Eating disorders in athletes: Overview of prevalence, risk factors and recommendations for prevention and treatment

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Eating disorders in athletes: Overview of prevalence, risk factors and recommendations for prevention and treatment

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Abstract
The prevalence of disordered eating and eating disorders vary from 0–19% in male athletes and 6–45% in female athletes. The objective of this paper is to present an overview of eating disorders in adolescent and adult athletes including: (1) prevalence data; (2) suggested sport- and gender-specific risk factors and (3) importance of early detection, management and prevention of eating disorders. Additionally, this paper presents suggestions for future research which includes: (1) the need for knowledge regarding possible gender-specific risk factors and sport- and gender-specific prevention programmes for eating disorders in sports; (2) suggestions for long-term follow-up for female and male athletes with eating disorders and (3) exploration of a possible male athlete triad.

Keywords: Eating disorders, athletes, leanness, dieting

Introduction
Eating disorders are serious mental illnesses with high-mortality rates (Smink, van Hoeken, & Hoek, 2012); they are often long-standing and make a significant negative impact to the individual’s quality of life (APA, 1994). These disorders are characterised by a preoccupation with food, body weight and shape that leads to behaviour such as starvation, fasting, binge eating and purging and excessive exercise (APA, 1994). This pathogenic behaviour becomes the main focus in the daily life and other areas in life such as family, school/work and social life are given less priority because of this disorder (Fairburn & Harrison, 2003). It was a belief that eating disorders only occurred in females, however, the last two decades have provided research showing that eating disorders also occur among boys and men (Domine, Berchtold, Akre, Michaud, & Suris, 2009).

The issue of sport, exercise and eating disorders has also received increasing attention the last two decades. The prevalence of disordered eating and eating disorders is high among adolescent and adult athletes, especially among athletes competing in weight sensitive sports (Torstveit, Rosenvinge, & Sundgot-Borgen, 2008). The higher prevalence of eating disorders seen among females compared to males in both athlete and non-athlete populations have led to more focus upon the hazards of eating disorders among females (Baum, 2006). Nevertheless, eating disorders appear more frequent in male athletes compared to male non-athletes (Sundgot-Borgen & Torstveit, 2004), and the disorders can be just as hazardous for the males. It is, therefore, crucial to thoroughly examine the gender issues of eating disorders in sports.

Due to the seriousness of eating disorders, and their frequent appearance in sports, it is important to examine and understand why athletes seems to be more at risk compared to non-athletes. Risk factors for eating disorders including both predisposing and trigger factors have been suggested (Sundgot-Borgen, 1994). However, to identify such factors, a causal relationship needs to be established (Striegel-Moore & Bulik, 2007). Otherwise, the factors can only be viewed as associating factors with eating
disorders, and not risk factor. Hence, an examination of the existing literature on general, sport- and gender-specific risk factors is needed.

The International Olympic Committee (IOC), American College of Sports Medicine (ACSM) and the National Athletic Trainer Association (NATA) in the USA have provided position stands for prevention, identification and management of eating disorders in sports (Bonci et al., 2008; Drinkwater, Loucks, Sherman, Sundgot-Borgen, & Thompson, 2005; Nattiv et al., 2007). As these position stands are presenting current recommendations in this field, it is necessary to explore and discuss their strengths and weaknesses. In that way, the next scientific steps in this field can be elaborated on.

This paper will, therefore, provide an overview of the prevalence and suggested sport- and gender-specific risk factors for eating disorders among adolescent and adult male and female athletes. Furthermore, current recommendations for early identification, prevention and management of eating disorders among male and female athletes are presented and discussed. In this paper, we use the terms disordered eating and eating disorders to show the disordered eating behaviour continuum. This continuum starts with healthy dieting (such as lowering energy intake and gradual weight loss), then goes on to use of more extreme weight loss methods such as restrictive diets (<30 kcal kg\(^{-1}\) fat-free mass per day), chronic dieting, frequent weight fluctuation, fasting, passive (e.g. sauna, hot baths) or active dehydration (e.g. exercise with sweat suits), use of laxatives, diuretics, vomiting, diet pills and/or excessive exercise (Nattiv et al., 2007). The eating disorders at a clinical level (i.e. meeting the diagnostic criteria for anorexia nervosa, bulimia nervosa or eating disorders not otherwise specified) represents the end of this continuum (APA, 1994).

