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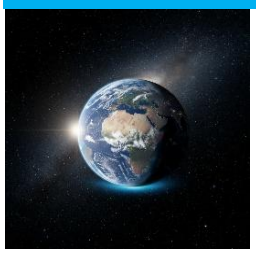

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Orthorexia Nervosa and Muscle Dysmorphia as Emerging Mental Health Threats in Athletes: A Comprehensive Narrative Review

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Abstract

Background: In modern sports, the line between healthy dedication and unhealthy obsession is becoming increasingly blurred. While classic eating disorders like anorexia and bulimia are well-known, Orthorexia Nervosa (ON) and Muscle Dysmorphia (MD) are growing problems that affect athletes of all genders but often go unnoticed.

Objective: This review summarizes current knowledge regarding the prevalence, causes, and health consequences of ON and MD in athletes, based on literature acquired from PubMed, Embase, and Web of Science.

Results: Evidence clearly shows that athletes are at a much higher risk for both conditions compared to the general population. Because strict diets and constant body monitoring are considered "normal" in sports, these disorders are often difficult to spot. Key risk factors include perfectionistic personality traits, pressure to meet weight requirements in certain sports, and the influence of social media, which promotes unrealistic body standards.

Conclusion: Both ON and MD can lead to serious physical health issues, such as Relative Energy Deficiency in Sport (RED-S). Current findings highlight an urgent need for better screening tools designed specifically for athletes. Furthermore, a significant change in how we educate athletes and coaches about mental health and nutrition is necessary.

Key Words: Orthorexia Nervosa, Muscle Dysmorphia, Athletes, Relative Energy Deficiency in Sport (RED-S), Eating Disorders, Sports Nutrition, Body Image.

Introduction

Becoming an excellent athlete requires a lot of discipline regarding training, recovery, and nutrition that often seems a bit excessive to the general public. While this dedication is necessary for performance, for a growing number of athletes, having that strict of a routine crosses the line into pathology. Traditionally, sports medicine has focused mainly on Anorexia Nervosa (AN) and Bulimia Nervosa (BN), often discussing them in the context of the "Female Athlete Triad." However, over the last two decades, we have witnessed the rise of different

psychopathologies that go beyond the diagnostic criteria for AN and BN: Orthorexia Nervosa (ON) and Muscle Dysmorphia (MD) [1].

Orthorexia Nervosa, first described by Bratman (1997), is characterized as an obsession with the quality and "purity" of food, rather than the quantity-focused restriction seen in anorexia [2]. In contrast, Muscle Dysmorphia, originally called "reverse anorexia" by Pope et al. (1997), involves a distorted belief that one's body is too small or not muscular enough, which causes them to extend their exercise program and start extremely strict dieting [3].

This review argues that ON and MD are not just lifestyle choices, but serious mental health risks that affect athletes among all genders and disciplines. By reviewing current literature, we aim to explain how the persona of a "dedicated athlete" can often hide severe underlying psychiatric issues.

Methodology

For this review, we searched PubMed, Embase, and Web of Science to identify relevant studies published between January 2000 and January 2024. We looked for research connecting Orthorexia Nervosa and Muscle Dysmorphia (including the term "Bigorexia") with sports contexts, using additional keywords such as "Athletes," "Sports Nutrition," "Body Image," and "RED-S."

We primarily selected peer-reviewed observational studies and reviews that focused on both competitive and recreational athletes. However, we also included specific case reports if they offered unique clinical insights that could contribute to our research.

Orthorexia Nervosa: Understanding the Obsession

Defining the Construct in Sports

Diagnosing ON remains difficult because it is not yet officially recognized in the DSM-5. In athletes, it typically looks like an obsession with food quality—focusing strictly on "clean eating" or organic food sources. Athletes often eliminate entire food groups, like gluten or dairy, viewing them as harmful to their results.

The key difference lies in flexibility. While functional sports nutrition adapts to training needs, ON is rigid and driven by anxiety. Breaking a dietary rule usually leads to intense guilt, with an athlete trying to "burn off" the calories through extra training, or withdrawing from social life [4].

Epidemiology and Prevalence

It is hard to say exactly how common Orthorexia Nervosa (ON) is because researchers use different testing methods. However, a major study by McComb and Mills (2019) confirms that athletes are at much higher risk than the general population. Depending on the sport, between

6% and 50% of athletes may struggle with ON [5]. The risk depends heavily on the type of sport they play.

