TITLE

Understanding eating disorders in elite gymnastics: ethical and conceptual challenges

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ABSTRACT

Eating disorders and disordered eating are more common in high performance sports than the general population, and particularly so in high performance aesthetic sports. This paper presents some of the conceptual difficulties in understanding and diagnosing eating disorders in high performance gymnasts. It presents qualitative and quantitative data from a study designed to ascertain the pattern of eating disorder symptoms, depressive symptoms and levels of self-esteem amongst national and international level gymnasts from the UK in the gymnastic disciplines of sport acrobatics, tumbling and rhythmic gymnastics.

KEY POINTS

- Symptoms of eating disorders are more prevalent in high performance gymnasts than the normal population
- The definition of eating disorders is problematic when applied to the high performance gymnastics environment
- The high levels of eating disordered attitudes and behaviours and depressive and anxiety symptoms should be of concern especially given the young age of this population

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Introduction

Eating disorders are serious mental disorders characterised by an overvalued desire to lose weight and/or be thin or a fear of fatness, a distorted body image, and associated behaviours,[1] They tend to begin in adolescence and young adulthood, and can derail development and life courses.[2,3] The mortality of eating disorders is the highest of all mental disorders, with deaths occurring not only in the throes of severe disorder but even years afterwards, both due to suicide and the physical consequences of disordered eating and weight loss behaviours.[4–6]

Of those who survive, much larger numbers suffer from psychiatric comorbidities and physical disabilities such as cardiac problems, gastrointestinal problems, osteoporosis, infertility and neurological deficits; some of these irreversible.[7] Treatments for eating disorders are often ineffective and a majority of sufferers either remain chronically unwell or suffer a relapsing and remitting course.[2] The best outcomes for eating disorders are seen when eating disorders are detected early in younger individuals and prompt treatment is provided to prevent them from becoming entrenched or chronic.[8,9] The cost of eating disorders to individuals, families and society in terms of suffering, loss of potential and treatment costs are immense.[10] The prevention, early identification and treatment of eating disorders are therefore of paramount importance.[9–11]

It is well established that eating disorders have a higher prevalence in elite and high performance sport as compared to the normal population, with a particularly high prevalence in disciplines that emphasise leanness, low weight or (slim) aesthetics.[12,13] The term ‘Female Athlete Triad’ was coined to characterise a variant of eating disorders commonly found in female athletes, consisting of disordered eating, menstrual dysfunction and low bone mass.[14,15] Research has investigated the characteristics of eating disorders and the Female Athlete Triad among athletes, and also the effects of high levels of physical training on the growth and sexual development of girls and young women.[14,16]

Despite considerable scientific research, some conceptual issues in the context of eating disorders and elite sports remain largely unaddressed. Research studies largely assume that mental health criteria developed for the normal population can be applied to the high performance sports domain.[12] This assumption, however, that mental health criteria and concepts map well onto the particular and unusual context of high performance sports is problematic. In the process of conducting our empirical research it became clear that there are difficulties with operating the current definition of eating disorders in an elite sport environment, where some features common to eating disorders are normalised within that milieu.[17] Here we report upon a quantitative and qualitative study into disordered eating and eating disorders, in which a range of conceptual and ethical difficulties raised clear problems for research, diagnosis, and treatment.[17]

Eating disorders; classification and diagnosis

There are three main eating disorders – Anorexia Nervosa, Bulimia Nervosa and Binge Eating Disorder (BED).[18] BED is a recently recognised diagnosis in the newly released DSM-5 (the American Psychiatric Association's Diagnostic Classification system and is mostly associated with obesity.[18] In addition to individuals who fulfil criteria for these specific eating disorders, there are larger numbers who are significantly eating disordered but do not fulfil criteria – these are variously classified as Eating Disorder Not Otherwise Specified (EDNOS) in the ICD-10 (which is the World Health Organisation's Classification of Psychiatric Disorders),[19,20] or Other Specified Feeding or Eating Disorder (OSFED) and Unspecified Feeding or Eating Disorder (UFED) in the DSM-5.[21]

Eating disorders are generally characterised by disordered eating behaviours and distorted cognitions concerning food, weight and shape. In Anorexia Nervosa, there is a strong drive to be thin or lose weight with self-induced weight loss, which is associated with distorted body perception and self-image; in Bulimia Nervosa there are cycles of binging and purging which are associated with similar cognitive distortions. Text Boxes 1 and 2 provide the current ICD-10 and

DSM-5 Criteria for Anorexia Nervosa and Bulimia Nervosa respectively, and Text Box 3 provides a list of the other ICD-10 and DSM-5 eating disorders.