**Literature search**

To ensure we included available relevant studies, literature searches were conducted using PubMed, Sport Discus, Psych Info and Google Scholar. The searches were performed in January 2012, and various combinations of the following words were used for the search: ‘disordered eating’, ‘eating disorders’, ‘dieting’, ‘anorexia nervosa’, ‘bulimia nervosa’, ‘muscle dysmorphia’, ‘athletes’, ‘sports’, ‘prevalence’, ‘risk factors’, ‘prevention’ and ‘treatment’. We included literature concerning both adolescent athletes (i.e. high school athletes) and adult athletes at collegiate, national and international level.

**Prevalence of eating disorders in sports**

The entire spectrum from disordered eating to Diagnostic and Statistical Manual for Mental Disorders, 4th ed. (DSM-IV) categorised eating disorders have been shown more prevalent among both male and female adult elite athletes compared to non-athlete controls (Sundgot-Borgen & Torstveit, 2004). Table I shows publications reporting prevalence of disordered eating and eating disorders either among athletes only or among athletes compared to controls. The prevalence is lower among male athletes compared to the female athletes (Byrne & McLean, 2002; Greenleaf, Petrie, Carter, & Reel, 2009; Martinsen, Bratland-Sanda, Eriksson, & Sundgot-Borgen, 2010; Petrie, Greenleaf, Reel, & Carter, 2008; Schaal et al., 2011; Sundgot-Borgen & Torstveit, 2004), however, a similar frequency of male elite athletes and female controls met the criteria for eating disorders in one of the studies (Sundgot-Borgen & Torstveit, 2004).

Schaal et al. (2011) report gender differences in eating disorder prevalence rates among different genres of sports. They found the highest prevalence among female in the endurance and aesthetic sports, whereas eating disorders among male athletes were most common in weight-class sports (i.e. wrestling and boxing). This is in agreement with findings among Norwegian elite athletes (Sundgot-Borgen & Torstveit, 2004). In contrast to findings on adult athletes, a study on adolescent elite athletes only found no sport-specific differences in prevalence (Martinsen et al., 2010). We speculate that this finding might be due to a shorter period of exposure of sport-specific demands such as the experienced pressure to diet, weight-in procedures, number of weight fluctuations and subjective evaluation among the adolescent compared to the adult elite athletes.

Interestingly, two studies on high school athletes have found higher prevalence of disordered eating among the controls compared to the athletes (Martinsen et al., 2010; Rosendahl, Bormann, Aschenbrenner, Aschenbrenner, & Strauss, 2009). However, the results from these studies are based on self-report, and studies on adult athletes using a two-step approach (self-report via questionnaire followed by clinical interview by experienced therapist) show that athletes tend to underestimate disordered eating and eating disorders (Sundgot-Borgen & Torstveit, 2004; Torstveit et al., 2008). Therefore, the prevalence of eating disorders among adolescent athletes might be higher than indicated from the studies using self-report.

Methodological considerations should be emphasised when discussing the published prevalence studies. The challenges of the existing publications are the variety of assessment instruments and
Table I. Selected publications showing prevalence of disordered eating and/or eating disorders among athletes and controls