Aesthetic Sports (Gymnastics, Ballet, Figure Skating): Athletes in these disciplines face a double challenge: they need to be strong to perform, but they also feel immense pressure to look thin. Consequently, gymnasts and dancers consistently show the highest rates of disordered eating [6]. In this context, ON often serves as a "controlled" alternative to anorexia - a way to maintain leanness in the disguise of health. Krentz and Warschburger (2013) noted that these athletes often distort the definition of "healthy food" to mean "low fat," eliminating essential nutrient groups to keep their body weight low [7].

Weight-class Sports (Judo, Wrestling, Rowing): In sports requiring weigh-ins, ON often starts with extreme dieting required before a competition which is usually followed by an immediate return to everyday diet. To handle the stress of the scale, athletes often categorize foods as "safe" or "unsafe." Artioli et al. (2010) highlighted a dangerous transition where the habits of Rapid Weight Loss (RWL) evolve into a chronic obsession. Even when not competing, these athletes may struggle to return to normal eating without guilt and anxiety, using ON as a psychological safety net [8].

Endurance Sports (Cycling, Long-distance Running): While aesthetic sports have historically been the primary focus, recent data has shown that ON is growing fast among runners and cyclists. Unlike aesthetic athletes who focus mainly on appearance, cyclists and runners often view ON through the lens of "fuel efficiency," believing that lighter equals faster. Lis et al. (2015) observed that these athletes frequently cut out gluten and other specific food groups to avoid perceived inflammation or gastrointestinal distress, often without medical justification [9]. This mindset is particularly dangerous because viewing food only as fuel may lead to severe restriction. As highlighted by Melin et al. (2014), such behaviors directly increase the risk of Low Energy Availability (LEA) and Relative Energy Deficiency in Sport (RED-S) [10].

The "Masking" Effect

One of the biggest challenges is simply spotting the problem. In the sports world, extreme habits often look like discipline. Weighing food and strictly tracking macros are standard parts of elite sport, so they do not raise any alarms. As noted by Bratland-Sanda and Sundgot-Borgen (2013), these behaviors are often indistinguishable from the traits of a “good athlete” which are expected by coaches, effectively camouflaging the disorder until health deteriorates [11].

Muscle Dysmorphia: The Obsession with Body Size

What does MD look like? MD goes beyond simple dissatisfaction with one's body; it is a specific obsession with not being muscular enough. Even when an athlete is objectively large in size and strong, they look in the mirror and see someone "small" or "weak." [12]

This distorted view drives them to extremes. Training becomes compulsive, often continuing despite serious injuries. Their diet turns into a strict schedule of high-protein meals, and they frequently rely on heavy supplement use or anabolic steroids in order to chase an impossible body standard [13].

Vulnerability to Muscle Dysmorphia Across Disciplines

Historically, Muscle Dysmorphia (MD) was seen as a disorder exclusive to male bodybuilders. However, Tod et al. (2016) point out that this view was too limited because research focused mainly on that one group [14]. Today, we know the disorder has spread beyond the bodybuilding stage to affect athletes in many different sports, adapting to the unique pressures they face.

Aesthetic and Functional Fitness (CrossFit, Bodybuilding): In these environments, the body is the sport. Behaviors that would normally raise red flags - like obsessive mirror-checking or strict checklist routines - are often viewed as normal parts of training. However, the level of risk depends on the specific discipline.

A recent study by Laus et al. compared CrossFit athletes with those doing traditional weight training. Interestingly, the results showed that weight-trainers (not CrossFitters) scored significantly higher on the "Drive for Size" scale. This suggests that while CrossFitters care about their appearance, the focus they put on functionality and performance (meaning what the body can *do* rather than just how it *looks*) may actually protect them from the intense obsession with muscle size often seen in typical gym culture. [15]

