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Can We Reduce Eating Disorder Risk Factors in Female College Athletes? A Randomized Exploratory Investigation of Two Peer-Led Interventions

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Abstract

Female athletes are at least as at risk as other women for eating disorders (EDs) and at risk for the female athlete triad (i.e., inadequate energy availability, menstrual disorders, and osteoporosis). This study investigated whether two evidence-based programs appear promising for future study if modified to address the unique needs of female athletes. Athletes were randomly assigned to athlete-modified dissonance prevention or healthy weight intervention (AM-HWI). ED risk factors were assessed pre/post-treatment, and 6-week and 1-year follow-up. Results (analyzed sample, $N = 157$) indicated that both interventions reduced thin-ideal internalization, dietary restraint, bulimic pathology, shape and weight concern, and negative affect at 6 weeks, and bulimic pathology, shape concern, and negative affect at 1 year. Unexpectedly we observed an increase in students spontaneously seeking medical consultation for the triad. Qualitative results suggested that AM-HWI may be more preferred by athletes.

Keywords: Eating disorders, Prevention, Athletes, Cognitive dissonance, Healthy weight

Can we reduce eating disorder risk factors in female college athletes? A randomized exploratory investigation of two peer-led interventions

Eating disorders (EDs) such as anorexia nervosa (AN) and bulimia nervosa (BN) are associated with significant increases in morbidity, medical complications (Kaplan & Woodside, 1987; Mitchell & Crow, 2006), and even mortality (Crow et al., 2009; Herzog et al., 2000). Research suggests that approximately 10% of collegiate females may meet criteria for a clinical ED (Cohen & Petrie, 2005), and approximately 50% of college women may exhibit subclinical ED symptoms such as binge-eating, purging, or other compensatory behaviors (Berg, Frazier, & Sherr, 2009; Mintz & Betz, 1988). Such high prevalence rates are worrisome given that only 44% of those completing the most empirically supported treatment for BN (i.e., cognitive behavioral therapy) typically cease binge eating and purging post-treatment (Fairburn, Normal, Welch, O'Connor, Doll, & Peveler, 1995). For those with AN, treatment is even less effective (Fairburn, 2005). Due to the high prevalence of EDs and subclinical EDs as well as the often bleak prospects in treating these disorders, prevention efforts have received increased interest.

Early ED prevention programs typically consisted of psychoeducational interventions. Research, however, generally indicates that although didactic psychoeducation is effective at increasing knowledge, it is substantially less effective at reducing ED pathology (Fingeret, Warren, Cepeda-Benito, & Gleaves, 2006; Stice & Shaw, 2004; Stice, Shaw, & Marti, 2007). ED prevention has improved, however, and one program that has garnered staunch empirical support is cognitive dissonance-based prevention (DBP: see Stice, Shaw, Becker, & Rohde, 2008). DBP utilizes the theory of cognitive dissonance, which holds that inconsistencies between behavior and beliefs will produce dissonance, and in order to reduce dissonance a change in beliefs should occur (Festinger, 1957). In DBP, participants speak and act against the thin-ideal standard of

female beauty through a series of interactive activities with the aim of creating cognitive dissonance.

DBP has generated positive results in high- and mixed-risk samples, and findings have been independently replicated by a number of researchers (see Stice, Shaw, et al., 2008 for review; see also Becker, Bull, Schaumberg, Cauble, & Franco, 2008; Becker, Smith, & Ciao, 2006; Green, Scott, Diyankova, Gasser, & Pederson, 2005; Matusek, Wendt, & Wiseman, 2004). In fact, DBP has been supported to the extent that it meets the American Psychological Association's (APA) criteria for an efficacious intervention (i.e., DBP outperformed no-treatment control groups, an alternative intervention, and findings have been replicated by independent laboratories/researchers), which is rare for ED prevention programs. Promisingly, effects from DPB appear to be long lasting with reductions in ED risk factors being maintained through 2- and 3-year follow-up periods (Stice, Marti, Spoor, Presnell, & Shaw, 2008), and DBP has been shown to reduce the onset of EDs by 60% compared to an assessment only control.

Additionally, there is some support for a Healthy Weight prevention intervention (HWI: Stice, Chase, Stormer, Appel, 2001; Stice, Shaw, Burton, & Wade, 2006) in adolescent girls with body dissatisfaction. In HWI, participants are encouraged to make small lifestyle changes in eating and exercise to help maintain a healthy weight. Like DBP, HWI has produced reductions in most ED risk factors (i.e., thin-ideal internalization, body dissatisfaction, negative affect, and bulimic pathology) that persist through a long-term follow-up period of three years (Stice, Marti, et al., 2008). Additionally, a peer-led modified version of HWI reduced ED risk factors in female sorority members, with reductions lasting through 14 months after the intervention (Becker et al., 2010). At this time, initial results for HWI have now been replicated by two independent groups of researchers (Becker et al., 2010; Matusek et al., 2004).

Despite positive findings from both DBP and HWI, research is still needed in order to assess the generalizability of these interventions to other groups of females. Notably, neither intervention has been rigorously tested in female athletes. This is of concern given that females in sport may not respond to interventions in the same way as non-sport populations. Indeed, female athletes may be unusually resistant to ED prevention efforts because of entrenched ideologies inherent in the culture of sport. For instance, despite equivocal empirical support, many coaches and athletes firmly believe that weight or body fat reduction enhances performance (Thompson & Sherman, 1993, 2010), and some leaders in the ED sport community have concluded that it may be futile to try and directly confront this belief (Thompson, personal communication). This belief also could make successful delivery of interventions like DBP difficult if not impossible.

In addition, much of the sport world believes that it is noble to continue to compete even if one risks serious physical harm. Thus, physical health effects of EDs may be viewed as just one more acceptable cost in the pursuit of athletic excellence. The norms of an athletic community also may inadvertently legitimize or encourage an ED by reinforcing unhealthy eating and/or exercise behaviors. For example, low weight may go unnoticed, or even be lauded in a sport environment that reinforces low weight or thin shape (Thompson & Sherman, 1993, 2010) or promotes a certain body ideal (e.g., the thin distance runner; Thompson & Sherman, 2010). It also has been proposed that certain personality traits common to "good athletes" may be common in those with EDs (Thompson & Sherman, 1999, 2010).

Although some studies have found evidence that athletes may sometimes have more positive body image than non-athletes (see Hausenblas & Downs, 2001; Smolak, Murnen, & Ruble, 2000), research also indicates that female athletes may be more at risk of developing EDs

than their non-athlete peers (Burckes-Miller & Black, 1988; Greenleaf, Petrie, Carter, & Reel, 2009; Sundgot-Borgen, 1993; Sundgot-Borgen & Torstveit, 2004) and are at least at equal risk (Johnson, Powers, & Dick, 1999). For example, Torstveit, Rosenvinge, and Sundgot-Bergen (2008) found that 46% and 20% of elite females in lean and non-lean sports respectively evidenced clinical eating pathology. It also is clear that female college athletes exhibit a significant amount of subclinical ED pathology. For instance, in one study of female college athletes from 10 different sports, 32% of the athletes exhibited some subclinical ED pathology (i.e., using laxatives, diuretics, diet pills, vomiting, and/or binging more than twice per week) (Rosen, McKeag, Hough, & Curly, 1986). This finding was replicated more recently by Greenleaf et al. (2009) who found that almost 28% of Division I collegiate athletes were either eating disordered or symptomatic.