<table>
<thead>
<tr>
<th>Study</th>
<th>Population (n)</th>
<th>Age (years)</th>
<th>Screening instrument and criteria for ED</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schaal et al. (2011), France</td>
<td>Adolescent and adult female and male elite athletes (n = 2067)</td>
<td>Range: 12–35</td>
<td>Psychological evaluation using DSM-IV for AN, BN and EDNOS</td>
<td>Ongoing eating disorders &lt;male athletes: 4%&lt;m/female athletes: 6%&lt;br&gt;Female athletes: 6%&lt;br&gt;Lifetime eating disorders Male athletes: 5.5%&lt;br&gt;Female athletes: 11.2%&lt;br&gt;Male &lt;females: Disordered eating: 35.4%&lt;br&gt;Dissociated eating: 22%&lt;br&gt;Risk for eating disorders: 89.2%&lt;br&gt;Range: 15–16</td>
</tr>
<tr>
<td>Thein-Nissenbaum et al. (2011), USA</td>
<td>High-school female athletes (n = 311)</td>
<td>Mean: 15.4 ± 1.2</td>
<td>Self-report (EDE-Q)</td>
<td>Eating disorders: 2%&lt;br&gt;Symptoms of eating disorders: 25.5%&lt;br&gt;Range: 13–30</td>
</tr>
<tr>
<td>Martinsen et al. (2010), Norway</td>
<td>High-school elite female and male athletes (n = 606) and age-matched female and male controls (n = 355)</td>
<td>Mean: 15.4 ± 1.2</td>
<td>Self-report (EDI), body mass index &lt;17.9 kg/m² (girls) and &lt;17.5 kg/m² (boys), current and/or ≥3 previous efforts to lose weight, use of pathogenic weight control methods and self-reported menstrual dysfunction</td>
<td>Disordered eating Female athletes: 22%&lt;br&gt;Male athletes: 8%&lt;br&gt;Female controls: 9%&lt;br&gt;Male controls: 0.5%&lt;br&gt;Male &lt;female, athletes &lt;br&gt;controls</td>
</tr>
<tr>
<td>Greenleaf et al. (2009), USA</td>
<td>Collegiate female athletes (n = 204)</td>
<td>Mean: 20.2 ± 1.3</td>
<td>Self-report (QUEDD and BULIT-R)</td>
<td>Eating disorders: 32.8%&lt;br&gt;Controls: 21.4%&lt;br&gt;Male &lt;females, athletes &lt;br&gt;controls</td>
</tr>
<tr>
<td>Quah, Poh, Ng, and Noor (2009), Malaysia</td>
<td>Adolescent and adult female elite athletes (n = 67)</td>
<td>Mean: 20.3 ± 1.6</td>
<td>Self-report (QEDD and BULIT-R)</td>
<td>Eating disorders: 0%&lt;br&gt;Symptoms of eating disorders: 25.5%&lt;br&gt;Range: 14–18</td>
</tr>
<tr>
<td>Rosendahl et al. (2009), Germany</td>
<td>High-school female athletes (n = 210) and male elite athletes (n = 366) and age-matched non-athletic female (n = 169) and male controls (n = 122)</td>
<td>Mean: 11–19</td>
<td>Self-report (EAT, BITE and BULIT-R)</td>
<td>Eating disorders: 32.8%&lt;br&gt;Controls: 21.4%&lt;br&gt;Male &lt;females, athletes &lt;br&gt;controls</td>
</tr>
<tr>
<td>Schtscherbyna et al. (2009), Brazil</td>
<td>Adolescent female elite swimmers (n = 78)</td>
<td>Mean: 20.3 ± 1.6</td>
<td>Self-report (EAT, BITE and BSQ)</td>
<td>Eating disorders: 32.8%&lt;br&gt;Controls: 21.4%&lt;br&gt;Male &lt;females, athletes &lt;br&gt;controls</td>
</tr>
<tr>
<td>Petrie et al. (2008), USA</td>
<td>Collegiate male athletes (n = 203)</td>
<td>Mean: 20.3 ± 1.6</td>
<td>Self-report (QEDD and BULIT-R)</td>
<td>Eating disorders: 32.8%&lt;br&gt;Controls: 21.4%&lt;br&gt;Male &lt;females, athletes &lt;br&gt;controls</td>
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<tr>
<td>Torstveit et al. (2008), Norway</td>
<td>Adolescent and adult female elite athletes (n = 186) and controls (n = 145)</td>
<td>Mean: 20.3 ± 1.6</td>
<td>Structured clinical interview (EDE)</td>
<td>Eating disorders: 32.8%&lt;br&gt;Controls: 21.4%&lt;br&gt;Male &lt;females, athletes &lt;br&gt;controls</td>
</tr>
<tr>
<td>Nichols et al. (2007), USA</td>
<td>High-school female athletes (n = 423)</td>
<td>Mean: 15.7 ± 1.7</td>
<td>Self-report (EDE-Q)</td>
<td>Eating disorders: 32.8%&lt;br&gt;Controls: 21.4%&lt;br&gt;Male &lt;females, athletes &lt;br&gt;controls</td>