Weight-Class and Collision Sports (Rugby, Wrestling, American Football): In contact sports, body size is related to safety and dominance. Unlike bodybuilders who train for aesthetics, athletes in collision sports are often driven by function. As explained by Steinfeldt et al. (2011), the pressure to be huge in collision sports is linked to traditional masculine norms, where physical size is a key component of athletic identity and dominance on the field [16]. Baghurst and Lirgg (2009) highlighted that while bodybuilders exhibit broad symptoms of Muscle Dysmorphia, American football players actually score lower on most dysmorphic traits. However, they score significantly higher on "Physique Protection," driven by the demand to maintain massive size as a form of physical armor on the field. Wrestlers face a similar,

dangerous paradox: they fight to keep this protective muscle while restricting food to make weight, which is leading to a constant mental battle. [17]

Endurance Sports (Cycling, Triathlon): MD does not only apply to weightlifters. In endurance sports, it is ideal to be able to shift from "ultra-lean" to "fit and strong." Cyclists, for instance, often face a confusing double standard: they need to be light for speed, yet society tells them they should be muscular to be "real men."

A research done by Uhlmann et al. (2018) confirms this specific psychological trap. They found that endurance athletes score surprisingly high on the "drive for muscularity", proving that even in sports demanding leanness, men are struggling to reconcile their performance goals with the societal pressure to maintain a masculine, muscular physique [18].

The Connection: Why They Often Happen Together

Research shows we should not look at ON and MD as separate problems. They often go hand-in-hand because they share the same underlying triggers.

Perfectionism and Control

Perfectionism is a key factor for these disorders, but not all ambition is so bad. Zydek et al. (2025) found that specifically "Negative Perfectionism"- driven by a fear of making mistakes and excessive self-criticism - is strongly linked to Orthorexia Nervosa in young athletes. What is interesting, this obsession is not driven by the athlete's actual body composition, but by psychological pressure. For these athletes, strict dietary rules serve as a mechanism to control the anxiety of not being "perfect" enough [19].

The Role of Social Media and "Fitspiration"

The digital world has added fuel to the fire. „Fitspiration” posts on Instagram or TikTok, which are usually being posted in order to inspire social media users to get in shape, often push body standards that are simply unrealistic. Tiggemann and Zaccardo (2015) found that just scrolling through these images can instantly ruin a person's mood and make them dislike their own body [20]. For athletes, who are already their own harshest critics, this constant comparison creates a feeling that they are never "good enough," driving them deeper into the cycle of obsession and restrictive dieting.

Physiological and Psychosocial Consequences

The health consequences of Orthorexia Nervosa (ON) and Muscle Dysmorphia (MD) are serious and affect the entire body.

Relative Energy Deficiency in Sport (RED-S)

The biggest medical risk here is RED-S. It happens when the restrictive nature of ON (cutting calories) collides with the extreme training of MD (burning calories). This creates a state of "Low Energy Availability" (LEA).

Mountjoy et al. (2018), in the IOC Consensus Statement, define this state as a mismatch where an athlete's food intake is insufficient to cover the energy costs of daily living after the cost of exercise is removed. This energy loss triggers a cascade of physiological impairments affecting metabolism, menstrual function, bone health, and immunity [21].

Bone Health and Stress Fractures: Bone damage is the most measurable proof of these disorders. When energy is low, the body stops building new bone and starts breaking down old bone. This happens because of hormonal changes and a lack of nutrients - athletes who are avoiding "impure" foods often accidentally cut out Calcium and Vitamin D. The result is a high risk of "stress fractures" (cracks in the bone), especially in the hips and lower back. Importantly, this is not just a female issue. Heikura et al. (2018) showed that male endurance athletes with low energy availability also have significantly weaker bones compared to well-fed athletes [22].

Hormonal Problems

In Females: The reproductive system often shuts down, leading to a pause in menstruation (amenorrhoea). This is dangerous because it is often masked by using birth control pills, that create "fake" periods, hiding the diagnosis of RED-S [23].

In Males: This creates a cruel paradox. Athletes with MD train to look hyper-masculine, but the lack of fuel actually kills their testosterone levels. This leads to low libido and erectile dysfunction. Tenforde et al. (2016) point out that low testosterone is a key sign of RED-S in men, which means the harder they train in order to get bigger without eating enough, the less their body can actually grow [24].