Poor eating – even if not part of a clinical or subclinical ED – also puts female athletes at risk for the female athlete triad. The female athlete triad refers to three interrelated health threats consisting of inadequate energy availability, menstrual disorders, and decreased bone mineral density (Manore, Kam, & Loucks, 2007). If female athletes do not consume adequate energy to fuel their activity levels, disruption of normal reproductive functions may occur such that females experience menstrual disorders (e.g., cessation of menses aka amenorrhea). Low energy availability and menstrual disorders have been shown to disrupt normal bone formation and resorption and are proposed to contribute to low bone mineral density (DeSouza, West, Jamal, Hawker, Gundberg, & Williams, 2008). Thus, athletes with the triad are at an increased risk for stress fractures (Myburgh, Hutchins, Fataar, Hough, & Noakes, 1990) and osteoporosis, among other skeletal problems (Warren & Perlroth, 2001).

Different components of the triad occur in female athletes at different frequencies, but it is clear that symptoms of the triad may be present in a significant proportion of female athletes. By one estimate, 70% of female college athletes do not consume adequate calories to fuel their active lifestyles (Hinton, 2005), and up to 79% of female athletes in some sports may suffer from menstrual irregularities, although prevalence of menstrual disorders (including amenorrhea) may be closer to 10-20% in most sports (Warren, 1999). Further, the low energy intake level needed to reach the mean desired body fat composition (13%) reported by female athletes in Johnson et al. (1999) would likely be associated with a cessation of menses.

Despite health risks posed to athletes by disordered eating and the triad, there have been very few ED prevention studies with female athletes. In one notable exception, high school female athletes participated in an 8-week program, ATHENA, designed to reduce disordered eating and other unhealthy behaviors (e.g., substance use) (Elliot, Goldberg, Moe, DeFancesco, Durham, & Hix-Small, 2004). The ATHENA program used both a coach-led and peer-led format, and targeted an array of potential concerns, including: depression, self-esteem, healthy norms, societal pressures to be thin, knowledge and expectancies about steroid use. Participants created public service campaigns to discourage EDs and drug use and also practiced refusal skills. ATHENA also included a media advocacy component and sought to establish shared healthy behavior expectations. Athletes who received ATHENA reported less diet pill use and positive change in diet habits and exercise self-efficacy compared to athletes who just received educational pamphlets. One to 3 years later, athletes in ATHENA showed reductions in marijuana and alcohol use, but not eating pathology (Elliot et al., 2008). One limitation is that follow-up was conducted as a second study, and the authors were unable to match follow-up data with baseline data. Another study investigated the effectiveness of an 8-week health education

program focusing on self-esteem, performance pressure, nutrition, and stress management in female collegiate athletes (Abood & Black, 2000). This intervention reduced body dissatisfaction and drive for thinness more than the control condition two weeks after the intervention. Despite positive findings, both interventions required significant time commitments (i.e., approximately 8 hours) and the Abood and Black study did not involve any long-term follow-up measures.

Two recent exploratory studies suffer from small sample size and/or design problems. Buchholz, Mack, McVey, Feder, and Barrowman (2008) tested an intervention guided by community health professionals for adolescents, parents, and coaches of gymnastics clubs. Adolescent female gymnasts who participated in "Body Sense" reported less pressure from their clubs to be thin, but no difference was apparent on measures of dieting and bulimic pathology, compared to controls. Only 62 total athletes participated in the study, however. Thus, statistical power may have been inadequate.

Another small study was conducted with 29 female collegiate athletes, comparing DBP with HWI and wait-list control (Smith & Petrie, 2008). No improvements were seen for either intervention compared to wait-list. Although this study is limited by both a small sample and the fact that the authors only made slight modifications to DBP or HWI to account for unique aspects of this population, it is important to highlight that this is the only study conducted to date with DBP and HWI to find no significant benefit for participants in the main analyses. Moreover, in contrast to the existing literature on DBP and HWI, no improvements at all were seen within groups on thin-ideal internalization and bulimic pathology at post-treatment suggesting that traditional versions of DBP and HWI, even when slightly tailored, may be unusually ineffective in this population compared to results obtained with non-sport participants.

The purpose of this exploratory study was to investigate whether or not DBP and/or HWI could be adequately tailored to yield results promising enough to support further research of DBP and/or HWI in sport populations. More specifically, it is possible that no amount of modification will make these interventions viable for female athletes. Thus, we sought to gather pilot data regarding the effectiveness of athlete-modified peer-led versions of DBP (AM-DBP) and HWI (AM-HWI) at reducing ED risk factors in female collegiate athletes to determine which intervention, if any, might be appropriate for future research in a larger, better powered, study with a control condition. In order for ED prevention to be effective for female athletes, we contend that such programs must address unique needs of athletes (e.g., female athlete triad) while realistically considering the dual body image pressures athletes face from their competitive environments (i.e., an emphasis on body weight/composition affecting performance, sport-specific body stereotypes) and the western thin-ideal standard of female beauty. Recent research by de Bruin (2010) indicates that body image is not a stable construct for female athletes and varies between their sport lives and daily lives. Thus, we altered both DBP and HWI in an attempt to address these concerns. The tailoring of DBP and HWI to align with the language and needs of a particular social system (i.e., athletics) has been successfully undertaken before (i.e., in sororities) and may be a crucial factor in creating evidence-based programs that social systems will want to sustainably disseminate (Becker, Stice, Shaw, & Woda, 2009).

We opted to work with peer-led models of these interventions for several reasons. First, peers have been found in another social system to be good, cost effective endogenous providers, which can facilitate dissemination (see Becker et al., 2009). Second, we had been directly approached by female athletes requesting that a peer-led program modeled after the one we run with sororities be developed for female athletes. Finally, the department of athletics expressed

enthusiasm for this model as it would offer student athletes a new option for gaining additional leadership experience. All peer-leaders in this study were current varsity-level (versus club-level) student athletes.

Although it would have been ideal from a research perspective to include a waitlist control group, this pilot study was developed using the principles of community participatory research (see Becker et al., 2009 for discussion of use of participatory methods in increasing dissemination of evidence-based interventions). Participatory research involves creating egalitarian partnerships that give all key stakeholders an equal voice in the research design. Secondary to ethical concerns involving the denying of a potentially beneficial intervention to their athletes, the department of athletics refused to accept a waitlist control group for this exploratory study. Given that (a) the main purpose of the study was simply to determine if either modified intervention was promising enough to warrant additional research in this population, and (b) given the failure of DBP or HWI to yield significant benefits in the Smith and Petrie (2008) study we decided to proceed with two intervention groups, while acknowledging that this is a significant limitation.