[Insert Text Boxes 1, 2 and 3 about here]

Eating disorders tend to emerge in adolescence and young adulthood – Anorexia Nervosa has a typical onset at 13-19 years, whilst Bulimia Nervosa has a slightly older typical age of onset.[5] Females are at higher risk of developing eating disorders, although males can suffer from them as well.[22] Risk factors for eating disorders include a family history of eating disorders, parental dieting or disordered eating behaviours, and personality traits of perfectionism and obsessionality.[23] Some common triggers for the development of eating disorders are dissatisfaction with body shape and weight for example as the body is changing in adolescence; dieting behaviours; traumatic or illness experiences; and bullying.[23] It is well established that context is important, and cultures and environments which place pressure on individuals to conform to unrealistically thin body ideals place individuals at risk for eating disorders, with the prevalence of eating disorders much higher amongst ballet dancers and models.[24,25]

There are physical and psychological developmental concerns associated with eating disorders in children and adolescents. When individuals develop eating disorders during adolescence, many of the developmental trajectories can be arrested or derailed as physical height, hormonal changes and bone growth are affected by nutritional fluctuations and/or deficiencies; social isolation and a narrowing of interests or growing co-morbid depression can affect academic and social development at a time when exploration of the social environment, friendships and intellectual capacities are usually increasing; and the young person's development of identity and self-image can also be affected.[10,26,27]

It is important to note that there are continuing conceptual and definitional controversies in eating disorders. The new DSM-5 classification published in 2014 loosened the criteria for both

Anorexia Nervosa and Bulimia Nervosa in order to enable more sufferers to be categorised as having these disorders.[21] The rationale behind this was that the majority of people suffering from disordered eating and eating disorders failed to meet criteria for these two disorders and were relegated to the ill-defined catch-all 'atypical' and 'EDNOS' categories, which is unhelpful as these 'atypical' categories are both poorly researched and undertreated.[21] A further difficulty is the shifting course of eating disorders within individuals – it has been shown that the majority of sufferers shift from one diagnosis to another in the course of their illness.[28] Proposals of a 'transdiagnostic eating disorders' categorisation have been made to reflect the fluctuating nature of many eating disorders.[29] In spite of this, distinct differences remain between Anorexia Nervosa and Bulimia Nervosa that are relevant to both conceptualisation, diagnosis and treatment.[30,31]

Anorexia Nervosa is characterised by weight loss and is particularly distinctive because of its egosyntonic nature; that is, it is often experienced as part of the self or congruent with the person's orientation and desires. [32,33] As a result, even when it is very severe and causing significant harm or debility, sufferers may deny they have an illness and claim their starvation is a matter of personal or lifestyle choice.[34–36] This is exemplified by the 'Pro-Ana' underground subculture which may glorify Anorexia Nervosa and individuals trade tips online about how to lose more weight and deceive health professionals, or the subversion of treatment efforts that can occur.[36,37] Even when in distress or suffering from diminishing function and increasing risk, sufferers can often be attached to their disorder or feel deep ambivalence to receiving treatment to the extent that compulsory treatment may be needed in order to save life.[38,39] Because of the opposing effects of binging and purging, Bulimia Nervosa sufferers may be low, normal or high in weight, and can more easily escape detection. The binging and purging behaviours adopted in Bulimia Nervosa can nevertheless lead to high risks of physical harm.[7]

The high performance gymnastics environment

Gymnasts aspiring to elite level typically enter and peak in the high performance arena at a young age. Specialisation and intensive training begins very early in life, and most competitive gymnasts retire before their mid-twenties.[40] The time window of peak performance often coincides with adolescence, and these adolescent athletes have to cope with both the demands of a high performance environment and the changes associated with physical and sexual growth and maturation.[41] It is important to understand how these changes are interpreted by gymnasts themselves. These normal developmental changes may be viewed in the gymnastics context as both undesirable and deleterious to performance, as illustrated by this female gymnast.

