

# Female Athlete Triad Screening in National Collegiate Athletic Association Division I Athletes: Is the Preparticipation Evaluation Form Effective?

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## INTRODUCTION

Over the past 4 decades, the number of female athletes involved in organized athletic programs has increased by more than 1000 percent.<sup>1</sup> There are many benefits of female athletic participation, including improved levels of self-esteem, decreased obesity rates, decreased alcohol and illegal drug use, and decreased teen pregnancy rates.<sup>2,3</sup>

However, there are medical issues unique to the female athlete, specifically the female athlete triad (triad). Defined by the American College of Sports Medicine (ACSM), the triad is an interrelationship between energy availability, menstrual function, and bone mineral density.<sup>4</sup> The triad has been identified in high school, collegiate, and elite athletes.<sup>5-8</sup> A study by Beals and Hill<sup>5</sup> of Division II college athletes found that 25% had disordered eating, 26% reported menstrual dysfunction, 10% had low bone mineral density, and 2.6% had all 3 components of the triad. This high prevalence has sparked interest in the role of the preparticipation history and examination as a screening tool for the triad. The purpose of this study was to determine how effectively National Collegiate Athletic Association (NCAA) Division I universities were screening for the triad.

## METHODS

Team physicians or certified athletic trainers at all 347 NCAA Division I universities were contacted by phone and/or e-mail in 2010 to ask if they would participate in a phone or e-mail survey. We asked participating physicians and athletic trainers specific questions about the administration of preparticipation screening at their universities, including the frequency, timing, and location of screening; the credentials of the examiners; and the use of a standardized preparticipation evaluation (PPE) form.

We also requested that universities e-mail or fax to us the most current version of the athlete history questionnaire used for their PPE. Many of the history forms were also accessible on university athletic department Web sites. The portions of the forms that were relevant to the triad were analyzed for the inclusion of the 12 items that the Female Athlete Triad Coalition recommends for preparticipation triad screening of female athletes.<sup>9</sup>

The Female Athlete Triad Coalition is a group of representatives from member universities and organizations, including the ACSM, International Olympic Committee, American Medical Society for Sports Medicine, American

**Objective:** To evaluate the screening practices and preparticipation evaluation (PPE) forms used to identify college athletes at risk for the female athlete triad (triad).

**Design:** Phone and/or e-mail survey.

**Setting:** National Collegiate Athletic Association (NCAA) Division I universities.

**Participants:** All 347 NCAA Division I universities were invited to participate in a survey, with 257 participating in the survey (74%) and 287 forms collected (83%).

**Main Outcome Measures:** Information about the nature of the PPE was requested from team physicians and certified athletic trainers during a phone or e-mail survey. In addition, a copy of their PPE form was requested to evaluate for inclusion of the 12 items recommended by the Female Athlete Triad Coalition for primary screening for the triad.

**Results:** All 257 universities (100%) required a PPE for incoming athletes; however, only 83 universities (32%) required an annual PPE for returning athletes. Screening was performed on campus at 218 universities (85%). Eleven universities (4%) were using the recently updated fourth edition PPE. Only 25 universities (9%) had 9 or more of the 12 recommended items included in their forms, whereas 127 universities (44%) included 4 or less items. Relevant items that were omitted from more than 40% of forms included losing weight to meet the image requirements of a sport, using vomiting, diuretics, and/or laxatives to lose weight; and the number of menses experienced in the past 12 months.

**Conclusions:** The current PPE forms used by NCAA Division I universities may not effectively screen for the triad.

**Key Words:** athlete, triad, preparticipation examination

(*Clin J Sport Med* 2012;0:1-4)

Submitted for publication April 14, 2011; accepted November 16, 2011.  
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The authors report no conflicts of interest.

