected to many of the restrictive behaviors and thoughts and nutrition misconceptions surrounding REDs. With discipline perceived as an integral part of training and performing at a high level, it can be easy for athletes to assume that this strict approach should also be taken with food (Stoyel et al. 2021, 6). An obsession with controlling food can then lead to psychological troubles, such as an eating disorder (Stoyel et al. 2021, 6). Body image struggles rely on a similar concept with athletes believing that discipline and performance are connected to the "ideal" body, an often unrealistic and harmful endeavor (Stoyel et al. 2021).

Social constructs of femininity can be equally damaging to female athlete health and well-being, especially when athleticism contradicts typical traits associated with femininity. Generally, masculinity emphasizes competitiveness, strength, and aggressiveness, all of which are key components of athleticism (Wellard 2016, 4). Similarly, the ideal male body type in Western society is muscular, often synonymous with athletic, whereas women are more commonly praised for being thin (Stoyel et al. 2021, 2). Here, female athletes are forced to reconcile two seemingly opposing identities in terms of appearance: a woman and an athlete.

However, even for those striving for an athletic body type, there is an additional problem: the "ideal" athlete will look different depending on the sport (Stoyel et al. 2021, 2). Many elite female athletes in traditionally male sports struggle with their identity as a female athlete, being critiqued for their muscular, masculine look in social contexts because it contradicts the typical feminine look (Devonport et al. 2018, 1132; Turelli et al. 2023, 212). Unfortunately, this sometimes dissuades those same athletes from doing certain training exercises necessary to improve their performance, solely because of how it will make them look (Turelli et al. 2023, 213). Even when an athlete does prioritize performance over aesthetics, they often experience shifts in body positivity and confidence depending on whether they are at practice or in non-athletic settings (Devonport et al. 2018, 1132). To compensate, these individuals will attempt to

emphasize their femininity in other ways, such as through clothing, cosmetics, or dieting (Devonport et al. 2018, 1132). Thus, when these internal struggles and social pressures are compounded with a society that has researched and set health recommendations primarily using male data, it is easy to see how female athletes can fall victim to external influences encouraging maladaptive patterns and beliefs (Thorpe et al. 2023, 5).

Overall, knowledge on REDs seems to be improving, although many still have a limited understanding of the condition. All but one participant was familiar enough with the condition to discuss it, although this may be the result of selection bias in participants. Even those with knowledge had varying degrees of it. Whether current knowledge and awareness are similar to that being described in recent studies cannot be concluded because of the small sample size, high probability of bias, and overall design of this project (Lodge et al. 2022, 387-88). REDs knowledge among athletes, as reported by participants working with them, is also poor, although additional data from athletes themselves is required. Athletes' lack of awareness may cause them to ignore potential symptoms, preventing early identification and contributing to a worse prognosis for the individual (Langbein et al. 2021, 1558). Weight stigma in physicians may also hinder diagnosis, preventing larger-bodied athletes from receiving REDs treatment sooner. This issue, described by Langbein and colleagues (2021, 1561), appears to persist, although its awareness is spreading.

The value of dietitians in preventing, identifying, and treating REDs was described by others (Bowler et al. 2022, 463; Hull et al. 2016, 4; Langbein et al. 2021, 1561; Ritson et al. 2023, 2; Torres-McGehee et al. 2021, 999). Dietitians can aid in the distribution of accurate nutrition information to athletes and staff, decreasing the need for athletic staff to seek out this knowledge on their own. Sports dietitians are particularly adept at assessing an athlete's nutritional needs and whether those needs are being met. These experts can act as a valuable resource by identifying early signs of REDs, helping athletes overcome unhealthy habits and thoughts regarding food, and offering support to those struggling to eat well for their sport. Ultimately, understanding the major internal and external contributors of REDs is necessary for identification, treatment, and prevention of the condition in female athletes.

Conclusion

These findings suggest that most cases of REDs are unintentional and are caused by misunderstandings about what a female athlete needs to fuel her training. Many misconceptions and problematic practices are spread by parents, society, and social media. REDs identification and diagnosis are hindered by its less obvious warning signs, its overlap with symptoms of other conditions, and athletes hiding or refusing to acknowledge their restrictive behaviors or symptoms. Overall, further education is required for most individuals working with female athletes, as well as for athletes and their parents, as this will help with prevention and identification of REDs. Future work advancing this project should focus on recruiting and interviewing female athletes with REDs to better understand their experiences. Additional coaches, athletic trainers, and physicians should also be interviewed to determine any trends in knowledge, behaviors, and attitudes

To help alleviate some of the knowledge gaps and aid with identification, athletic institutions should consider employing dietitians. Widespread REDs screening practices are also necessary, as many institutions lack screening protocols and therefore miss a valuable opportunity to identify athletes at risk for or suffering from REDs. Finally, to ensure best health and performance outcomes for athletes, increasing communication between all those working with athletes is needed, both in medical and sports-related institutions. By collaborating with others and having conversations about REDs, we can work towards ensuring a better future for female athletes, where those succumbing to societal pressures and misinformation are far in between and athletes can live a healthy, fulfilling life in sport.