But I mean like when we get boobs and bums and hips and, it is, you kind of think "Well go away for a bit, come back when I'm older, I don't need you now."

Because of their relatively young age and the intensive nature of high performance training required, coaches have extensive contact with high performance gymnasts and become important in providing psychological support and structure to their athletic lives which spills over into everyday life. Most coaches are in effect acting in *loco parentis*. In the process of shaping their young protégés' bodies and performance coaches develop strong bonds of trust and shape their attitudes and values, transmitting their own values and goals to the developing gymnasts.[42] The heteronomous nature of this relationship, and the high levels of external structure normal and necessary to the high performance environment are accentuated by the nature of the relationship, where the youth of many gymnasts means there is a dependence and clear asymmetry in power and experience, and the gymnast has to trust his or her coach implicitly to know the athlete's limits and capabilities better than the gymnast himself or herself could.[42]

There is a constant focus on optimising weight for performance in high performance gymnastics, consistent with any high performance sport; but in gymnastics (depending on discipline) there can be an additional element of the demands of aesthetic judging which idealises the slim physique

and the constant drive to optimise maximal power and performance for minimal weight.[13,43] There are clear differences between different gymnastics disciplines, in performance and aesthetics demands.[44] Tumbling requires small yet very powerful physiques, with less emphasis on slimness. Rhythmic gymnasts, are typically tall and slim with a uniformity of shape and size across the team. In sport acrobatic gymnasts work in teams, with specific roles. Bases have to be strong and powerful and are usually older while the 'tops' have to be small and light and are usually younger.[44] Some disciplines or competition formats require conformity and teamwork so relationships with and responsibilities to teammates become important.[44]

The research study

The aim of the overall study was to study the ethical issues involved in eating disorders, and the aim of the quantitative sub-study was to ascertain the pattern of eating disorder symptoms, symptoms of depression and levels of self-esteem amongst high performance British gymnasts aged 10 to 25 years. Our particular focus here will be upon the conceptual and ethical issues in diagnosing eating disorders that became apparent as the study progressed, that the physician should be aware of in order to support, diagnose and/or treat adolescent athletes in high level sports environments.

METHOD

In collaboration with British Gymnastics, coaches of selected high performance gymnastics clubs were invited to facilitate recruitment of the sample. This study was reviewed and approved by the Swansea University Research Ethics Committee. All participants (and their parents if under 18) were given invitation letters, information sheets and consent forms via their coaches, who also provided access for data collection at their regular training venue in confidential settings. All participants signed consent forms, with additional consent provided by parents of participants aged below 16 years. Each participant was given a set of four self-administered questionnaires and then interviewed individually. Participation in research was followed by a psycho-education

session for gymnasts (and separately with parents) about eating disorders. All high performance gymnasts aged 10 to 25 years old training were eligible to take part in this study. Fieldwork took place between November 2011 and March 2012 at four high performance clubs across Britain.

Four questionnaires were used: the Eating Attitudes Test (EAT-26);[45] the Eating Disorder Examination Questionnaire Version (EDE-Q6);[46] the Beck Depression Inventory (BDI-II);[47] and the Rosenberg Self Esteem Scale.[48] The Eating Disorder Examination Questionnaire is a detailed questionnaire which provides detailed scores on four subscales (restraint, eating concern, weight concern and shape concern);[46] it has been shown to be an accurate screening tool for identifying likely cases of eating disorders in the community.[49] The Eating Attitudes Test is a briefer screening instrument that has been found to be useful in identifying athletes at risk of eating disorders.[50] The Rosenberg Self-Esteem Scale indicates whether there is significant low self-esteem.[48] The Beck Depression Inventory differentiates between symptoms of mild, moderate and severe depression.[47] The EDE-Q6, EAT-26, BDI, and Rosenberg Self-Esteem Scale are all validated for ages 12 and above.[47,48,50–55] The participants' self-reported dates of birth, height, and weight were also collected at the same time.