As just noted, DBP and HWI were not effective for athletes in Smith and Petrie (2008). These authors, however, failed to make the full range of modifications we believed were necessary for a sport population. Thus, based on previous efficacy and effectiveness research supporting the use of both DBP and HWI interventions (Becker et al., 2010; Stice et al., 2006) we cautiously hypothesized that both AM-DBP and AM-HWI would reduce ED risk factors (negative affect, thin-ideal internalization, dietary restraint, shape concern, weight concern and bulimic pathology) in collegiate female athletes post-intervention and at 6-week and 1-year follow-ups. We made no hypotheses about which intervention would perform better in this

highly unique population because we felt there were inadequate grounds for doing so. For instance, although DBP has performed better in non-athlete populations at post-intervention compared to HWI, we and other researchers (e.g., reviewers for the first submission of the grant supporting this study) have been concerned that athletes may not respond to DBP as well as non-athletes given potential entrenched beliefs about the performance benefits of losing weight and the fact that DBP would more directly challenge these beliefs. We also had no hypotheses about which intervention would qualitatively seem better suited to this population, but planned to use audiotape review and peer-leader debriefing to see if clear differences emerged in the qualitative fit between this population and the two interventions.

Method

Participants

Participants consisted of female college students (N = 168) participating in all 9 varsity sports teams (basketball, n =18; swimming & diving, n = 28; softball, n = 15; tennis, n = 16; cross country, n = 21; soccer, n = 23; volleyball, n = 15; golf, n = 4; and track & field, n = 12) and on the varsity cheerleading squad (n = 16) at a highly competitive NCAA Division III university between Fall 2007 and Spring 2009. As in previous studies (Becker et al., 2006, 2008), participants (n = 8) who appeared to meet criteria for an ED based on their responses to the Eating Disorder Examination-Questionnaire (Fairburn & Bèglin, 1994) were excluded from all analyses because the interventions being studied are aimed at prevention not treatment. Three other participants were excluded from analysis because of incomplete baseline data, resulting in a final analyzed sample of 157 (see CONSORT flowchart for participant flow). Participants ranged in age from 18 to 22 years (M = 18.94, SD = 1.04). Because this study was funded by NIMH, we used the required two question format for asking about ethnicity and race. Regarding

ethnicity, 7% identified as Hispanic and 93% as non-Hispanic. Regarding race, a majority of the sample indicated they were Caucasian (74.4%) but others indicated that they were American Indian/Alaskan native (2.4%), Asian (2.4%), African American (1.2%), or more than one race (4.8%). The remaining (14.8%) declined to answer the question regarding race.

Procedure

Because the department of athletics wanted all female athletes to receive an active intervention, we separated the study from the program. Thus, athletes were able to participate in the required program but choose to not participate in the voluntary study, which consisted of simply completing the assessment instruments. This procedure was approved by the Trinity University IRB and has been used in previous trials with other populations (Becker et al., 2006, 2008, 2010). To minimize problems with coercion, coaches did not ask athletes to participate in the study and were not present for any part of the intervention sessions or assessments.

Overview of program. In the first year, all female athletes were required to participate in the Female Athlete Body Project (FABP), the umbrella program. Interventions were run within teams because body image concerns may vary according to sport (i.e., a volleyball group may want to discuss revealing uniforms whereas cross country runners performance concerns associated with weight). Moreover and perhaps more importantly given our use of participatory methodology, this study was designed in collaboration with the department of athletics, which was given an option of mixing athletes or running within teams and pros and cons of both approaches were discussed. The athletics staff unanimously and emphatically reported that they wanted the study to run within teams for the reasons described above and so that the program would also facilitate team building.

Teams were divided such that half of each team was randomized to AM-DPB and the other half to AM-HWI by a BA-level project coordinator. For instance, 50% of the volleyball team received AM-HWI and 50% received AM-DPB. Participants were first randomized to a team subgroup and then subgroups were randomly assigned to condition stratified by team. Interventions consisted of three sessions each lasting approximately 60-80 minutes over a three week period. Thus, both AM-DBP and AM-HWI consisted of approximately four hours. To accommodate athletes' schedules, teams participated during their off season or early in their competitive season. Thus, the cross country, basketball, softball, tennis and swimming & diving teams participated during the fall semester and the volleyball, soccer, golf, track & field, and cheerleading teams participated during the spring semester. Each intervention was peer-led by between two and four peer leaders (at least one peer leader belonged to the participating team and the remaining belonging to other teams). The vast majority of groups were run by 3 peer-leaders, which is the model we have successfully used previously (e.g., Becker et al., 2006, 2008, 2010). We relied on 2 peer-leaders if scheduling made it impossible to have three, and used four only on a couple of occasions to help facilitate a particularly large group. Groups consisted of 2-14 members. The wide range in group sizes was due to respective differences in team sizes and was unavoidable due to the need to run groups within teams as discussed above. All participants completed all three sessions. If a participant had to miss a session, she completed a make-up session with a BA level project coordinator.

In the second year of the study, all new athletes (incoming first years and those who had not completed the program the first year) from the 9 varsity sports and cheerleading were randomly assigned to either AM-DBP or AM-HWI following the procedure described above. All athletes who had participated in the first year of the FABP and were still competing in their

sport, participated in the opposite intervention from the one they had received in the first year. Thus, if an athlete had AM-DBP in Year 1, she received AM-HWI in Year 2. This helped maintain group size. Without this, some teams would have had groups consisting of peer-leaders and one team member. Coaches also requested that older members continue to participate in the FABP which was viewed as facilitating team camaraderie. In the present report, however, we only discuss results based on athlete's first exposure to the interventions.

Overview of study. Despite the mandatory nature of the FABP program, the study, which consisted of the assessment, was completely voluntary. Out of the 177 female athletes who participated in the FABP program, 95% volunteered to participate in the study (N = 168). Participants were asked to fill out surveys at 4 different times (pre-intervention, post-intervention, 6-week follow-up, 1-year follow-up). One-year follow-up was completed prior to experiencing the second intervention in the second year. In order to reduce coercion, coaches were not present when athletes completed questionnaires (or at any point during the actual program). In addition, during the survey completion, athletes sat in a circle with their backs to one another and were told that they could pretend to fill out the questionnaires if they did not want to participate, but were concerned about being viewed negatively. All identification numbers were self-coded by the athletes. More specifically, athletes were asked a series of questions that allowed the generation of a unique alpha numeric ID number that only they would know, and this allowed us to link their surveys because we asked the same questions every time (e.g., what is the day of your birth, what are the last 3 initials of your mother's first name). The research staff had no ability to break the ID codes to identify athletes. Athletes returned folded questionnaires to a large envelope. In addition to the IRB, this study was approved by department of athletics.