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References

Adeoye-Olatunde, Omolola A. and Nicole L. Olenik. 2021. "Research and Scholarly Methods: Semi-structured Interviews." *Journal of the American College of Clinical Pharmacy 4*: 1358–1367.

Baker, Lindsay B., Heaton, Lisa E., Nuccio, Ryan P., and Kimberly W. Stein. 2014. "Dietitian-observed Macronutrient Intakes of Young Skill and Team-sport Athletes: Adequacy of Pre, During, and Postexercise Nutrition." *International Journal of Sport Nutrition and Exercise Metabolism 24* (2), 166–76.

Bowler, Amy-Lee M., Coffey, Vernon G., and Gregory R. Cox. 2022. "Sports Dietitian Practices for Assessing and Managing Athletes at Risk of Low Energy Availability (LEA)." *Journal of Science and Medicine in Sport 25* (6): 460–65.

Cowley, Emma S., Olenick, Alyssa A., McNulty Kelly L., and Emma Z. Ross. 2021. ""Invisible Sportswomen": The Sex Data Gap in Sport and Exercise Science Research." *Women in Sport and Physical Activity Journal 29* (2): 146–51.

DeJonckheere, Melissa and Lisa M. Vaughn. 2019. "Semistructured Interviewing in Primary Care Research: A Balance of Relationship and Rigour." *Family Medicine and Community Health 7* (2): 57.

Devonport, Tracey J., Russell, Kate, Leflay, Kath, and Jennifer Conway. 2018. "Gendered Performances and Identity Construction Among UK Female Soccer Players and Netballers: A Comparative Study." *Sport in Society 22* (7): 1131–47.

Fahrenholtz, Ida L., Melin, Anna K., Garthe, Ina, Hollekim-Strand, Siri M., Ivarsson, Andreas, Koehler, Karsten, Logue, Danielle, et al. 2023. "Effects of a 16-Week Digital Intervention on Sports Nutrition Knowledge and Behavior in Female Endurance Athletes with Risk of Relative Energy Deficiency in Sport (REDs)." *Nutrients 15* (5): 1082.

Hooper, David R., Mallard, Jared, Wight, Jeff T., Conway, Kara L., Pujalte, George G. A., Pontius, Kelsey M., Saenz, Catherine, et al. 2021. "Performance and Health Decrements Associated With Relative Energy Deficiency in Sport for Division I Women Athletes During a Collegiate Cross-Country Season: A Case Series." *Frontiers in Endocrinology 12*: 524762.

Hull, Michael V., Jagim, Andrew R., Oliver, Jonathan M., Greenwood, Mike, Busteed, Deanna R., and Margaret T. Jones. 2016. “Gender Differences and Access to a Sports Dietitian Influence Dietary Habits of Collegiate Athletes.” *Journal of the International Society of Sports Nutrition 13*: 38.

Klein, Dylan J., Eck, Kaitlyn M., Walker, Alan J., Pellegrino, Joseph K., and Daniel J. Freidenreich. 2021. “Assessment of Sport Nutrition Knowledge, Dietary Practices, and Sources of Nutrition Information in NCAA Division III Collegiate Athletes.” *Nutrients 13* (9): 2962.

Kroshus, Emily, DeFreese, J. D., and Zachary Y. Kerr. 2018. “Collegiate Athletic Trainers’ Knowledge of the Female Athlete Triad and Relative Energy Deficiency in Sport.” *Journal of Athletic Training 53* (1): 51–59.

Langbein, Rachel K., Martin, Daniel, Allen-Collinson, Jacquelyn, Crust, Lee, and Patricia C. Jackman. 2021. “"I’d Got Self-destruction Down to a Fine Art": A Qualitative Exploration of Relative Energy Deficiency in Sport (RED-S) in Endurance Athletes.” *Journal of Sports Sciences 39* (14): 1555–64.

Lodge, Melissa T., Ackerman, Kathryn E., and Jessica Garay. 2022. “Knowledge of the Female Athlete Triad and Relative Energy Deficiency in Sport Among Female Cross-Country Athletes and Support Staff.” *Journal of Athletic Training 57* (4): 385–92.

Mahmood, Lubna, Flores-Barrantes, Paloma, Moreno, Luis A., Manios, Yannis, and Esther M. Gonzalez-Gil. 2021. “The Influence of Parental Dietary Behaviors and Practices on Children’s Eating Habits.” *Nutrients 13* (4): 1138.

Moore, Daniel R., Sygo, Jennifer, and James P. Morton. 2022. “Fuelling the Female Athlete: Carbohydrate and Protein Recommendations.” *European Journal of Sport Science 22* (5): 684 –96.

Mountjoy, Margo, Ackerman, Kathryn E., Bailey, David M., Burke, Louise M., Constantini, Naama, Hackney, Anthony C., Heikura, Ida A., et al. 2023. “2023 International Olympic Committee’s (IOC) Consensus Statement on Relative Energy Deficiency in Sport (REDs).” *British Journal of Sports Medicine, 57* (17): 1073–97.