Stalled Metabolism (Metabolic Adaptation): Athletes with ON or MD often panic because they stop losing weight, even though they are starving and training constantly. This phenomenon is called "metabolic downregulation." To survive chronic hunger, the body drastically slows down its resting metabolic rate, lowering thyroid hormones and raising stress hormones (cortisol). Trexler et al. (2014) note that this slowed metabolism can last a long time, making weight management very difficult even after recovery [25]. For someone with Orthorexia, this weight-loss plateau often triggers even more restriction, creating a vicious cycle of metabolic crashing and constant anxiety.

Mental Health and Cognitive Function: It is a two-way street: the disorder causes RED-S, but the physical starvation makes one's mental state much worse. The brain runs on glucose and fats. Without them, athletes suffer from "brain fog," irritability, and depression. As confirmed

in a comprehensive review by Logue et al. (2020), low energy availability impairs judgment, concentration, and coordination [26]. In sports like gymnastics or cycling, this lack of focus is extremely dangerous - it significantly increases the risk of traumatic accidents, adding injury to an already fragile body.

Social and Mental Consequences

The social cost of experiencing these disorders is huge. It often starts with isolation - athletes skip team dinners or restaurant outings simply because they are terrified of eating food that they did not prepare themselves (Koven & Abry, 2015) [27].

It is rarely just about the diet, though. These conditions typically go hand-in-hand with deep depression and constant anxiety. For those battling Muscle Dysmorphia, the desperation to get bigger can lead to steroid use. It is a dangerous path that risks permanent heart damage and liver failure (Pope et al., 2014) [28].

Discussion: Research Gaps

Despite all the new research highlighting the dangers of Orthorexia Nervosa (ON) and Muscle Dysmorphia (MD) in athletes, there are some significant research gaps that restrain the development of effective prevention and treatment protocols.

Unclear Definitions: We still do not have one clear, agreed-upon rule for diagnosing Orthorexia Nervosa. This makes it impossible to compare results between different studies. It also makes it hard to draw the line between an athlete who just eats healthy and one who is actually sick.

Longitudinal Data: Most research just takes a brief look at the present; that is why we have almost no idea what happens to these athletes after they retire. Does the obsession fade away when the competition ends, or does it turn into a lifelong eating disorder?

Male Representation: Science tends to focus on women when it comes to Orthorexia Nervosa, while men are considered to be mostly affected by Muscle Dysmorphia. We are aware of the fact that male endurance athletes struggle with "clean eating" too, but they are rarely the focus of the conversation.

Clinical Recommendations and Conclusion

Orthorexia Nervosa and Muscle Dysmorphia are dangerous specifically because they are deceptive. They hide behind the mask of "professionalism" and "discipline," but in reality, they silently destroy an athlete’s health, performance, and general well-being. In order to combat this issue effectively, the sports community must shift from a reactive mindset to a proactive one - we cannot simply wait for a crisis to hit. The foundation of this strategy is to detect the issue early enough. Since standard periodic health evaluations often miss these subtle psychological

warning signs, annual screenings must incorporate specialized tools designed for this purpose, such as the “Düsseldorf Orthorexia Scale” [29]. However, no questionnaire can replace the watchful eye of a coach, who is often the very first person to witness even the slightest changes in behavior. This makes education for the coaching staff vital; they need to understand that behaviors like refusing to eat with the team, an obsession with "clean" food, or training through injury are not badges of honor, but alarming red flags. Once the issue is identified, fixing it requires far more than just a meal plan; it demands a collective and holistic approach. Effective recovery relies on a multidisciplinary team working in sync: a sports physician to manage the physical damage, a dietitian to normalize the relationship with food, and a psychotherapist to address the root cause - usually the deep-seated perfectionism driving these destructive behaviors.

Author Contribution

Conceptualization, H.B. and K.B.; methodology, G.Ł., E.D. and J.D.; formal analysis, A.D., K.B. and O.B.; investigation, S.C. and J.B.; resources, A.W., H.B. and E.D.; data curation, S.C., G.Ł. and J.D.; writing, H.B., J.B. and E.D.; review and editing, A.D. and O.B.; supervision, H.B.; project administration, H.B. and A.W.;

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Not applicable. This literature review is based on publicly available published literature. All sources are cited in the References section.

Conflicts of Interest

The authors declare no conflicts of interest.

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During the preparation of this work, the authors used Google Gemini for the purpose of basic data analysis and verification of bibliographic styles. After using this tool/service, the authors

reviewed and edited the content as needed and take full responsibility for the substantive content of the publication.

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