



## Grant Information Summary:

# An Investigation of the Female Athlete Triad Among High School Athletes

### Practical Significance Statement

**This prevalence of individual components of the Female Athlete Triad was alarmingly high among this sample of high school athletes (N=589). We recommend that coaches, athletic trainers, parents, and athletes work together to recognize its symptoms and prevent its development.**

### Study Background

Several studies of the Female Athlete Triad have been reported for college athletes, but the prevalence of this syndrome among high school athletes is unknown. Given that the majority of college athletes with disordered eating behaviors and menstrual irregularity report that these conditions began during adolescence, investigations of the triad are needed in younger athletes, especially in light of the rapidly growing participation and competitive nature of high school athletics.

### Objective

The purpose of this study was to determine the prevalence of the female athlete triad syndrome among high school athletes representing multiple sports.

### Design And Setting

This was an observational study where data were collected in 6 high schools in San Diego County, CA.

### Subjects

Fine hundred eighty-nine female high school athletes (age  $15.3 \pm 1.7$  yr; height  $165 \pm 7$  cm; mass  $59.4 \pm 8.9$  kg) representing 10 interscholastic sports including: cross-country running, track & field, soccer, basketball, volleyball, swimming, tennis, softball, lacrosse and field hockey participated in this study.

### Measurements

Questionnaires for disordered eating behaviors (EDE-Q), menstrual history/status, and sport participation; bone mass by DXA (n=170).

### Results

The percentages of athletes classified at risk were as follows: disordered eating (DE): 17.8%; Menstrual irregularity (MI): 22.4%; low bone mineral density: 22.2%. Moreover, 10 (5.7%) of the girls met two of the three criteria for the triad; whereas, only two girls (1.1%) met all three criteria. In a related sub-study in which lean-build (LB) athletes were compared to non-lean-build (NLB), the prevalence of MI was higher in LB (26.7%) than NLB (16.6%) athletes ( $P=0.01$ ). Further, athletes with DE were over two times more likely (OR=2.3, 95%CI: 1.3, 4.2) to report oligo/amenorrhea than athletes without DE.

### Conclusions

The data suggest the need for screening female high school athletes for disordered eating behaviors and menstrual irregularities. Interventions are needed to prevent the long-term health consequences associated with the Female Athlete Triad Syndrome.

### Principal Investigator:



**Jeanne F. Nichols,  
Ph.D., FACSM**

Dr. Jeanne Nichols is Professor of Exercise and Nutritional Sciences and Co-Director of the Center for Optimal Health and Performance at San Diego State University. Dr. Nichols' research focus is on exercise and bone health, primarily among adolescent athletes. Her professional memberships include Fellow status with the American College of Sports Medicine, the California Governor's Advisory Committee on Physical Fitness, the American Society for Bone & Mineral Research, and the International Society for Clinical Densitometry. She serves on the editorial board for the ACSM Health & Fitness Journal, and is a reviewer for several other exercise science, health promotion, and sports medicine journals.

### Publication & Presentation List

Nichols JF, Rauh MJ, Lawson MJ, Ji M, Barkai HS. Prevalence of the female athlete triad among high school athletes. *Arch Pediatr Adolesc Med.* 2006;160: 137-142.

Nichols, JF, Rauh MJ, Barrack MT, Barkai HS, Pernick Y. Disordered eating and menstrual irregularity in high school athletes: Comparisons among lean and non-lean-build sports. *Int J Sport Nutr Exerc Metab.* 2007;17:364-377.

Barkai S, Nichols JF, Rauh MJ, Ji M. Influence of sport participation and menarche on bone mineral density in female high school athletes. *J Sci Med Sport.* 2007;10:170-179.

Nichols, JF, Rauh MJ, Barrack MT, Barkai HS. Bone mineral density in female high school athletes: Interactions of menstrual function and type of mechanical loading. *Bone.* 2007;41:371-377.

### Printing by:

Ellington Printery, Ellington, CT

### Funded by NFL Charities



2952 Stemmons • Dallas, TX 75247  
214-637-6282

*Supporting and advancing the  
Athletic Training profession through  
research and education.*