</tr>
<tr>
<td>Nichols et al. (2006), USA</td>
<td>High-school female athletes (n = 170)</td>
<td>Mean: 15.7 ± 1.7</td>
<td>Self-report (EDE-Q)</td>
<td>Eating disorders: 32.8%&lt;br&gt;Controls: 21.4%&lt;br&gt;Male &lt;females, athletes &lt;br&gt;controls</td>
</tr>
<tr>
<td>Pernick et al. (2006), USA</td>
<td>High-school female athletes (n = 453)</td>
<td>Mean: 15.7 ± 1.7</td>
<td>Self-report (EDE-Q)</td>
<td>Eating disorders: 32.8%&lt;br&gt;Controls: 21.4%&lt;br&gt;Male &lt;females, athletes &lt;br&gt;controls</td>
</tr>
<tr>
<td>Beals and Hill (2006), USA</td>
<td>Collegiate female athletes (n = 112)</td>
<td>Mean: 19.5 ± 1.2</td>
<td>Self-report (EDI symptoms check list, EDE-Q)</td>
<td>Eating disorders: 32.8%&lt;br&gt;Controls: 21.4%&lt;br&gt;Male &lt;females, athletes &lt;br&gt;controls</td>
</tr>
<tr>
<td>Toro et al. (2005), Spain</td>
<td>Female elite athletes (n = 283)</td>
<td>Mean: 15.3 ± 3.1</td>
<td>Self-report (EAT and CETCA)</td>
<td>Eating disorders: 32.8%&lt;br&gt;Controls: 21.4%&lt;br&gt;Male &lt;females, athletes &lt;br&gt;controls</td>
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<tr>
<td>Sundgot-Borgen and Torstveit (2004), Norway</td>
<td>Adolescent and adult female athletes (n = 120) and controls (n = 76), and male athletes (n = 58) and controls (n = 19)</td>
<td>Mean: 15.3 ± 3.1</td>
<td>Structured clinical interview (EDE)</td>
<td>Eating disorders: 32.8%&lt;br&gt;Controls: 21.4%&lt;br&gt;Male &lt;females, athletes &lt;br&gt;controls</td>
</tr>
<tr>
<td>Byrne and McLean (2002), Australia</td>
<td>Adolescent and adult female (n = 155) and male (n = 108) elite athletes and controls (n = 263)</td>
<td>Mean: 15–39</td>
<td>Structured diagnostic interview (CIDI)</td>
<td>Eating disorders: 32.8%&lt;br&gt;Controls: 21.4%&lt;br&gt;Male &lt;females, athletes &lt;br&gt;controls</td>
</tr>
</tbody>
</table>
definitions used. There is a wide range of definitions, from vague signs and symptoms of disordered eating to strict DSM-IV criteria for anorexia nervosa, bulimia nervosa and eating disorders not otherwise specified. This makes comparison between the different studies very difficult. Most of the available studies have used self-report through questionnaires such as Eating Attitudes Test (Rosendahl et al., 2009; Schtscherbyna, Soares, de Oliveira, & Ribeiro, 2009; Toro et al., 2005), Eating Disorders Inventory (Beals & Hill, 2006; Johnson, Powers, & Dick, 1999; Martinsen et al., 2010) and Eating Disorders Examination Questionnaire (Hulley & Hill, 2001; Nichols, Rauh, Barrack, Barkai, & Pernick, 2007; Nichols, Rauh, Lawson, Ji, & Barkai, 2006; Thein-Nissenbaum, Rauh, Carr, Loud, & McGuine, 2011), and different choice of cut offs give differences in prevalence estimates. These wide ranges of definitions may explain the variety of prevalence rates in both athletes and controls in some of the included studies. Nevertheless, in studies using clinical evaluation such as Torstveit et al. (2008), the prevalence of eating disorders among the female controls was much higher than reported in other studies. The control sample was representative of Norwegian females aged 13–39 years, but it is possible that the responders had more eating disorders psychopathology compared to the non-responding females. Although it is difficult to predict actual prevalence of eating disorders based on self-report, it gives an estimate of the numbers of athletes and controls at risk. This is in our opinion valuable, because it can help identify sub groups were prevention is crucial. Another possible explanation for the variety of prevalence rates is the difference in performance level in the populations investigated.

