

EDITORIAL COMMENTARY:

FEMALE ATHLETE TRIAD RECOGNITION AND KNOWLEDGE OF COLLEGIATE CROSS-COUNTRY COACHES

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The Female Athlete Triad (Triad) refers to the triad of low energy availability, impaired menstrual function and low bone density. However, each component of the Triad is, in fact, a spectrum with energy availability ranging from normal to low, menstrual function ranging from normal to luteal phase defects and anovulatory cycles to frank functional hypothalamic amenorrhea (FHA, absence of menses) and bone density ranging from normal to low. There is an obvious need to engage coaches in education efforts so they know about the Triad and its components, can pass on this information to their teams, be comfortable discussing dietetic and menstrual issues with female athletes, and recognize Triad symptoms early and bring these to medical attention in a timely fashion. Coaches are in a unique position to educate athletes and prevent the Triad from developing or worsening over time, and to advocate for optimal resources including for the services of a sports dietician and psychologist.

The Female Athlete Triad (Triad) refers to the triad of low energy availability, impaired menstrual function and low bone density.¹⁻³ However, each component of the Triad is, in fact, a spectrum with energy availability ranging from normal to low, menstrual function ranging from normal to luteal phase defects and anovulatory cycles to frank functional hypothalamic amenorrhea (FHA, absence of menses) and bone density ranging from normal to low.³

Low energy availability results when energy intake is insufficient to meet the needs of increased energy expenditure in these women. Alterations in menstrual status are a consequence of hypothalamic dysfunction, which in turn is a consequence of many hormonal changes resulting from low energy availability.⁴ Menstrual irregularity is reported in up to 24% of high school athletes and in up to 66% of adult athletes.^{5,6} The risk of developing FHA depends on the nature of athletic activity, the extent of training and the

nutritional status of the athlete, and is more common in endurance athletes (including long distance runners, swimmers and rowers) and those engaged in sports that favor leanness (such as runners, gymnasts, figure skaters, cheerleaders and divers). The risk increases with increasing intensity of training and with lower body mass index (BMI) and is higher in those with disordered eating patterns or frank eating disorders. Menstrual dysfunction has a deleterious impact on reproductive, bone and other health outcomes.

Suppression of the hypothalamic-pituitary-gonadal axis from a state of energy deficit results in a reversible form of infertility, that resolves with normalization of energy status and resumption of ovulatory cycles.^{2,3,7} In young women, a major consequence of low energy availability and associated hormonal alternations (lower levels of gonadal hormones, insulin like growth factor-1, leptin and higher levels of cortisol and peptide YY) is low bone density and increased fracture risk.^{4,8}

Particularly, female athletes with amenorrhea tend to have a higher risk for stress fractures than normally menstruating athletes.⁹ In addition, there is a concern that low energy availability and menstrual dysfunction may result in impaired bone accrual during the pubertal years of peak bone acquisition. There are also other consequences of low energy availability and hypogonadism in athletes, including possible cardiovascular and psychological consequences.^{4,10}

To prevent a long-lasting impact on bone health, timely diagnosis of the Triad is critical, such that nutritional, psychological and other interventions can be implemented in a timely fashion. A position statement from the Female and Male Athlete Coalition and the American College of Sports Medicine discusses the importance of asking questions related to the three components of the Triad during the pre-participation physical.³ It also provides recommendations regarding who should get bone density testing and when, and strategies to improve energy status, optimize menstrual function and manage low bone density. Most importantly, a team approach is recommended that includes input from a physician provider, a sports dietician, a psychologist or psychiatrist, the athletic trainer or coach and the athlete's family and friends.

For all these reasons, it is critical for coaches and athletic trainers, who have frequent interactions with athletes, to be aware of the various components of the Female Athlete Triad, monitor their teams, and bring concerns around the Triad to medical attention in a timely fashion. There was a time when amenorrhea in athletes was accepted as an indicator of intensity of training and considered almost inevitable and not necessarily harmful to the athlete. Given current knowledge regarding the deleterious consequences of energy deficit on reproductive, bone and other outcomes, awareness of the same among coaches could result in early diagnosis and therefore early management of the condition. Coaches spend large amounts of time with athletes and have tremendous opportunity to act as educators, promote healthy eating and exercise habits, and provide guidance around the Triad components and their impact on sports participation.