RESULTS

A total of 51 male (n=16) and female (n=35) high performance gymnasts from four clubs completed the questionnaire, from the disciplines of Tumbling (n=7), Acrobatics (n=28) and Rhythmic Gymnastics (n=16). 38 gymnasts were competing at international level and 13 at national level. Table 1 characterises the sample and questionnaire scores. Four of these participants were aged below 12 years and have been excluded from the analyses that follow as there are no norms for individuals below 12 years in the instruments used. The project also involved semi-structured interviews with gymnasts and support staff (n=42). These are only briefly reported upon here, a more detailed analysis of these findings is published elsewhere (Bloodworth, *et al*., submitted). [Table 1 here]

238

239 On the Rosenberg Self-Esteem Scale, five athletes (11%) had low self-esteem (<15 indicates low
240 self-esteem). Nine athletes (18%) had scores above 25. On the Beck Depression Inventory, 26
241 (55%) had scores indicating minimal or no depression (range 0-9); 19 (40%) had scores indicative
242 of mild depression (range 10-18); 3 (6%) had scores suggestive of moderate levels of depression.
243 On the EAT 26, 9 athletes (19%) had scores indicating a significant eating problem (=/>20). The
244 EDE-Q6 showed far higher proportions above population norms: 67% of females 16+ years, 61%
245 of females <16 years and 31% of males had mean EDE-Q6 global scores above population norms.

246

247 Table 2 shows the bivariate correlations between all study variables for all gymnasts. Sex was
248 associated with self-esteem and disordered eating behaviours and attitudes, with males reporting
249 higher levels of self-esteem than females, and females indicating greater propensity for eating
250 disorder symptoms, particularly in the EDE-Q6 Restraint, Weight Concern and Shape Concern
251 subscales. International gymnasts generally reported greater restraint over eating than national
252 gymnasts. Self-esteem was marginally negatively associated with shape concern. Higher levels of
253 self-esteem were linked with fewer concerns about body shape. Depressive symptoms were
254 positively associated with eating disorder symptoms. As expected, all of the eating disorder
255 measures (EAT26 & EDE-Q6, along with all the subcomponents of the EDE-Q6) were highly
256 correlated. [Table 2 here]

257

258 The EDE-Q6 asks 3 questions concerning menstrual status, requiring free responses. The
259 responses were converted into a variable ('Menstrual Status') that was subject to bivariate
260 correlation analysis. Table 3 shows bivariate analysis for females only. Table 4 shows male
261 gymnasts' data. In females, menstrual status is highly correlated with the EDE-Q6 Global,
262 Restraint Subscale and Eating Concern Subscale scores, and significantly correlated with Shape
263 Concern Subscale, Weight Concern Subscale and EAT-26 scores. Body Mass Index (BMI)
264 centiles were not significantly correlated with either eating disorder symptom scores either for sex

or menstrual status. Additionally, a series of sequential multiple regression models were run to assess the unique effects of each of the key variables on the different eating disorder measures (Table 5). Specifically, the analyses examined whether sex, level of competition, age, self-esteem, and depressive symptoms independently predicted eating disorders. A separate analysis was performed for EAT-26, EDE-Q6 Global and each Sub-scale scores, and the proportion of variance is also reported. [Tables 3,4 and 5 here]

The patterns of relationships were similar between male and female gymnasts. Self-esteem was independently associated with eating disorder symptoms (Restraint and Eating Concerns sub-scales) and marginally associated with EAT-26 and EDE-Q6 Global measures of eating disorders. An increase in self-esteem was linked to an increase in eating disorder symptoms. However, most of the participants had 'good' self-esteem and this effect may have been being driven by the minority who scored lowly for self-esteem. Depressive symptoms were independently associated with eating disorders, with greater levels of depressive symptoms as scored by the BDI linked with greater severity of symptoms of eating disorders. Each model explained a 'good' proportion of the variance in eating disorders.