Peer-leader training. Peer-leaders were athletes belonging to one of the varsity teams or cheerleading. The head athletic trainer recruited peer-leaders. Criteria for peer-leaders included not being in their first year of competition (i.e., we did not recruit first year students), no known ED or excessive body image concerns, and voluntary commitment to help lead at least their own sport through the intervention (AM-DBP or AM-HWI). We did not formally screen peer-leaders but used the voluntary self-screening we have used in other studies (e.g., Becker et al., 2006, 2008, 2010). This decision was made in partnership with the department of athletics. Thus athletes were approached, informed of the requirements and asked to self-screen if they had an active ED or high levels of body concern. We told them we did not expect them to have perfect body image. We also told athletes that we understood that some would decline because of the time commitment, and thus, if they self-screened for ED or body image reasons we would not automatically assume they had an ED because they could be opting out due to time demands. Finally we reminded them that having an athlete with significant body image concerns or an ED could undermine the whole program secondary to an appearance of hypocrisy. Throughout the study, we found no evidence of any peer-leaders with an ED or significant body image concerns.

Athletes who met criteria for peer-leading went through six hours of training. Although peer-leaders were not formally blinded, they were not told anything about the other intervention or hypotheses. Training consisted of leading mock sessions and receiving supervision from a licensed psychologist, the project coordinator (B.A. level position) and undergraduate research assistants, all of whom were female. The male head athletic trainer observed one round of training for each intervention so as to become more familiar with how the interventions ran. All sessions were audiotaped and every session was rated against an adherence checklist by the

project coordinator and a highly experienced undergraduate research assistant. Kappa ratings for inter-rater reliability was very good (M = .90). Adherence for all sessions was good.

Athlete-modified dissonance-based prevention. The AM-DBP manual was based on the DBP manual developed by Stice and Presnell (2007). Additions to the original manual included information on the female athlete triad as well as a discussion of the body image pressures placed on athletes in their specific sport. For instance, athletes defined not only the traditional thin-ideal standard of female beauty but also the sport-specific thin-ideal – which is described as what a given sport views as the ideal body type. One way in which sport-specific thin-ideals often differ from the traditional thin-ideal is with respect to bust size. For example, the traditional thin-ideal is associated with large breasts and most sport-specific thin-ideals are associated with small breasts. So athletes were able to explore the dual body image pressures described by de Bruin (2010). We also discovered with some sports that there were position specific thin-ideals (e.g., in softball).

We also made an attempt to tailor the language to athletics. For example, the healthy-ideal was changed to the athlete-specific healthy-ideal. The latter was defined as however an athlete's body looks when she is doing everything possible to simultaneously maximize physical health, mental health, quality of life and sport performance. Role plays also were modified to be sport focused. Regarding the common sport belief that decreased weight/body fat will improve performance, we did not challenge this directly based on advice from experts in the field of sport and EDs (R. A. Thompson, personal communication, 2006). Rather, we let athletes explore this themselves via the dissonance activities (e.g., by having them list the costs of pursuing the sport-specific thin-ideal, trying to convince the role-play characters to give up pursuit of the sport-

specific thin-ideal) with the hope that this belief would shift via dissonance the same way traditional thin-ideal internalization shifts in standard DBP.

All modifications to both interventions were made by a licensed psychologist with past experience in the sport world and two recently graduated BA-level former varsity collegiate athletes who also had past experience with DBP in sororities. The literature on body image and EDs within the sport world as well as the existing literature on the female athlete triad was considered in making modifications and we consulted with leaders in the ED sport field (e.g., R. A. Thompson). Changes were then discussed with and modified according to feedback from the head athletic trainer at the university where the study was conducted.

Session 1. In this session, participants defined both the sport-specific and traditional thin-ideals and contrasted them with the athlete-specific healthy-ideal, examined the ways in which the traditional thin-ideal may influence the sport-specific thin-ideal, explored the costs of pursuing both thin-ideals (via writing and discussion), and were asked to complete a homework assignment. Homework consisted of a mirror exercise in which participants were instructed to write down positive qualities about themselves (both physical and emotional) while standing in front of a mirror with as little clothing as they felt comfortable wearing.

Session 2. Participants discussed the female athlete triad, listed ways to avoid the triad, participated in role plays which included speaking against the sport-specific thin-ideal, and were given a homework assignment. This homework assignment consisted of writing a letter to a teammate in which participants were asked to write (but not send) a letter to a hypothetical teammate they felt might be at risk for or struggling with an ED or body image issues.

Session 3. In this session, participants created verbal challenges for times when they felt pressure to pursue either thin-ideal (participants typically focused on the sport-specific thin-

ideal), listed the top ten ways to resist the sport-specific thin-ideal, and were asked to complete a homework assignment. The homework assignment consisted of a self-affirmation exercise (to be completed in the next week) in which participants could choose from such things as: making a pact with a friend to end negative body talk or practicing accepting compliments.

Athlete modified-healthy weight intervention. The AM-HWI manual was based on the HWI manual developed by Stice and Presnell (2007). Additions to the original manual included information on the female athlete triad as well as a discussion of the sport-specific thin-ideal and the athlete-specific healthy-ideal. The language was also changed to recognize that athletes do not always need to increase their activity level and that at times, athletes benefit from a reduction in training, particularly those athletes who are exercising extensively above and beyond that recommended by their coaches. We also asked athletes to consider differences in their behavior on and off season.

Further modifications also included those made by Becker et al. (2010), who modified the original HWI manual to make it more viable for peer-leadership (e.g., providing dialogue so that peer-leaders led participants through a self-review of food logs versus having peer-leaders review logs). Becker et al. also included an additional focus on increasing nutritional density (i.e., eating foods provide a high degree of nutrients relative to calories), reducing consumption of highly processed foods, and managing sleep (which can influence weight) so as to make it easier for participants to understand that the goal was health not pursuit of either thin-ideal. We also added questions asking athletes to consider what are other things they can do – besides weight loss – to improve performance. Answers focused on factors such as sleep, nutrition, better training, stretching, appropriate rest time, and decreasing alcohol use.

Session 1. As in AM-DBP, participants defined the traditional thin-ideal, sport-specific thin-ideal, and athlete-specific healthy-ideal, contrasted the athlete-specific healthy-ideal with both thin-ideals so that all participants were on the same page with regards to definitions. In contrast to AM-DBP, participants then discussed benefits of pursuing the athlete-specific healthy-ideal, discussed energy intake/output balance, discussed the female athlete triad, and were asked to complete a homework assignment. The homework consisted of filling out a food and exercise log for three days (two week days and one weekend day) and filling out a healthy changes goal setting worksheet in which they wrote down a specific goal pertaining to eating behaviors and a specific goal pertaining to exercise sleep behaviors to be completed in the week before the next session.

Session 2. Participants contrasted healthy and unhealthy dietary restriction, discussed society's effect on food choices, discussed ways to make participants' diets healthier, discussed benefits of exercise/physical activity, discussed the importance of sleep, and were asked to repeat the eating and exercise/sleep goal setting activity from last week for homework before the next session (participants were expected to choose new goals for this week).