What do we know about risk factors?

**General risk factors**

No controlled long-term prospective studies have been conducted; hence it is difficult to determine ‘true’ risk factors, which contributes to the development of eating disorders in general or athletic populations in particular. Cross-sectional and case–control studies suggest that the risk factors for development of eating disorders are multi-factorial, and that these factors can be divided into predisposing factors, trigger factors and perpetuating factors (Nattiv et al., 2007). The predisposing factors includes biological (e.g. genetics), psychological (e.g. body dissatisfaction, low self-esteem and personality traits such as perfectionism) and socio-cultural factors (e.g. peer pressure, media influence and history of bullying) (Mazzeo & Bulik, 2009; Stice, 2002; Stice, Marti, & Durant, 2011). The trigger factors are typically negative comments regarding body weight and/or shape, traumatic experiences, etc. (Stice, 2002). The eating disorders are maintained by perpetuating factors such as approval by the coach or significant others, the physiological consequences of starvation or initial success (Drinkwater et al., 2005). Suggested general
risk factors for development of eating disorders are summarised in Table II.

**Sport-specific risk factors**

Suggested sport-specific risk factors include frequent weight regulation, dieting and experienced pressure to lose weight, personality traits, early start of sport-specific training, injuries, symptoms of overtraining, impression motivation, threat perception and the impact of coaching behaviour (Smolak, Murnen, & Ruble, 2000; Sundgot-Borgen, 1994). Some of these risk factors are shared with non-athletes; however, it is suggested that the sport environment can make athletes even more vulnerable to these risk factors compared to non-athletes (Currie, 2010).

**Weight cycling and dieting pressure.** For athletes in sports that emphasize leanness, reduction in body mass or body fat can enhance performance (Currie, 2010). Often an initial loss of weight leads to a better performance and this initial success can force the athlete to continue dieting to lose weight and unknowingly slip into an eating disorder (Rodriguez, Di Marco, & Langley, 2009). Therefore, athletes who are extreme dieters, those struggling with making weight and athletes with deliberate or unintended restrictive caloric intake are considered being at increased risk for eating disorders (Drinkwater et al., 2005). This can also lead to an unfortunate domino effect when other athletes, both team members and competitors, observe this initial success. The awareness of hazardous dieting and weight fluctuation among athletes has resulted in position stands on safe weight loss and maintenance practices from, e.g. the NATA and the ACSM (Rodriguez et al., 2009; Turocy et al., 2011).

**Personality.** Thompson and Sherman (1999) have suggested that some traits desired by coaches in their athletes are similar to traits found in individuals with eating disorders, such as excessive exercise, perfectionism, and (over-)compliance. These athletes also may have evidence of psychological traits such as high achievement orientation and obsessive-compulsive tendencies commonly associated with eating disorders, but also essential for successful competitions (Thompson & Sherman, 1999). Furthermore, a recent review suggested perfectionism as a central confounding factor in the relationship between athletes and eating disorders (Forsberg & Lock, 2006).

**Early start of sport-specific training.** The problem with early start of sport-specific training is the chance of choosing a sport inappropriate for the athlete’s body type (Sundgot-Borgen, 1994). The pubertal changes can, therefore, be arbitrary for performance. Furthermore, socializing to extremely weight pre-occupied sports such as weight-class sports at an early and vulnerable age is also suggested to increase risk of eating disorders (Currie, 2010).

**Traumatic events including injuries.** Traumatic events are significant trigger factors among both athletes and non-athletes. However, some events have been characterized as traumatic and trigger factors for eating disorders in a sport-specific context only. Injury is an example of the latter (Currie, 2010). When a non-athlete gets an injury that keeps him/her out of training for a few weeks or months, it does not have the same impact on the professional life as it does with athletes. Injured athletes often experience an undesired weight gain, and combined with the negative affects an injury cause (e.g. not being able to train and compete in championships etc.), this can increase risk of eating disorders (Sundgot-Borgen, 1994).