DISCUSSION

The results of this study reflect a high prevalence of eating disordered behaviours and attitudes that are found amongst high performance gymnasts, when defined using standard mental health criteria.[12] Importantly, 31% male gymnasts also scored highly on the eating disorder scales, which suggests that male gymnasts must not be overlooked as potentially having disordered eating attitudes and behaviours. There were no reports of purging and Bulimia Nervosa did not appear to be a likely diagnosis in this particular group of gymnasts, which is consistent with the young age of the sample.

There are difficulties, however, in applying standard eating disorder criteria to this group of individuals. Traits such as perfectionism and obsessionality associated with success in an elite sport context have similarities with those found in eating disordered individuals.[56–58] In this context, the high performance gymnastics 'job requirements' are the demand for constant surveillance of dietary intake, frequent self monitoring of weight and shape (amplifying monitoring of weight and shape by coaches), high levels of concern about any weight gain and in particular concern about gaining fat, all of which would be considered 'eating disordered' in the mental health context. Here a female participant reflects upon a stringent and perhaps even disordered attitude toward food, but cites an ability to switch this off.

- *'I mean I didn't eat a lot at all and what I did eat I constantly knew what I was eating for the right reasons. But I always felt like I was hungry, like if I felt like I wanted to eat, I knew I could just eat. Like the minute I finished I just went back into a regular eating plan straightaway. So it never kind of held me back'*

The challenge here is discriminating between extreme attitudes and behaviours, that while seemingly disordered, are rationalised in the sporting context, and are reflected upon and endorsed by the athlete. (Bloodworth et al, submitted) As noted above, where individuals with Anorexia Nervosa experience the condition as a central aspect of their identity, and positively endorse this aspect, it becomes difficult to dissociate the apparently autonomously choosing person from the apparent disorder.[59] Furthermore, it will be not in the interests of the athlete to reveal their eating related concerns and issues to the coach for fear of de-selection, since health-related concerns may dictate removal form the squad on grounds of their duty of care to the athlete.[60–62]

These concerns may be compounded in sports acrobatics where the gymnasts perform in teams, as interdependent units. Indeed, the attitudes of the gymnasts, particularly amongst females and the 'tops' (i.e. the performer at the apex of complex moves where they may be executing complex

skills on top of the shoulders of two or three other gymnasts) of both sexes of the acrobatics teams, were that the pre-pubertal slim figure was highly prized by the athlete and the team, and where otherwise "normal" growth in height and female sexual development in particular was viewed as problematic and challenging. A difficulty in the opposite direction presented itself when assessing the gymnasts' (self-reported) weights and body mass indices. Because of the relatively high body mass indices of all the gymnasts, none of them satisfied the low weight criterion of Anorexia Nervosa. This data must be understood against a background of research which shows that bone density and lean body mass are higher in elite gymnasts than normal adolescents.[63,64] Our observational data was that some individuals were very clearly thin and pale, whom the coaches were clearly concerned about, and for whom the clinician researchers among the research team suspected that they were suffering from an eating disorder; yet none of these individuals had a Body Mass Index below 17.5, nor were they willing to disclose any disordered eating behaviours in their interviews. Indeed, these individuals were less forthcoming about disordered eating behaviours and attitudes than their peers.

These difficulties in matching the standard criteria of eating disorders to this special population raises the possibility that the Female Athlete Triad may be a better means of defining athletes as having eating disorders, as it does not rely on any weight criterion or cognitions. Even so, there are difficulties with this for the specific young population under study. Research suggests that the triad does not identify many of the athletes at risk.[65] Menstrual abnormalities are common as a consequence of the negative energy balance, yet this is difficult to assess in this age group who mostly not have reached or established menarche as they begin high levels of training, and who may suffer delayed menarche rather than a more measurable disruption of already established menstrual cycles. Low bone mineralisation is also likely to be a particularly late sign of negative energy balance and severe nutritional problems in this group, because gymnastics is a high impact sport and tends to increase bone density as compared to normal populations.[63,64,66] Some researchers believe that small stature, late menarche and late physical maturation are selected for

by sports such as gymnastics, rather than being the consequence of intensive training.[41] Finally, disordered eating is a problematic concept when the issue is the 'job description' of high performing gymnastics reflected in a highly controlled and restricted intake characteristic of Anorexia Nervosa.