The study by Beaudry *et al.*¹⁷ examining Triad recognition and knowledge among National Collegiate Athletic Association (NCAA) coaches of collegiate cross-country athletes is troubling in that the authors report that 29% of coaches had not

heard of the Triad and nearly 40% of the 143 coaches who responded to the survey could not identify any of the three components of the Triad. These are large numbers, and while similar studies have been reported previously, the fact that such numbers remain a reality in the third decade of the 21st century despite extensive efforts to disseminate Triad related knowledge and guidelines by the International Olympic Committee (IOC), the Female and Male Athlete Triad Coalition and the ACSM is worrisome.^{2,3,10,11-14} This appears to be a problem particularly among Division II and III coaches, likely because Division I athletes and coaches have had better access to Triad-related education given the impact of the Triad on the health and well-being of elite athletes, their ability to continue sports participation when diagnosed with the Triad or its consequences and long-term implications of being unable to participate/return to play.^{3,15}

There seems to be a trend for geographical location impacting knowledge about the Triad, such that coaches in the West were most aware of the Triad, followed by those in the Midwest, Northeast and South, in that order. Given that only 12.6% and 14.7% of the coaches were from the West and Midwest respectively, with greater representation from the Northeast (39.9%) and South (26.6%), and the overall sample size was relatively small, these results should be considered preliminary. However, if these numbers hold up in a larger sample, this could have implications for where education efforts for coaches should be focused for greatest yield.

Only about 60% of coaches indicated that they were comfortable or very comfortable discussing menstrual issues with their athletes and only 31.5% were likely to talk about this with their female athletes. It is very concerning that 12.6% of surveyed coaches indicated agreement with the statement that absence of menses is a normal result of exercise in female athletes, and that 20.3% of coaches thought that fewer than 8 menses per year is normal. Given that menstrual function is a key indicator of energy status and a key driver of bone and other outcomes, this knowledge deficit is essential to address and soon. Further, male coaches were less likely to be comfortable discussing menstrual issues and dietary habits with female athletes than the female coaches, and this indicates the necessity to empower male coaches with not just

knowledge of the Triad, but also strategies to make such communications comfortable and routine.

Another concerning finding from the survey was the low access to resources with only 51% and 29% of responding teams having access to registered dietitians or sports psychologists, and this was particularly an issue with Division II and III teams; Division I teams fared better for such resources, and geographic location did not impact results. A sports dietitian can be critical to diagnosing energy deficit states early and providing appropriate recommendations for dietetic modifications to optimize energy status, and also tailor recommendations to the individual athlete. Similarly, psychologists are essential for optimal management of disordered eating and eating disorders that may contribute to low energy availability through insufficient intake or purging behavior. One study reported significant success of cognitive behavioral therapy in driving menstrual resumption in a small group of women with FHA, highlighting the critical role that psychologists can play in this context.¹⁶ All findings from the study by Beaudry *et al.*¹⁷ are even more concerning in that the survey went to collegiate cross-country coaches, and it is well known that cross-country runners are at very high risk for developing one or more components of the Triad.

This study by Beaudry *et al.*¹⁷ is both timely and a call to action. There is an obvious need to engage coaches in education efforts so they know about the Triad and its components, can pass on this information to their teams, be comfortable discussing dietetic and menstrual issues with female athletes, and recognize Triad symptoms early and bring these to medical attention in a timely fashion. Coaches are in a unique position to educate athletes and prevent the Triad from developing or worsening over time, and to advocate for optimal resources including for the services of a sports dietitian and psychologist. They can be critical to optimizing the health of athletes, and thus it is essential to maximize their education, particularly for Division II and III coaches (the bulk of education appears to have been directed thus far to Division I coaches).

Conflict of Interest Statement

The author reports no conflict of interest with the contents of this manuscript.

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