**Coaching behaviour.** The environment provided by the sports coaches can either reduce or increase risk of eating disorders (Currie, 2010). A study by Biesecker and Martz (1999) found a performance-related and body weight pre-occupied coaching style to increase body image anxiety, dieting and fear of fatness. Similarly, a supportive and caring coaching...
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style may reduce the risk of eating disorders (Biesecker & Martz, 1999; Currie, 2010).

Rules and regulations. Sports which emphasize lean-ness (i.e. aesthetic, endurance and weight-class sports) show higher frequencies of dieting behaviour (Torstveit et al., 2008). In weight-class sports, the weight classes and the weigh-in rules make use of rapid weight loss regimens prior to competition common (Currie, 2010). In aesthetic sports athletes are evaluated on both technical skills and execution/artist effects, and such esthetical evaluation creates ‘body paradigms’ in these sports (Currie, 2010). Body paradigms, rules and norms in the specific sports can both make athletes more prone to eating disorders, but it can also make it a challenge to identify athletes at risk (Currie, 2010).

Gender-specific risk factors: the male athlete with an eating disorder

There are more similarities than differences regarding suggested risk factors for eating disorders between females and males (Baum, 2006). Some shared risk factors among both females and males are overweight, a history of being teased and experience of violence (Domine et al., 2009). Suggested gender-specific risk factors among males are drive for muscularity, anabolic androgenic steroid use, and homosexuality (Kanayama, Barry, Hudson, & Pope, 2006; Lock, 2009; Russell & Keel, 2002). These factors are further elaborated in the next paragraphs.

Drive for muscularity. It is our opinion that one of the limitations with today’s screening tools for eating disorders is the focus upon drive for thinness and the lack of focus upon drive for muscularity. The latter has been found to be a more important construct among both athletic and non-athletic males than the drive for thinness (Cafri, Blevins, & Thompson, 2006). It has been suggested that drive for muscularity is a risk factor for development of eating disorders and muscle dysmorphia in males, and that this construct is a more positive construct among females compared to males (Bratland-Sanda & Sundgot-Borgen, 2012; Pope, Gruber, Choi, Olivardia, & Phillips, 1997). Muscle dysmorphia refers to the preoccupation with being muscular and lean, and this preoccupation results in extreme dieting behaviour, exercise behaviour, and increased risk of anabolic-androgenic steroids use. Muscle dysmorphia is not yet accepted as a diagnosis although criteria following the DSM-IV diagnosis for Body Dysmorphic Disorder has been proposed (Pope et al., 1997). There is disagreement in the literature regarding whether muscle dysmorphia should be viewed as an eating disorder or not (Cafri et al., 2006; Murray, Rieger, Touyz, & De la Garza Garcia Lic, 2010; Vandereycken, 2011). Muscle dysmorphia has mostly been explored among athletes in weight lifting and body building, but it is possibly prevalent in other sports where muscle mass and strength are important factors for performance (Baghurst & Lirrg, 2009). The knowledge about drive for muscularity as a risk factor for eating disorders is, however, sparse, and this construct needs to be more thoroughly explored in both male and female athletes.

Anabolic-androgenic steroid use. Anabolic-androgenic steroid use is frequent among those who meet the suggested criteria for muscle dysmorphia (Pope et al., 1997), and it is associated with disordered eating in both female and male athletes (Vertalino, Eisenberg, Story, & Neumark-Sztainer, 2007). Not only is steroid use illegal in organized sports, but also it is hazardous in a health perspective. Therefore, it is important to further examine the associations between steroid use, muscle dysmorphia and eating disorders among athletes from a greater range of sports and the exercise/fitness groups. Similarly, use of ‘diet doping’ such as ephedrine among athletes seems to co-occur with eating disorders and body image disorders (Gruber & Pope, 1998), and this co-occurrence needs further examination. A weakness in the existing studies examining doping and eating disorders is that these studies only have reported an association between these factors. It is, therefore, difficult to determine if use of doping is a risk factor for eating disorder, or if it is actually a consequence of eating disorders.

Homosexuality. The prevalence of eating disorders is higher among homosexual males compared to heterosexual males, this difference has not been detected between heterosexual and lesbian females (Russell & Keel, 2002). The reasons for this increased risk of eating disorders among homosexual males are, yet, unknown. However, it has been speculated that mechanisms such as history of bullying, differences in emphasis on physical appearance between homosexual and heterosexual males, low self-esteem etc. might play a role (Striegel-Moore & Bulik, 2007). In our search for literature, we found no studies who examined differences in prevalence of eating disorders between homosexual and heterosexual athletes. Therefore, futures studies are needed to examine to what degree homosexuality is a specific risk factor for eating disorders among male athletes.