Many gymnasts in the study had a heavy training load (approximately 25 to 30 hours per week) in addition to their mainstream educational demands. The BDI responses showed no individuals with thoughts of self-harm or suicide, which contrasts very favourably with 20-45% of the adolescent population which reports suicidal thoughts.[67,68] Instead, the gymnasts' questionnaire responses reported difficulties going to sleep, and high levels of anxiety and tiredness. In qualitative data many athletes cited a busy life and restrictions upon their spare time, while also referring to the gains from participating in sport at this level.

Erm … the worst is probably all the time it takes, like with training every single night. I wish I did have a little bit more spare time and stuff. But the best is when you're at a competition and then you just go on the floor and then that just … that feeling that you get. And especially if you win the competition, when you're on the podium it just … it's just an amazing feeling (female gymnast).

The findings are not straightforward to interpret, and present conceptual difficulties. There are also limitations to our study. Access to elite sports populations for the purposes of non-performance enhancing research. Despite a variety of approaches to weighing practices by coaches, it was not within the scope of the study for the authors to conduct any weighing, physical measurements or clinical assessments, because the study focussed on in-depth interviews yet attempted to be minimally disruptive to the gymnasts' busy training schedules and minimally physically intrusive. The formal diagnosis of any mental disorder requires a full clinical interview, which was also beyond the remit of this study. The method of selection meant that the clubs that volunteered to participate could not be assumed to be representative of high performing clubs in general, and

there can be no overarching claims of the representativeness of the data of these high performance gymnasts. Nevertheless, the participants were confident, self-motivated and ambitious young people, a markedly different population from the standard mental health clinic or indeed the standard school. This was borne out by the high self-esteem scores, which we would suggest reflects the high levels of success, public esteem and validation associated with successful participation in high performance sport.

Given the 'occupational requirements' of being a high performance athlete in a particularly physically demanding sport, one may ask whether the high scores on the eating disorder questionnaires simply a reflection of a (possibly coincidental) similarity of characteristics between eating disordered people and elite athletes, and the high depression scores are simply a reflection of juggling hectic 'jobs' in addition to being in fulltime education? Or is this a highly stressed population constantly performing at their limits, and compromised in their mental health with respect to disordered eating, anxiety and depression as a result? As suggested by one participant, one distinguishing feature of a functional rather than pathological preoccupation with weight and shape was whether the individual was able to 'switch off' this preoccupation when on holiday from training or, indeed, after retirement from competitive sport. A problem, however, that gymnasts pointed out was that unlike some other international sports, modern competitive gymnastics does not appear to have any particular 'off season' when gymnasts can allow themselves to eat at liberty and gain weight prior to returning to intensive training and conditioning. Enforcing some kind of 'off-season' for athlete rest and recovery, could be respite from the constant training and self-discipline which might lend itself to loosening of control and more disordered eating, and that respite might also help to discriminate between those who can stop their 'anorexic' attitudes and behaviours when it is not needed and those who cannot. A further issue is that even if functional rather than 'mentally disordered', the constant preoccupation with weight and constant idealisation of an unrealistic shape, particularly at an important developmental period of self-regulation and self-image is likely to have longer term

implications for the way these gymnasts conceptualise and view food and their own bodies or indeed their identities, long after they have retired from sport.[40,69]

