The Female Athlete Triad & Injury Risk in High Performance Athletes

11/29/2021
Written by: Hannah Greving - Junior in Exercise Physiology, DPT Program, & Member of the Women's Lacrosse Team
Mentor: Toni Uhrich
Edited by: Dr. Sandra Hunter, Mike Haischer

Key Points:

- **The female athlete triad is the presence of disordered eating, amenorrhea, and osteoporosis in female athletes**
- **Common symptoms of the triad are low bone mineral density, low body mass index, low energy availability, and presence of an irregular menstrual period**
- **Awareness and prevention of these symptoms are essential to help the wellbeing of the athletes and reduce risk of musculoskeletal injuries**

The female athlete triad is a serious condition involving the combination of disordered eating, amenorrhea, and osteoporosis that negatively impacts high performing athletes (Figure 1)[1]. Disordered eating results from lower levels of available energy. Amenorrhea is the presence of an irregular menstrual period, and osteoporosis indicates low bone mineral density that causes bones to become weak and brittle. Unfortunately, the triad is often unrecognized and underreported which increases the risk for injury and other negative impacts to the athlete.

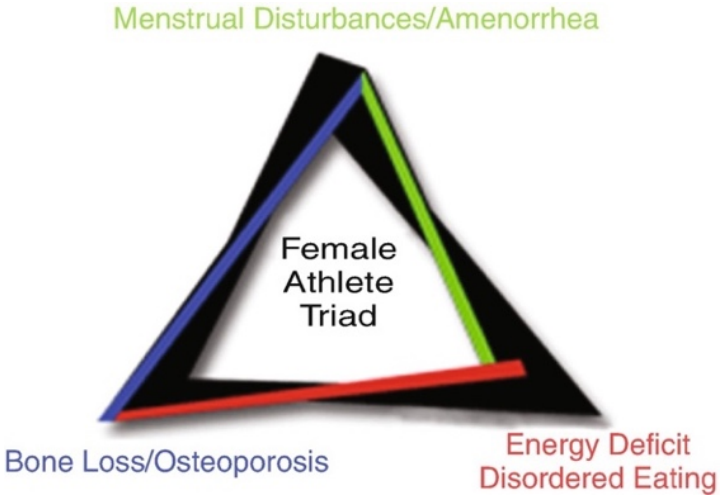

Figure 1: The female athlete triad combines the following: osteoporosis, menstrual disturbances, and energy deficiencies caused by disordered eating[4].

Compared to ball sports, athletes that participate in technical, aesthetic, endurance, weight class, and anti-gravitational sports like gymnastics, figure skating, cross country, and track are more likely to have symptoms of the triad because leanness and a low body weight may be beneficial to performance success (Figure 2) [1]. For gymnasts specifically, menstrual irregularity has been associated with more time-loss from hand/wrist injuries and more surgeries involving the lower extremity compared to gymnasts with a regular menstrual period. Gymnasts with disordered eating also reported greater percentages of spine and lower extremity injuries, with or without surgery[2].

The Female Athlete Triad & Injury Risk in High Performance Athletes

In collegiate athletes, risk factors for the female athlete triad include the presence of a low energy availability, low body mass index, delayed menarche, amenorrhea, low bone mineral density, and a prior stress fracture. Athletes with all 6 of these symptoms are in the high-risk category for injury[3]. For example, the number of risk factors for the triad is proportional to the risk for bone stress injuries as stress fractures and bursitis (inflammation in the small, fluid-filled sacs around the joints) are significantly more common for the athletes in the moderate to high-risk category. Additionally, the likelihood of developing bone stress fractures is about 3-5 times higher for female athletes who have one of the risk factors than athletes with no risk factors[3].

Due to the continuing prevalence of disordered eating, amenorrhea, and osteoporosis in female athletes (the triad), it is vital that parents, coaches, teammates, trainers, and the athletes themselves can recognize the symptoms and are educated on preventative and treatment options. Athletes typically have a yearly physical with a team doctor or trainer and can use this appointment to record risk factors and take action when needed. Other measures, such as body composition assessment, can provide valuable information based the athlete's weight, percent body fat and lean mass, and bone density levels. Overall, awareness and prevention are key to minimizing the harmful impacts of the female triad [1,3].

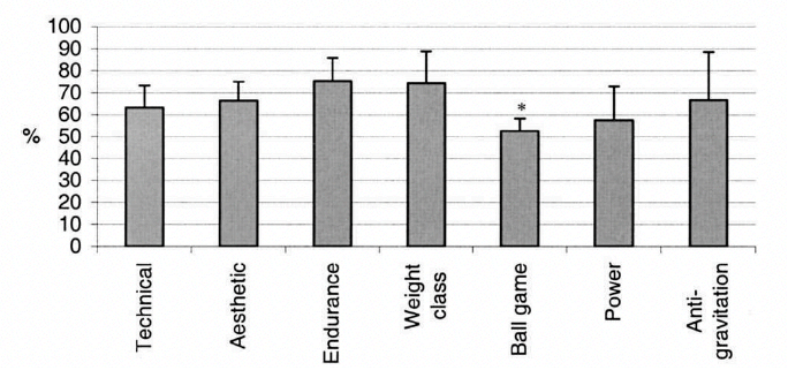

Figure 2: Type of sport and its percentage of its athletes that are at risk for developing the female athlete triad. Athletes participating in ball sports are at significantly less risk when compared to technical, aesthetic, endurance, weight class, and anti-gravitational sports (high jump, long jump, and pole vault)[1].

References

1. Jorunn Sundgot-Borgen. 2005. The Female Athlete Triad: Are Elite Athletes at Increased Risk? American College of Sports Medicine. DOI: 10.1249/01.MSS.0000152677.60545.3A. https://journals.lww.com/acsm-msse/Fulltext/2005/02000/The_Female_Athlete_Triad__Are_Elite_Athletes_at.3.aspx
2. Fryar C, Howell DR, Seehusen CN, Tilley D, Casey E, Sweeney EA. 2021. Time loss injuries among former collegiate gymnasts: The influence of female athlete triad symptoms. Orthopaedic Journal of Sports Medicine. DOI: 10.1177/2325967121S00171. https://journals.sagepub.com/doi/pdf/10.1177/2325967121S00171
3. Edama M, Inaba H, Hoshino F, Natsui S, Maruyama S, Omori G. 2021. The relationship between the female athlete triad and injury rates in collegiate female athletes. PeerJ 9:e11092. DOI: 10.7717/peerj.11092. https://peerj.com/articles/11092/
4. Tayne S, Hrubes M, Hutinchson M, Mountjoy, M. 2019. The Female Athlete Triad and RED-S. https://www.researchgate.net/figure/The-Female-Athlete-Triad_fig1_332385676