Mountjoy, Margo, Sundgot-Borgen, Jorunn, Burke, Louise, Carter, Susan, Constantini, Naama, Lebrun, Constance, Meyer, Nanna, et al. 2014. “The IOC Consensus Statement: Beyond the Female Athlete Triad--Relative Energy Deficiency in Sport (RED-S).” *British Journal of Sports Medicine 48* (7): 491–97.

Mountjoy, Margo, Sundgot-Borgen, Jorunn K., Burke, Louise M., Ackerman, Kathryn E., Blauwet, Cheri, Constantini, Naama, Lebrun, Constance, et al. 2018. “IOC Consensus Statement on Relative Energy Deficiency in Sport (RED-S): 2018 Update.” *British Journal of Sports Medicine 52* (11): 687–97.

Ritson, Alex J., Hearris, Mark A., and Laurent G. Bannock. 2023. “Bridging the Gap: Evidence-based Practice Guidelines for Sports Nutritionists.” *Frontiers in Nutrition 10*: 1118547.

Riviere, Aaron J., Leach, Rae, Mann, Haleigh, Robinson, Samuel, Burnett, Donna O., Babu, Jeganathan R., and Andrew D. Frugé. 2021. “Nutrition Knowledge of Collegiate Athletes in the United States and the Impact of Sports Dietitians on Related Outcomes: A Narrative Review.” *Nutrients 13* (6): 1772.

Rogers, Mary A., Appaneal, Renee N., Hughes, David, Vlahovich, Nicole, Waddington, Gordon, Burke, Louise M., and Michael Drew. 2021. “Prevalence of Impaired Physiological Function Consistent with Relative Energy Deficiency in Sport (RED-S): an Australian Elite and Pre-Elite Cohort: *British Journal of Sports Medicine 55* (1): 38–45.

Ruslin, Mashuri, Saepudin, Rasak, Muhammad S. A., Alhabsyi, Firdiansyah, and Hijrah Syam. 2022. "Semi-structured Interview: A Methodological Reflection on the Development of a Qualitative Research Instrument in Educational Studies." *IOSR Journal of Research & Method in Education 12* (1): 22-29.

Sims, Stacy T., Kerksick, Chad M., Smith-Ryan, Abbie E., Janse de Jonge, Xanne A. K., Hirsch, Katie R., Arent, Shawn M., Hewlings, Susan J., et al. 2023. “International Society of Sports Nutrition Position Stand: Nutritional Concerns of the Female Athlete.” *Journal of the International Society of Sports Nutrition 20* (1): 2204066.

Spencer, Rebecca A., Numer, Matthew, Rehman, Laurene, and Sara F. L. Kirk. 2021. “Picture Perfect?: Gazing into Girls’ Health, Physical Activity, and Nutrition Through Photovoice.” *International Journal of Qualitative Studies on Health and Well-Being 16* (1): 1874771.

Skinner, Jensen, Vento, Kaila A., Johnston, Carol S., and Floris C. Wardenaar. 2022. “Using Nutrition Knowledge and Diet Quality Questionnaires as Screening Tools to Identify Female Collegiate Athletes in Need of Dietitian Referral.” *Canadian Journal of Dietetic Practice and Research 83* (3): 133–38.

Stoyel, Hannah, Delderfield, Russell, Shanmuganathan-Felton, Vaithehy, Stoyel, Alex, and Lucy Serpell. 2021. “A Qualitative Exploration of Sport and Social Pressures on Elite Athletes in Relation to Disordered Eating.” *Frontiers in Psychology 12*: 633490.

Thorpe, Holly, Bekker, Sheree, Fullagar, Simone, Mkumbuzi, Nonhlanhla, Nimphius, Sophia, Pape, Madeleine, Sims, Stacy T., et al. 2023. “Advancing Feminist Innovation in Sport Studies: A Transdisciplinary Dialogue on Gender, Health and Wellbeing.” *Frontiers in Sports and Active Living 4*: 1060851.

Torres-McGehee, Toni M., Emerson, Dawn M., Pritchett, Kelly, Moore, Erin M., Smith, Allison B., and Nancy A. Uriegas. 2021. “Energy Availability With or Without Eating Disorder Risk in Collegiate Female Athletes and Performing Artists.” *Journal of Athletic Training 56* (9): 993–1002.

Trakman, Gina L., Forsyth, Adrienne, Hoye, Russell, and Regina Belski. 2019. “Australian Team Sports Athletes Prefer Dietitians, the Internet and Nutritionists for Sports Nutrition Information.” *Nutrition & Dietetics: the Journal of the Dietitians Association of Australia 76* (4): 428–37.

Turelli, Fabiana C., Vaz, Alexandre F., and David Kirk. 2023. “"We Are Not Products": Stereotyping Women Athletes in Karate Through Demands on Femininity and Sensual Bodies.” *Mujer y Políticas Públicas 2* (1): 207–27.

Wellard, Ian. 2016. “Gendered Performances in Sport: An Embodied Approach. *Palgrave Communications 2*: 16003.