A recent meta-analytic review of prospective and experimental studies revealed that several accepted risk factors for eating pathology have not received
empirical support or have received contradictory support (e.g. dieting) (Stice, 2002). Risk factors in the sport setting have not been investigated in terms of prospective studies, and the strength of these findings is, therefore, in our opinion limited. Case-control and cross-sectional study designs make it difficult to determine whether the factors are actual risk factors, or if they are consequences of eating disorders behaviour. Thus, the listed sports-specific risk factors (Table II) are not evidence based. We, therefore, agree with the suggestions by Stice (2002) that it will be important to search for additional risk and maintenance factors, develop more comprehensive multivariate models, and address methodological limitations that attenuate effects.

The athlete triad: also occurring in males?
The female athlete triad concerns the relationship between energy deficiency, menstrual irregularities and low bone mass (Nattiv et al., 2007). It has been reported that energy deficiency may lead to reduced testosterone levels and low bone mass among males (Rigotti, Neer, & Jameson, 1986). Thus, a male athlete triad does exist but rarely comes to attention because the reproductive consequences are not perceived by men (Bennell, Brukner, & Malcolm, 1996; De Souza & Miller, 1997). Due to the presence of the different triad components among male athletes, future studies are needed to explore this phenomenon more in depth.

Prevention and management of eating disorders among athletes: overview and discussion of the current position stands
The IOC, ACSM and NATA have published position stands regarding prevention, early identification and treatment of eating disorders among athletes (Bonci et al., 2008; Nattiv et al., 2007; Sherman & Thompson, 2006). The position stands from IOC and ACSM concentrate on the female athlete triad, whereas the position stand from NATA includes disordered eating among female and male athletes.

Early identification and treatment
Early detection of eating disorders is crucial for the prognosis and the process of recovery (Bonci et al., 2008). It is important that the athletes with eating disorders are considered ill and receive proper medical, nutritional and psychiatric treatment. In addition, when medically cleared, they are in need of close follow-up on training (Nattiv et al., 2007; Sherman & Thompson, 2006). The position stands recommend a multi-disciplinary treatment approach, and athletes suffering from eating disorders usually need to adjust exercise volume and type (Nattiv et al., 2007). Unfortunately, the position stands do not adequately cover that these adjustments need to be guided by an exercise physiologist in cooperation with the rest of the treatment team.

Although acknowledging that eating disorders also occur in male athletes, the different position stands do not adequately cover the importance of monitoring male athletes at risk. Male athletes may, therefore, be neglected by coaches and medical staff. In addition to the guidelines regarding training and competition, the position stands emphasise the importance of restricting competition for athletes meeting the criteria for an eating disorder (Drinkwater et al., 2005; Nattiv et al., 2007). Restriction from competition is mainly due to medical risks, but also due to the possible effect on other athletes. However, none of the current position stands present guidelines regarding return to play.

When can athletes return to play?
There is no consensus regarding recovery criteria for eating disorders in patients in general, or in athletes. Also, the position stands are inconclusive when it comes to the question when athletes with eating disorders should be considered recovered to the degree that they can compete (Bonci et al., 2008; Drinkwater et al., 2005; Nattiv et al., 2007).

We, therefore, suggest that specific criteria for return to play should be developed; this would be beneficial to the medical staff, coaches and athletes. Such criteria can be based on general recovery criteria for eating disorders, but they need to be made sport specific. A core question regarding recovery and competition for the eating disordered athlete is whether an athlete can be allowed to compete before one is fully recovered. And when is an athlete fully recovered? Is it with sufficient energy availability, restored body weight, normalised cognition regarding food, body shape/weight etc., or when the medical status, nutritional status, cognition and behaviour combined are within healthy range? Future position stands need to elaborate on this, and provide guidelines which are easy to apply for the treatment team.