Does the prevalence or normalisation of such behaviours and attitudes within a sporting discipline imply that these are normal, healthy or morally acceptable? To what extent can a physician not intimately familiar with the training demands and milieu of elite gymnasts interpret the fine grained judgements about weight and shape that gymnasts and coaches do as part of the normal everyday encounter with their sport?[62] To the extent that that the physician is an insider to the norms and values of the population, how will they guard against "going native" – the anthropologists' nightmare of uncritically accepting the norms of a host population? Without wishing to pathologise emotionally healthy and well-functioning athletes, there is a strong argument that exposure to a negative energy balance and constant preoccupation with weight and shape and high levels of tiredness and anxiety cannot be healthy, especially amongst young developing minds and bodies at a uniquely susceptible time of life. Some research suggests that post-retirement release of high performance athletes from the constraints of low caloric intake can lead to 'rebound/catch-up' physical growth and eventual normal adult height and weight, and there is also an argument that these sports may be self-selecting for smaller, leaner, or slower maturing individuals.[41,70] There is, however, currently relatively little evidence concerning the long-term psychological or emotional implications of these practices, although one study suggests that gymnasts' eating disorder symptoms do abate somewhat after retirement; this is clearly an area for researchers to explore further.[71]

There are many similarities but also many differences between eating disorders (in particular Anorexia Nervosa) and high performance gymnastics. Many people with Anorexia Nervosa are perfectionistic and obsessional; they are also often highly disciplined and self-controlled and able to focus solely on their goal of weight loss, being able to sacrifice other interests and enjoyments to this goal.[72,73] The similarities in personality between high performance athletes and people with

Anorexia Nervosa places this individuals at particular risk of developing an eating disorder; the contextual pressures within the sport to lose weight and idealisation and focus on low weight and slim shape compound these risks.[56] There are arguments that high performance gymnasts may self-select both for body type and also ability to exert high levels of discipline and control over their own bodies and over food intake, and therefore may also be self-selected as being more susceptible to eating disorders as opposed to the sport by its nature inducing these disorders.

There are, however, many differences between high performance sport and eating disorders. For the 'functional eating disordered' athlete, the attitudes and behaviours around eating and shape are secondary to an overarching goal of improving performance. In psychiatric 'eating disordered' populations, the attitudes and behaviours have no goal other than themselves, or else serve as some maladaptive coping mechanism, for example in trying to take control of one's own life in the face of abusive situations or a chaotic family background, although overexercise is often used as a tool to achieve control and weight loss.[74] The non-functional and ultimately self-defeating nature of eating disorders is the hallmark of all mental disorders, and such individuals continue to perceive themselves as fat and have a drive to lose weight even when their gain or function is diminishing from malnutrition, psychological difficulties or poor physical health. In contrast, one might expect an athlete with a 'functional eating disorder' to have the power to cease their weight loss behaviours as they tip over from helpful to harmful with regard to performance and competitiveness. The problem, however, is that there is a fine line between 'functional' and 'pathological' eating attitudes and behaviours; indeed, there may be no line at all. Again, the quality of the athlete-physician relationship will be crucial in interpreting this phenomenon with validity and care.[62]

Well known elite athletes have spoken in hindsight of their own struggles with eating disorders.[75] It may be possible that eating disorders may coexist at the same time as a highly successful sporting career if the athlete succeeds in a precarious balancing act of maintaining control over

behaviour so that it does not (seriously) harm performance; this may correspond with what clinicians recognise as subclinical eating disorders in the normal population. At the same time, it can be argued that something which is functional in nature may nevertheless be pathological both in terms of its harmfulness and its grip over the psyche.

CONCLUSIONS

The conceptual challenge facing researchers and physicians confronted with potential eating disorders in high performing gymnastics is in distinguishing between functional and pathological eating attitudes and behaviours in high performance sport. This is crucial if we are to identify those mentally ill individuals (including those with subclinical variants) who need prompt and appropriate help to prevent them from coming to harm, without intervening needlessly in the lives of other individuals who are engaging in similar practices out of necessity without any negative psychological consequences. The practical challenge is in understanding what is harmful for athletes, especially young athletes who are still in the process of physical, emotional and social development, in order to promote their current and future wellbeing; and having understood it, to modify the pressures within the sport to promote wellbeing and prevent harm.

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