Session 3. In this session, participants created a list of top ten reasons to pursue the athlete-specific healthy-ideal, discussed barriers to pursuing the healthy-ideal and ways to overcome those barriers, and discussed ways to promote the athlete-specific healthy-ideal as a team and/or as an athletics department.

Measures

Thin-ideal internalization. Thin-ideal internalization was measured with the Ideal Body Stereotype Scale—Revised (IBSS–R; Stice & Agras, 1998). On this measure, participants indicate how much they agree or disagree (*strongly disagree* = 1, *strongly agree* = 5, scale range:

1-5) with certain statements promoting the thin-ideal standard of female beauty (e.g., "slender women are more attractive"). In past studies, this scale has demonstrated adequate internal consistency (α = .89) and test-retest reliability (r = .63) (Stice, 2001; Stice & Agras, 1998). Internal consistency in the present sample was consistent with past research (α = .86).

Dietary restraint. Dietary restraint was assessed with the Dutch Restrained Eating Scale (DRES; Van Strien, Frijters, Van Staveren, & Defares, 1986). This 10-item measure assesses how often (1 = *never*, 5 = *always*, scale range: 1-5) participants engage in restrained eating behaviors such as "do you take into account your weight with what you eat?" Dietary restraint measures have not been shown to be good measures of actual dietary intake (Stice, Fischer & Lowe, 2004). These measures, however, have been shown to predict bulimic pathology (Stice et al., 2004) which is why we included this in the present study. Research supports the internal consistency (α = .95) and predictive validity of the DRES (Stice & Agras, 1998; Van Strien et al., 1986). Internal consistency in the present study was excellent (α = .93).

Bulimic pathology. Bulimic pathology was measured by taking a composite score from the bulimic diagnostic items from the Eating Disorder Examination-Questionnaire (EDE-Q; Fairburn & Bèglin, 1994) as has been previously done in related studies (e.g., Becker et al., 2008). These 10 items assess to what degree participants engaged in bulimic behaviors over the past 28 days (e.g., over the past 28 days, how many times have you taken laxatives as a means of controlling your shape or weight?). Internal consistency for the bulimic composite was adequate (α = .83) in the present sample.

Body dissatisfaction. Body dissatisfaction was assessed using the shape and weight concern subscales from the Eating Disorder Examination-Questionnaire (EDE-Q; Fairburn & Bèglin, 1994). The Shape Concern subscale is an eight item subscale assessing how frequently

participants were concerned about their shape over the past 28 days (e.g., "has your shape influenced how you think about (judge) yourself as a person?" 0 = no days, 1 = 1-5 days, 2 = 6-12 days, 3 = 13-15 days, 4 = 16-22 days, 5 = 23-27 days, 6 = every day). The five item Weight Concern subscale assessed how often participants were concerned about their weight over the past 28 days (e.g., "how dissatisfied have you been with your weight?"). Both subscales have shown good internal consistency at baseline (shape concern, α = .93; weight concern, α = .89) and 2-week test-retest reliability (shape concern, r = .94; weight concern, r = .92) (Luce & Crowther, 1999). Internal consistency in this study was consistent with previous research (shape concern α = .94; weight concern α = .88).

Negative affect. Negative affect was assessed with the fear, guilt and sadness subscales from the Positive Affect and Negative Affect Schedule—Revised (PANAS–X ; Watson & Clark, 1992). These 17 items assess to what degree (1 = *not at all*, 5 = *extremely*; scale range: 1-5) participants are feeling various emotions (e.g., nervous, guilty, scared) over the past few weeks. Past research has demonstrated good internal consistency (α = .95), convergent validity, as well as predictive validity for bulimic symptom onset (Stice & Agras, 1998; Watson & Clark, 1992). In this study internal consistency was good (α = .92).

Manipulation check. A manipulation check and evaluation sheet was included at post treatment and 6-week and 1-year follow-up. The manipulation check asked, "In the Female Athlete Body Project, we spent more time discussing: (a) how to obtain the healthy-ideal or (b) how to reject the thin-ideal". The evaluation sheet also asked participants to rate how much they learned about areas like nutrition, consequences of pursuing the thin-ideal, and the female athlete triad on 5-point Likert scale ranging from not at all to very much. These 8 items were summed with the reject the thin-ideal questions scored normally and the nutrition/HWI questions reverse

scored. We hypothesized that AM-DBP would score significantly higher on this measure than AM-HWI at all three post-intervention time points. Finally, at post-intervention, we also asked participants to describe the main idea discussed during their group.

Qualitative Assessment

In addition to assessing adherence to the interventions, we reviewed audiotapes to assess whether the groups ran smoothly in this population. The research team for this study has extensive experience listening to audiotapes of peer-led HWI and DBP in sororities, and the goal was to determine if the participants sounded like they were engaging typically with the intervention and having fun or whether participants were reluctant to participate and/or were hostile. The first author listened to any tapes that were identified as sounding more negative than what we usually hear in our other line of research as well as a random selection of audiotapes. After all group sessions, peer-leaders also were informally contacted just to check in and ask how the groups went. The main purpose was to find out if additional clinical supervision was needed to help peer-leaders with subsequent sessions, but this also gave us a chance to hear peer-leaders sense of the program. Additional supervision was requested by peer-leaders in four groups, all of which were AM-DBP. In these cases, we reviewed the audiotapes of the sessions, met with the peer-leaders to get their take on the previous session and then brainstormed and gave suggestions for strategies to improve the next session (e.g., additional probe questions, ways to use “going around the group” to defuse arguments, strategies for staying socratic).

Results

Statistical Analyses

Independent samples t-tests run with all baseline measures, BMI, and age indicated no significant differences between interventions. For our main analyses we elected to use

Hierarchical Linear Modeling (HLM). HLM provides unique advantages over General Linear Modeling (GLM) because it accounts for correlated data (i.e., repeated measurements on individuals) and unequal variances. Additionally, HLM allows for participants not measured at all time points to be included in analyses. Since no participants were excluded due to missing follow-up data, we view these as intent-to-treat analyses.[1] Repeated measurements nested within participants were modeled at Level 1 and intervention group was included at Level 2. All models used a diagonal covariance matrix structure.

The Level 1 model, run separately for each of the dependent variables, revealed a significant effect of Time (all *ps* <.001). We then ran conditional models, including treatment group as the Level 2 variable, although we had not hypothesized significant treatment effects. Indeed, likelihood ratio Chi-square tests indicated no significant change in model fit for any of the dependent measures after adding treatment group as a predictor. Nevertheless, to compare the within and between treatment effects, we report the conditional model results below. Table 1 presents means and standard deviations at each time point (Time 1 (Baseline) = T1, Time 2 (Post-intervention) = T2, Time 3 (6-week follow-up) = T3, Time 4 (1-year follow-up) = T4).