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Academy of Orthopaedic Surgeons, American Academy of Pediatrics, NCAA, American Dietetic Association, and National Athletic Trainers Association among others.<sup>9</sup> The Female Athlete Triad Coalition used the third edition PPE,<sup>10</sup> the International Olympic Committee Female Athlete Triad PPE,<sup>11</sup> and the ACSM Female Athlete Triad Position Stand<sup>4</sup> to generate its initial questionnaire, which consists of 8 questions on disordered eating, 3 questions on menstrual dysfunction, and 1 question on bone health.<sup>9</sup>

The PPE forms we received were also evaluated for inclusion of a nutritional assessment in the form of a record of food and energy expenditure to calculate energy availability. The institutional review board of the Medical College of Wisconsin did not require approval for this study, as there are no identifiers. No statistical analysis was performed in this study.

## RESULTS

### Characteristics of the Screening Process

Of the 347 NCAA Division I universities initially contacted, 257 agreed to participate in a phone or e-mail survey. All 257 universities (100%) that participated in the survey required preparticipation screening with a personal history and physical examination for freshman and transfer athletes before they could begin any athletic participation, including summer training camps. However, only 83 universities (32%) required an annual PPE for returning athletes, which included a physical examination completed by a physician. Twelve universities (5%) completed a full PPE on their athletes every 2 years, whereas the other 162 universities (63%) only completed a full history and examination on freshman and transfer athletes. The returning athletes at those universities were only required to update their medical history, typically with an athletic trainer. Those athletes did not complete a full physical examination with a physician unless the athletic trainer identified a “red flag” on the history update.

Screening was performed on campus at 218 of the universities (85%), whereas 39 of the universities (15%) allowed athletes to have the PPE completed by their family physician before arriving on campus. At the 218 universities (85%) where screening was performed on campus, the history portion of the initial PPE for incoming freshmen typically consisted of the athlete completing a questionnaire, which was reviewed by an athletic trainer and then signed off by a physician at the time of the examination. One hundred fifty-six family physicians, 53 internists, 2 pediatricians, 4 emergency medicine physicians, 3 medicine/pediatrics specialists, 4 physiatrists, 1 gynecologist, 9 cardiologists, and 8 orthopedic surgeons conducted the general portion of the PPE examination. Of these physicians, 99 (45%) had completed a sports medicine fellowship. The orthopedic portion of the examination was conducted by an orthopedic surgeon at 109 universities (42%). Although several universities reported that physician assistants, nurse practitioners, residents, or fellows were part of the health care team who screened the athletes, only 1 school reported that a nurse practitioner was the only

examiner and only 1 school reported that a physician assistant was the only examiner.

### Preparticipation Screening Forms

The most updated versions of the PPE forms were obtained from 287 universities via fax, e-mail, or athletic department Web sites. Two hundred forty-two universities (94%) required the PPE to be completed on a standardized form, whereas 15 universities (6%) allowed students to use any form provided by their family physician. Eleven universities (4%) were using the recently updated fourth edition of PPE<sup>12</sup> developed by the American Academy of Family Physicians, American Academy of Pediatrics, American College of Sports Medicine, American Medical Society for Sports Medicine, American Orthopaedic Society for Sports Medicine, and American Osteopathic Academy of Sports Medicine, which was released in May 2010, and another 16 universities (6%) were using the third edition of the PPE,<sup>10</sup> which was released in 2005. The remaining 260 universities (90%) were not using either of these PPE forms.

The content of the PPE forms pertinent to screening for the triad is displayed in the Table. Questions to screen for disordered eating that were omitted from more than 50% of the PPE forms included history of limiting food intake, losing weight to meet the image requirements of a sport, eating in secret, and using vomiting, diuretics, and/or laxatives to lose weight. Relevant questions to screen for menstrual dysfunction that were omitted from more than 40% of the PPE forms included age at onset of menses and the number of menses experienced in the past 12 months. In screening for bone health, 237 of the PPE forms (83%) included questions on fracture history. Only 20 universities (7%) included a nutritional assessment, using a food record to assist in calculating energy availability.