Prevention
More knowledge about the possible gender-specific risk factors associated with eating disorders in athletes is needed before we can argue that the prevention programmes need to be gender specific. However, it seems quite clear that for female athletes it is still the extreme focus upon ‘dieting to win’ that should be de-emphasised as described in the latest position stand from the ACSM (Nattiv et al., 2007).
In addition, the focus on leanness among male athletes representing sports such as weight-class sports is a complex issue, since they are expected to lose total body weight and at the same time increase muscle mass (Cafri et al., 2006). For most athletes this is impossible since positive energy balance is needed to gain muscle mass (Rodriguez et al., 2009). Although it has been shown possible to increase lean body mass during a rapid weight loss regime in elite athletes (Garthe, Raastad, Refsnes, Koivisto, & Sundgot-Borgen, 2011) this is extremely demanding, requires close follow-up by professionals, and possibly increases risk of eating disorders. Since extreme dieting and eating disorders are almost part of the culture within aesthetic and weight-class sport (Currie, 2010), the recommendations for these sports should be more related to (1) prevention of extreme dieting, (2) optimizing energy and nutrient intake and (3) education about approaching athletes who wish to lose weight to enhance performance (Rodriguez et al., 2009). Furthermore, since body composition is considered an important performance variable in many sports, more knowledge within this area is needed. Assessment of body composition may be used to assess the effectiveness of an exercise or dietary intervention, or be used to monitor the health status of an athlete. Individual body composition goals should be identified by trained health care personnel, and body composition data should be treated in the same manner as other personal and confidential medical information (Ackland et al., 2012).

Studies have reported poor awareness and knowledge in coaches regarding eating disorders (Nattiv et al., 2007; Turk, Prentice, Chappell, & Shields, 1999). One important aspect in preventing eating disorders among athletes is to increase the coaches’ knowledge about risk and trigger factors, how to identify signs and symptoms, and how to manage concerns about eating disorders. Eating disorders and the athlete triad are, therefore, suggested as mandatory curriculum in education of coaches across all sports (Bonci et al., 2008). In addition, the position stands suggest development of common guidelines for all national and international sport federations, which states what to do with athletes who suffer from disordered eating or eating disorders.

Implications for future research

As most prevalence studies have assessed risk and symptoms of eating disorders through self-report, more studies also using clinical evaluation of the athletes are needed. Future studies examining the prevalence of eating disorders should include clinical interview using the Eating Disorders Examination, and highly trained personnel should conduct these interviews. Furthermore, prospective studies following cohorts of athletes can provide important data on changes in eating and dieting behaviour from adolescence to adulthood. Such prospective cohort studies are also suitable for examination of risk factors for eating disorders among athletes. Risk factors that further needs to be examined are use of doping, drive for muscularity and sexual orientation. Although suggested as gender specific for males, these risk factors need to be examined in both males and females. In addition, multi-factorial risk factor models for eating disorders in athletes need to be developed and examined. Such models need to include general, sport- and gender-specific risk factors. Increased knowledge about risk factors for development and maintenance of eating disorders among female and male athletes is crucial for enhancement of the prevention programmes. Similar to the energy deficiency, low estrogenic levels and reduced bone mass observed in the female athlete triad, we need to explore the possibility of a male athlete triad consisting of energy deficiency, low testosterone levels and reduced bone mass. Future studies also need long-term follow-up of athletes with eating disorders to examine the course of the disorder also after the end of the career as an athlete. Studies exploring muscle dysmorphia in both male and female athletes across a variety of sports are also necessary for the awareness of the complexity of the athletes’ mental health issues. The position stands for identification, treatment and prevention need to be carefully evaluated to explore the usefulness and effectiveness of such recommendations.

Summarising and conclusion

The prevalence of eating disorders is higher among female athletes/non-athletes compared to male athletes/non-athletes, and among athletes compared to non-athletes. It is especially athletes in sports that emphasize leanness who are at risk, but there might be gender differences as to which sports are most at risk. Among male athletes, it is important to further examine the concept of muscle dysmorphia as a possible eating disorder. There is still a need for increased openness and awareness related to eating disorders among both male and female athletes. Coaches and administrators have to accept the seriousness of this issue, and all personnel involved in athletes need to increase their competence on early identification, treatment and prevention of eating disorders in all athletes regardless of age and gender.
References