HLM Analyses

Thin-ideal internalization. The HLM model predicting thin-ideal internalization (fixed effects: time, group, Time x Group; random effects: subject) revealed only a significant effect of time, $F(3, 176.36) = 14.01$, $p < .001$ (see Table 2). Examination of the parameter estimates revealed a significant decrease in internalization between T1 and T2 ($t = 3.72$, $p < .001$) and T3 ($t = 2.37$, $p < .05$). However, there were no differences between T1 and T4 ($t = .55$, $p = .58$).

Dietary restraint. The dietary restraint HLM model (fixed effects: time, group, Time x Group; random effects: subject) revealed only a significant time effect, $F(3, 202.30) = 12.63$, $p <$

.001. Results indicate a significant decrease in dietary restraint between T1 and T2 ($t = 2.39$, $p < .05$) and T3 ($t = 4.66$, $p < .001$). There were no differences between T1 and T4 ($t = 0.50$, $p = .61$).

Bulimic pathology. The HLM model predicting bulimic pathology (fixed effects: time, group, Time x Group; random effects: subject) revealed only a time effect, $F(3, 183.26) = 20.69$, $p < .001$. Parameter estimates showed a significant decrease in bulimic pathology between T1 and T2 ($t = 3.07$, $p < .01$), T3 ($t = 4.87$, $p < .001$) and T4 ($t = 2.22$, $p < .05$).

Shape concern. The HLM model predicting shape concern (fixed effects: time, group, Time x Group; random effects: subject) revealed only a significant effect of time, $F(3, 189.99) = 19.24$, $p < .001$. Results indicated a significant decrease in participants' level of shape concern between T1 and T2 ($t = 2.32$, $p < .05$), T3 ($t = 4.75$, $p < .001$), and T4 ($t = 2.12$, $p < .05$).

Weight concern. The HLM model predicting weight concern (fixed effects: time, group, Time x Group; random effects: subject) revealed only a significant time effect of, $F(3, 200.02) = 10.77$, $p < .001$. Parameter estimates revealed that weight concern did not significantly decrease between T1 and T2 ($t = 1.15$, $p = .25$), but did decrease from T1 to T3 ($t = 2.66$, $p < .01$). This difference was not observed however between T1 and T4 ($t = 1.11$, $p = .27$).

Negative affect. The negative affect HLM model (fixed effects: time, group, Time x Group; random effects: subject) revealed only a significant time effect, $F(3, 197.56) = 10.99$, $p < .001$. Parameter estimates revealed that negative affect significantly decreased between T1 and T2 ($t = 2.60$, $p < .01$) and T3 ($t = 3.00$, $p < .01$) and T4 ($t = 2.11$, $p < .05$).

Manipulation Check

Of the 79 participants in AM-DBP at post-intervention, 74% wrote that the main idea of the intervention was body acceptance/rejecting the thin-ideal. In contrast, 83% of those in AM-HWI indicated that the main idea was pursuing the healthy-ideal. When asked whether more

time was spent discussing the thin-ideal or healthy ideal, 85% of AM-HWI stated healthy ideal in contrast to 29% of AM-DBP. These numbers remained largely consistent at 6-week (AM-HWI 78%; AM-DBP 42%) and 1-year follow-up (AM-HWI 65%; AM-DBP 35%). This finding supports the manipulation given that both interventions discussed the thin-ideal and healthy-ideal to some degree, albeit with a different focus. Finally, we analyzed the eight item questionnaire about the specific content of the two interventions. As predicted, AM-DBP scored significantly higher at post-intervention, t (155) = 7.48, $p < .0001$, 95% CI [2.58, 4.43], 6-week follow-up, t (144) = 4.49, $p < .0001$, 95% CI [1.19, 3.07], and 1-year follow-up, t (115) = 4.72, $p < .0001$, 95% CI [1.53, 3.75]. This provides some additional support for our experimental manipulation.

Qualitative Results

Across the board, the AM-HWI sessions sounded as though participants were engaged and, much of the time, enjoying the process (e.g., there was appropriate laughter and supportive comments). In contrast, we heard markedly more contention and hostility during some, though certainly not all, of the AM-DBP sessions. For instance, participants attempted to argue with peer leaders and at times sounded quite angry. Indeed, compared to our experiences with sororities, AM-DBP sessions sounded more difficult, despite the fact that peer-leaders did an admirable job in our opinion of staying on course. For instance, peer-leaders generally resisted arguing when challenged by participants and remained Socratic. A number of peer-leaders, however, reported that running the AM-DBP groups was hard and, at times, unpleasant. In general, more team oriented sports (e.g., basketball, volleyball, and soccer) appeared to do better with AM-DBP than more individual sports (e.g., cross country, swimming, tennis), possibly because of personality characteristics that help to draw particular people to different sports (e.g., more independent). It may also be that running a group of people drawn to individual sports is

inherently more difficult (possibly because of personality traits) and that this challenge was beyond the clinical capabilities of peer-leaders. Yet, informal reports from peer-leaders, participants, and coaches indicated a fairly high level of consensus regarding a preference for AM-HWI, which appears to have more face validity to this population than AM-DBP. More specifically, they reported preferring a nutrition-oriented intervention because it intuitively made sense to them that this could help performance and health as opposed to one that appeared to be more body image focused.

Unexpected Results

We also observed 2 unexpected results during this study. First, 7 athletes came forward to our head athletic trainer concerned that they might have the female athlete triad. This is notable because this had never previously happened during the entire course of our head athletic trainer's extended career. Moreover, none of these students were flagged on their beginning of the year medical screening questionnaire; all reported menstruating regularly. When asked about the inconsistency, some reported not remembering why they had answered the way they did on the questionnaire even while admitting that their menstrual disorders had been present for some time. Others, however, reported that they did not think the question was important and wanted to just say what they thought sports medicine staff wanted to hear.

Regarding outcome for these athletes, 2 graduated before full evaluations were completed, so we do not know the eventual outcome. After extensive testing, 1 student was determined to have another gynecological disorder that was resulting in her amenohrrea. For the remaining 4 athletes, after evaluation by a physician it was recommended that they increase their intake. All were able to do so and tolerate corresponding weight gain, suggesting they did not

have EDs, but rather just underestimated their energy needs. All reported that their menses resumed several months after they increased their intake.

Second, we heard a number of reports of peer-leaders serving as "triad police," actively informing fellow students that menstrual disorders were associated with low bone density and had to be taken seriously. Although we had no way to verify this beyond informal reports, it appears that our peer-leaders had a surprising level of information about who was and was not menstruating and attempted to encourage their fellow students to seek medical consultation.

Discussion

This exploratory study investigated whether it was possible to sufficiently modify dissonance based prevention (DBP) and a healthy weight intervention (HWI) to meet the unique needs of female athletes. This is the first study to attempt to significantly modify DBP and HWI for athletes, and is a much larger study than the only other published study of DBP and HWI conducted with female athletes (Smith & Petrie, 2008: $N = 29$). To our knowledge this is also the only ED prevention study with athletes to have preplanned follow-up out to one year.