Of the PPE forms that were analyzed from 287 Division I universities, only 25 universities (9%) had 9 or more of the 12 Female Athlete Triad Coalition screening recommendations included in their forms, 1 form (0.3%) contained 11 of the recommended items and no forms (0%) contained all 12 items. One hundred twenty-seven universities (44%) had 4 or less items on their forms, including 63 forms (22%) that had only 1 or 2 items (Figure).

## DISCUSSION

This study reveals that many of the PPE forms currently used by Division I universities may have a limited ability to identify athletes at risk for the triad. If the Female Athlete Triad Coalition screening recommendations<sup>9</sup> were used as a “gold standard” for comparison, then more than half of the Division I universities are currently using forms that are missing >50% of the recommended screening items.

However, do these screening recommendations truly represent the screening “gold standard”? There are numerous other screening questionnaires that are used in clinical practice to screen for the components of the triad.

Many consider the Eating Disorder Examination (EDE) interview<sup>13</sup> to be the “gold standard” for screening for eating disorders<sup>14</sup>; however, it is time consuming, athletic trainers

**Table.** Items Recommended by the Female Athlete Triad Coalition to Screen for the Triad on PPE Forms

Items Recommended by the Female Athlete Triad Coalition to Screen for the Triad on PPE Forms	Included in Screening Forms, No. 287 Universities (%)
<b>Disordered eating</b>	
Do you worry about your weight?	164 (57)
Do you limit the foods you eat?	131 (46)
Do you lose weight to meet image requirements for your sport?	121 (42)
Does your weight affect the way you feel about yourself?	4 (1)
Do you feel you have lost control over what you eat?	17 (6)
Do you make yourself vomit; use diuretics or laxatives after you eat?	36 (13)
Have you ever suffered from an eating disorder?	176 (61)
Do you ever eat in secret?	7 (2)
<b>Menstrual dysfunction</b>	
What age was your first menstrual period?	167 (58)
Do you have monthly menstrual cycles?	210 (73)
How many menstrual cycles have you had in the last year?	151 (53)
<b>Bone health</b>	
Have you ever had a stress fracture?*	237 (83)

\*A point was awarded for asking about any fracture, but many schools specifically asked about lower extremity stress fractures (N = 287).

would require training to administer the interview questions, and it is not appropriate for mass athlete screenings.<sup>13-15</sup> Because of such limitations, the EDE-Q<sup>16</sup> was adapted from the EDE interview. The EDE-Q is a self-report questionnaire that assesses eating disorder attitudes and behaviors.<sup>16</sup> The EDE-Q includes subscales on restraint, shape concern, weight concern, and eating concern as well as a global score.<sup>16</sup> It also assesses frequency of bulimic episodes and other compensatory behaviors in the past 28 days.<sup>16</sup> More practical than the EDE interview, with only 41 items, the EDE-Q may be the best way to screen for disordered eating as both the sensitivity and specificity have been reported at 80% for global scores of  $\geq 2.8$ .<sup>17</sup>

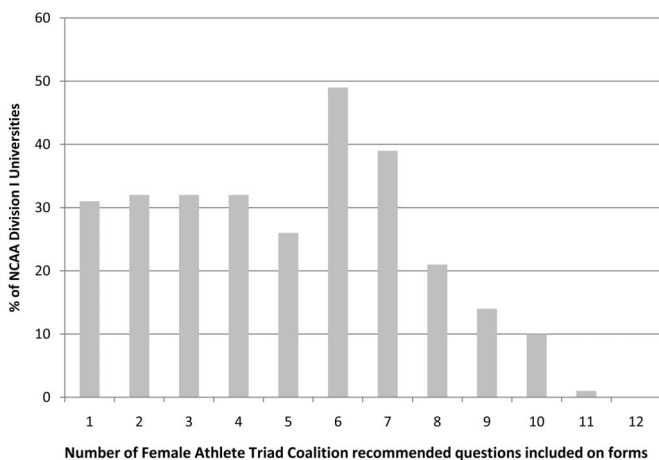
Another possibility is a shorter 5-item questionnaire named after a mnemonic: SCOFF.<sup>18</sup> Although its sensitivity and specificity have been reported to be slightly less than the EDE-Q (72% vs 80% and 73% vs 80%, respectively),<sup>17</sup> the