Both AM-DBP and AM-HWI reduced all dependent variables at 6 weeks, and effects remained at 1-year follow-up for negative affect, bulimic pathology, and shape concern. These findings are encouraging for three reasons. First, to our knowledge, no other study has found significant effects at 1-year follow-up for ED risk factors in female athletes. As noted above, however, with the exception of Elliot et al. (2008), no intervention study has followed athletes for any significant time period, and Elliot et al. were unable to match follow-up data to baseline data. Second, because of the dual body image pressures faced by female athletes (i.e., sport performance concerns plus traditional thin-ideal in daily life), they are considered by many to be an unusually challenging population with which to work. Indeed, one reviewer for the grant that

supported this study stated that he/she could not imagine DBP being remotely viable in such a difficult population despite its broad success in the non-sport world. A number of colleagues with clinical sport expertise also have noted they were surprised that a 3-4 hour intervention reduced any risk factors in this population at post-intervention, let alone 6-week and 1-year follow-up. Third, preliminary research with these interventions by other researchers was not positive. More specifically, based on examination of reported means, it appears that Smith and Petrie (2008) did not get *any* improvement on either traditional thin-ideal internalization (i.e., importance of being thin and attractive) or bulimic pathology even at post-intervention. Indeed effects were non-significantly in the negative direction on these measures. This finding, which is contrasted by virtually every study of DBP and HWI in non-athletes, supports the general clinical sense that many ED specialists in the sport world have that female athletes represent a uniquely challenging population with which to work. Thus, we were pleased to find preliminary evidence that two interventions with substantial empirical support in other populations may be effective with female athletes if adequately tailored.

We were surprised to have 7 students come forward to the head athletic trainer reporting that they were concerned that they might have the female athlete triad. This is a particularly positive finding given that our head athletic trainer had never previously had a student present in this manner. Also, given that many students are on birth control, meaning that the most obvious symptom of the triad is masked, this represents a clinically significant number of students. More specifically, of the 77 students who reported not taking birth control, almost 10% came forward expressing concern about having the triad after the FABP was instituted. This percentage closely fits with the average estimate (10-20%) that Warren (1999) gives for most sports.

Overall, it appeared that when provided with a script and appropriate training, peers are well suited to teaching one another about the female athlete triad. Moreover, many seemed to embrace their job as health advocates for athletic females generally and were active in reminding their peers about the medical complications associated with the female athlete triad. Further, much to our surprise, they seem to have a surprising knowledge about the menstrual status of their peers, which seemed to help them know who to reach out to more assertively.

A key goal of this study was to determine to whether peer-led AM-DBP and/or AM-HWI warranted further study with a wider range of female athletes in a more controlled study. Although quantitative results support further investigation of both interventions, qualitative results provide greater support for peer-led AM-HWI in our opinion. In our experience running peer–led DBP with sororities, we have never heard as many confrontational groups as we did in this study with AM-DBP, though again we must note that many groups ran well. Yet in the groups that were more confrontational, the participants almost seemed to bully the peer-leaders. Although it is impossible to know exactly why this happened, a number of athletes appeared to experience intense dissonance during the exercises and lashed out in response to that uncomfortable psychological state. One possible reason for this may be that peer-leaders lack the clinical skills to navigate the dissonance program with more challenging populations.

The athletes also seemed more inclined to think that a body image intervention was a waste of time as compared to one that – on the surface – appears to be aimed at improving nutrition. We should note that the fact that all athletes were required to participate in the program likely exacerbated negative reactions for AM-DBP relative to what might be seen for a program that is run on a voluntary basis for athletes who self-identify as body dissatisfied. Yet, discussions with many departments of athletics that have resulted from the broad scale

dissemination of DBP in sororities throughout North America (i.e., campuses that have the sorority program often wonder about having a similar program for athletes) indicate that many departments like the idea of (a) requiring all female athletes to participate in a program, (b) running such a program on a team by team basis so that the program also facilitates team building and cohesion and (c) having a peer-led program. So results from this trial likely generalize to the ways in which many (though certainly not all) athletics departments may want to operate such a program. And across the board, there was fairly widespread agreement regarding a preference for AM-HWI. For instance, an informal survey among athletes participating in both interventions (AM-DBP and AM-HWI) also indicated that about 80% preferred AM-HWI to AM-DBP. This preference was supported by peer-leaders. More peer-leaders in AM-DBP sought additional supervision because their groups were so difficult to run, and AM-HWI peer-leaders seemed to have a better time running groups. Given that we also received feedback from coaches and athletic training staff showing a preference for AM-HWI, and that in subsequent discussions with athletic training staff, administrators and coaches at other universities we found a preference for peer-led AM-HWI, we believe that further research and ultimate dissemination will be substantially easier with AM-HWI as compared to AM-DBP – particularly if the program is to be run on a required basis, within teams and with peer-leaders.

This study has a number of limitations. First, because we would have had inadequate statistical power, we were unable to randomize entire teams to condition and thus had to randomize at the individual level within teams. This increases the likelihood of spillover effects and may have obscured quantitative differences in outcome between the interventions. We acknowledge this is a significant design flaw, but note that the purpose of this study was simply to determine if future research with these interventions, using better designs, was warranted.

Future research should attempt to keep conditions consistent within teams to reduce issues with spillover. It should also be noted that some believe that it may be better to mix athletes across teams and future researchers should consider this option, although it was rejected by athletics staff in the present study and several other athletics departments at the Division I level have seconded the desire to run within teams. Second, the study is limited by the exclusive use of self-report measures. Third, use of a waitlist control would have markedly strengthened the study. It is conceivable that the athletes only improved on measures as a result of maturation, demand, or other factors not associated with the interventions. This seems very unlikely, however, given the challenge prior researchers have encountered in reducing risk factors in this population at post-intervention and given the results of Smith and Petrie (2008). Also, past research has shown that while social desirability is associated with many ED risk factors at baseline, it is not associated with change over time in ED risk factors when they shift in response to a prevention program (Tilgner, Wertheim, & Paxton, 2004). A waitlist condition, however, also would have allowed us to assess whether or not the interventions reduced onset of EDs, which is often considered to be the Holy Grail for prevention. Future trials should include a waitlist control and ideally a longer follow-up so that reduction in onset of EDs can be assessed. Fourth, this pilot study was conducted on the campus of a competitive Division III athletics program, which limits generalizability at this time to this level of competitiveness (e.g., versus Division I). Future research needs to determine whether results generalized to more competitive athletics programs.

Fifth, this study was conducted on a campus where there is a parallel program that is run annually with sororities, and there is some overlap between the sorority population and athletic population. Thus, it is plausible that the culture of this campus is somewhat unique and results are limited to this environment. Indeed, it was the presence of the highly successful sorority

program that led some female athletes (both sorority and non-sorority) to ask their coaches if the athletes could have their own "body image program." It should be noted, however, that the athletes did not feel that the content of the sorority program had bled into or influenced their own culture in a meaningful way. Rather, they believed that another sub-community had a positive program and that athletes would experience similar benefits from their own program. In summary, it may be that positive results were related to the existence of another program on campus, although it seems more likely that openness to creating FABP in the first place was the primary result of the sorority program. This interpretation is supported in part by the regular requests we receive for athlete-oriented programming from universities that have successfully launched the sorority program. We should note that currently we encourage athletic departments to save their resources until there is sufficient data to support use of a particular program – be it ours or another program. We do not consider the results of this exploratory study sufficient to justify launching the HWI program on a broad scale. Further research is needed.

Sixth, at this point is not possible to determine to what degree positive findings resulted from the specific interventions or from a culture change within the department of athletics – or more specifically coaches. We did not observe any marked change in behavior on the part of coaches, and we did not conduct any intensive interventions with coaches. The main "face" of the program in athletics was the head athletic trainer. Coaches were updated on an annual basis as to the status of the program and provided a refresher on the female athlete triad. For the most part they reported being happy with the program, because they felt their athletes were less body image focused (e.g., resisted strength training less because they no longer feared "bulking up" as much). In summary, it is possible that the culture changed in subtle ways that influenced the outcome of the program, though we did not detect this. This would likely be true, however, in the

future as well if the program was run with all athletic teams and with substantial support by the head athletic trainer and the director of athletics.

Seventh, it is possible that more sessions could produce more robust effects. The number of sessions selected in this study was based on the general prevention literature which showed that 3 sessions of these interventions could produce effects out to 3 years (Stice, Marti et al., 2008), and based on the maximum number of sessions that athletics thought was viable for their busy students.

Eighth, our groups were of uneven sizes because of the decision to run within teams. In the smaller than ideal groups (e.g., golf with 2 participants), this did not seem to overly influence group dynamics because of the use of multiple peer leaders. Peer leaders were trained to move back and forth between their role as group leaders and responding as participants when it was useful to do so. In the very large groups, however, peer leaders reported that it was harder to make sure that all participants were sufficiently active. As a result, in the future, we recommend breaking very large teams into smaller subgroups.

Finally, although we used intent-to-treat analyses to control for dropout, we only retained 76% of the sample at 1-year follow-up. Participants were not paid for completing the study assessments, in part because when this study was initiated, NCAA compliance rules forbade it. The rules were recently altered, however, and future studies might benefit from offering incentives to retain a greater portion of the sample at follow-up.

This study suggests that when sufficiently modified for females in sport, both DBP and HWI are capable of reducing some ED risk factors at 1-year and raising awareness and action with respect to the female athlete triad, which are promising findings. Future research is needed to replicate these results and study these interventions using more rigorous designs. In addition,

future research should examine whether or not results are comparable when interventions are administered at more competitive collegiate programs. For instance, we are currently exploring clinical issues that arise when staff from a highly competitive Division I athletics department try to implement AM-HWI on their own. Future research might also explore whether more sessions produce better outcomes and identify conditions under which athletics departments opt for more sessions, given that the 3-session format used in this study was selected by the department of athletics. Based on our qualitative experiences and numerous discussions with people in the sport world, we encourage future researchers to focus their efforts on AM-HWI over AM-DBP if they are interested in working with peer-leaders and within teams on a required basis. Even with AM-HWI it will be important to see if effects can be increased given that in non-sport populations, all risk factors assessed in this study often remain significantly improved at one year, suggesting that there is room for improvement in working with females in sport.

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Footnotes

1. For the few participants who dropped out after completing pre-intervention questionnaires, we carried forward their pre-intervention scores to post-intervention prior to running the HLM analyses.

Table 1

Means and standard deviations for dependent measures

Measures	Baseline *M (SD)*	Post Intervention *M (SD)*	6-week Follow-up *M (SD)*	1-year Follow-up *M (SD)*
Thin-ideal internalization				
AM-DBP	3.50 (0.52)	3.12 (0.70)	3.31 (0.61)	3.36 (0.43)
AM-HWI	3.48 (0.65)	3.21 (0.77)	3.32 (0.75)	3.43 (0.67)
Dietary restraint				
AM-DBP	2.48 (0.85)	2.24 (0.88)	2.24 (0.91)	2.27 (0.88)
AM-HWI	2.40 (0.91)	2.29 (0.91)	2.15 (0.82)	2.30 (0.89)
Bulimic pathology				
AM-DBP	11.11 (8.65)	8.79 (7.78)	7.85 (7.64)	7.88 (7.36)
AM-HWI	9.19 (7.88)	7.87 (8.19)	7.04 (7.08)	7.29 (7.44)
Shape concern				
AM-DBP	2.10 (1.59)	1.65 (1.57)	1.55 (1.46)	1.58 (1.35)
AM-HWI	1.79 (1.59)	1.61 (1.63)	1.40 (1.32)	1.40 (1.41)
Weight concern				
AM-DBP	1.82 (1.65)	1.55 (1.53)	1.35 (1.47)	1.34 (1.40)
AM-HWI	1.37 (1.44)	1.31 (1.50)	1.15 (1.21)	1.11 (1.21)
Negative affect				
AM-DBP	1.71 (0.57)	1.47 (0.53)	1.56 (0.62)	1.51 (0.55)
AM-HWI	1.68 (0.62)	1.57 (0.64)	1.50 (0.55)	1.50 (0.51)

Note: Athlete-modified dissonance-based prevention (AM-DBP) baseline and post-intervention, $n = 73$, 6-week $n = 68$, 1-year $n = 55$. Athlete-modified healthy weight intervention (AM-HWI) baseline, $n = 84$, post-intervention $n = 82$, 6-week $n = 75$, 1-year $n = 65$.

Table 2

Effects of intervention group and time on thin-ideal internalization, dietary restraint, bulimic pathology, shape concern, weight concern and negative affect

Source	Numerator *df*	Denominator *df*	*F*	η^2
Thin-ideal internalization				
Intercept	1	147.61	9.79**	.06
Time	3	176.36	14.01***	.07
Group	1	147.61	0.12	.00
Time x Group	3	176.36	0.60	.00
Dietary restraint				
Intercept	1	158.64	3.85	.02
Time	3	202.30	12.63***	.06
Group	1	158.64	0.07	.00
Time x Group	3	202.30	2.06	.01
Bulimic pathology				
Intercept	1	158.22	7.19**	.04
Time	3	183.26	20.69***	.10
Group	1	158.22	1.04	.00
Time x Group	3	183.26	0.56	.00
Shape concern				
Intercept	1	159.15	5.18*	.03
Time	3	189.99	19.24***	.09
Group	1	159.15	0.68	.00
Time x Group	3	189.99	0.92	.00
Weight concern				
Intercept	1	158.60	2.29	.01
Time	3	200.02	10.77***	.05
Group	1	158.60	1.50	.01
Time x Group	3	200.02	1.37	.01
Negative affect				
Intercept	1	154.20	8.75**	.05
Time	3	197.56	10.99***	.05
Group	1	154.20	0.03	.00
Time x Group	3	197.56	1.82	.01

* $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 1: FABP CONSORT flowchart of participant movement through the study