SCOFF may be more feasible in the setting of the PPE because of its brevity. The 5 items included on the SCOFF are (1) Do you make yourself Sick because you feel uncomfortably full? (2) Do you worry that you have lost Control over how much you eat? (3) Have you recently lost more than One stone (15 lbs) in a 3-month period? (4) Do you believe yourself to be Fat when others say you are too thin? (5) Would you say that Food dominates your life?<sup>18</sup> The SCOFF was designed for use in a primary care setting<sup>18</sup>; future studies assessing its validity in college athletes may be beneficial.

To test the validity of the Female Athlete Triad Coalition's screening recommendations<sup>9</sup> for the PPE in college athletes, a follow-up to our study may be warranted that would compare the actual prevalence of athletes with components of the triad with the number of athletes identified during screening. Athletes at the 25 universities with 9 or more of the 12 screening items on their PPE forms may be the best population to study.

Of the PPE forms collected, only 20 forms (7%) included a nutritional assessment in the form of a food record. A 72-hour food record, including 2 weekdays and 1 weekend day, is reported to be the "gold standard" to screen for an athlete's typical energy intake.<sup>19</sup> An exercise history and/or an accelerometer can be used to calculate energy expenditure. Accelerometers can be purchased for less than \$15. These screening tools pose a relatively low cost to the university and may result in early identification of athletes at risk for the triad.

Of the universities who participated in the phone or e-mail survey, only 83 (32%) required an annual PPE, whereas 162 (63%) of those surveyed relied on an abbreviated history update form, typically reviewed by an athletic trainer rather than a physician, to screen their returning athletes for new health issues. The athlete who develops risk factors for the triad after her freshman PPE has been completed may go undetected at the universities where annual PPE screening is not a requirement.



**FIGURE.** Combined assessment of PPE forms used at 287 Division I Universities.

Previous studies evaluating screening for the triad in college athletes include a study by Beals<sup>20</sup> in which 170 NCAA Division I universities were contacted to assess how the universities were screening for and educating athletes on disordered eating and menstrual dysfunction. These universities were selected because they had at least 2 of the following sports: cross country/track, gymnastics, and swimming. Beals found that less than 6% of universities were using a validated eating disorder screening questionnaire or interview, and 24% were using a comprehensive menstrual history questionnaire. Only 7% of the universities withheld athletes with menstrual dysfunction from athletic participation, and only 21% withheld athletes with a confirmed eating disorder from competition. This study suggested that current screening practices are limited, and a standardized screening program would likely identify a greater number of athletes with risk factors for the triad.

In a review article of current literature on triad screening, Rumball and Lebrun<sup>21</sup> suggested that a standardized female section on the PPE form would be an excellent way to screen for the triad. The third and fourth edition PPE history forms<sup>10,12</sup> both have female sections, but they only address 6 and 7 of the 12 Female Athlete Triad Coalition screening items,<sup>9</sup> respectively. There is a need for future research to explore the most sensitive and specific items to include as a screening tool.

The study by Rumball and Lebrun<sup>22</sup> evaluated the PPE forms from Canadian universities between 2000 and 2002 to determine if there was any improvement in screening for the triad over this period. The percentage of forms including a specific female section increased from 46% in 2000 to 62% in 2002. However, they concluded that there was still a lack of uniformity among the forms. In 2002, 59% of forms still did not ask about frequency of periods in the last year, 47% did not ask about menstrual irregularity, and 65% did not ask about history of stress fracture, even though these were the 3 questions the article cited as important red flag questions to ask.

## CONCLUSIONS

The current PPE forms used by NCAA Division I universities may not effectively screen for the triad based on the recommendations from the Female Athlete Triad Coalition. Improved preparticipation screening for the triad may lead to more frequent identification of athletes who are at risk and in need of further evaluation.

## ACKNOWLEDGMENT

The authors thank Grael Cullen and the Cullen Foundation for supporting this study.

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