

Preventing Substance Use and Disordered Eating

Initial Outcomes of the ATHENA (Athletes Targeting Healthy Exercise and Nutrition Alternatives) Program

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Objectives: To implement and to assess the efficacy of a school-based, sport team-centered program to prevent young female high school athletes' disordered eating and body-shaping drug use.

Design and Setting: Prospective controlled trial in 18 high schools, with balanced random assignment by school to the intervention and usual-care control conditions.

Participants: We enrolled 928 students from 40 participating sport teams. Mean age was 15.4 years, 92.2% were white, and follow-up retention was 72%.

Intervention: The ATHENA (Athletes Targeting Healthy Exercise and Nutrition Alternative) curriculum's 8 weekly 45-minute sessions were incorporated into a team's usual practice activities. Content was gender-specific, peer-led, and explicitly scripted. Topics included healthy sport nutrition, effective exercise training, drug use and other unhealthy behaviors' effects on sport performance, media images of females, and depression prevention.

Main Outcome Measures: We assessed participants by confidential questionnaire prior to and following their sport season. We determined program effects using an analysis of covariance-based approach within the Generalized Estimating Equation framework.

Results: Experimental athletes reported significantly less ongoing and new use of diet pills and less new use of athletic-enhancing substances (amphetamines, anabolic steroids, and sport supplements) ($P < .05$ for each). Other health-harming actions also were reduced (less riding with an alcohol-consuming driver [$P = .05$], more seat belt use [$P < .05$], and less new sexual activity [$P < .05$]). The ATHENA athletes had coincident positive changes in strength-training self-efficacy ($P < .005$) and healthy eating behaviors ($P < .001$). Reductions occurred in intentions toward future use of diet pills ($P < .05$), vomiting to lose weight ($P < .05$), and use of tobacco ($P < .05$) and muscle-building supplements ($P < .005$). The program's curriculum components were altered appropriately (controlling mood [$P < .005$], refusal skills [$P = .05$], belief in the media [$P < .005$], and perceptions of closest friends' body-shaping drug use [$P < .001$]).

Conclusions: Sport teams are effective natural vehicles for gender-specific, peer-led curricula to promote healthy lifestyles and to deter disordered eating, athletic-enhancing substance use, and other health-harming behaviors.

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APPROXIMATELY HALF OF female and male high school students participate in school sports.^{1,2} Contrary to popular belief, these young athletes are not protected from drug use and other harmful behaviors.^{3,4} For young females, the sociocultural pressures toward thinness may be compounded by similar influences of their sport, resulting in more prevalent disordered eating behaviors and body-shaping drug use (tobacco, diet pills, diuretics, laxatives, amphetamines, and anabolic steroids).^{5,6} These health-harming actions, even among individuals lacking the full diagnostic

criteria for anorexia or bulimia nervosa, can be associated with significant morbidity and mortality.^{7,8} Unfortunately, programs to prevent these practices largely have been unsuccessful⁹ or paradoxically, may have increased these detrimental behaviors.¹⁰

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The high school years are important for prevention, as drug use approximately doubles,² and middle-school prevention programs' beneficial effects often are attenuated or lost.¹¹ Because

older adolescents' behaviors are shaped more by peers and social influences and less by classroom activities,¹² effective high school-based prevention programs are limited.¹³

Although sport participation may increase a young female's risk for certain unhealthy activities, athletic teams also may provide a natural setting for bonded peers to address gender-specific topics. The sport team's use as a vehicle for health promotion was demonstrated for male high school athletes with the ATLAS (Adolescents Training and Learning to Avoid Steroids) program, which significantly improved nutrition behaviors and exercise self-efficacy, while reducing use of alcohol, illicit drugs, and performance-enhancing supplements.¹⁴

The ATHENA (Athletes Targeting Healthy Exercise and Nutrition Alternatives) program parallels ATLAS in its school-based, team-centered format and promotion of healthy nutrition and effective exercise training as alternatives to harmful behaviors. However, ATHENA's objectives are to reduce the young female athlete's disordered eating habits and to deter use of body-shaping substances. To evaluate the ATHENA program's feasibility and efficacy, we recruited 18 high schools and randomized them to an intervention and a usual-care control group. We hypothesized that program participation would result in greater positive change, which would be mediated by gender-specific influences targeted in the curriculum.

METHODS

PARTICIPANTS

We asked 18 public high schools from northwest Oregon and southwest Washington to participate; all enrolled in the study. In selecting that number of schools, we used prevalence rates from our prior studies^{15,16} and assumed relatively low interdependence among students enrolled at the same school. We anticipated 18 schools would provide a greater than 90% chance of detecting intervention effects accounting for 10% or more of the variance, without covariate adjustment, for primary outcomes, such as diet pill use, disordered eating behaviors, and healthy alternative behaviors. Participating schools had a spectrum of sizes and varied locales to minimize potential cross-contamination. They were matched in balanced dyads based on size, average socioeconomic status, and student demographics. An individual unfamiliar with the participating schools used a program for generating random numbers to assign 1 member of the pair to the experimental (even) or control (odd) group, with the remaining pair member going to the other condition.

Because disordered eating is a feature among all women's sports,⁶ after randomization we met with the experimental schools' athletic directors and coaches and offered participation to all women's sports teams, including dance and cheerleading. At least 1 or 2 teams per school chose to participate. In general, not enlisting was because of logistic and feasibility concerns, such as the coach not yet being hired or a sport's funding being in jeopardy. For each experimental team electing to participate, we specifically recruited the similar team from its matching control school, and with that focused effort, all corresponding control teams chose to participate. Study enrollment was offered to all athletes from involved sport teams. Students and their parents or guard-

ians provided written informed consent for study participation. The institutional review board of Oregon Health & Science University, Portland, approved the study.

Student involvement was voluntary. Study information highlighted that neither team membership nor playing time would be influenced by ATHENA participation. School personnel were not involved in recruitment, and signed consents were returned to research staff. Research assistants administered confidential questionnaires at baseline (immediately preceding the sport season) and within 2 weeks of the sport season's conclusion. Coaches, teachers, and other school personnel were not involved with survey administration.

SURVEY INSTRUMENT

We assessed potential influences on drug use and disordered eating, including those of peers, coaches, the media, and society.¹⁷ In addition, individuals' knowledge and characteristics were indexed using items from our earlier research^{14,15} and surveys concerning disordered eating,^{17,18} depression,¹⁹ self-image,²⁰ and self-esteem.²¹ For knowledge of specific topics, self-esteem, body image, and perceptions about peers and teammates, we grouped 3 to 7 survey items into reliable constructs (standardized α at least .78) and used the items' mean as the score.

Acquiring new behaviors typically follows a sequence, wherein intentions toward an action increase, followed by experimenting with an activity, and finally, the behavior becomes an established practice.^{22,23} Higher intentions can characterize those with a greater likelihood of practicing those habits in the future. We assessed behavioral intent by asking about future actions. These and other items used a 7-point Likert scale, with anchors ranging from strongly disagree to strongly agree. Substance abuse questions used a format similar to the Monitoring the Future National Survey²⁴ and the Youth Risk Behavior Surveillance-United States, 2001,² with similar designs to assess supplement use and disordered eating behaviors. The final instrument contained 177 questions and could be completed in approximately 30 minutes.

INTERVENTION

The ATHENA intervention was delivered during a team's sport season, and its eight 45-minute classroom sessions were integrated into a team's usual practice activities. During those sessions, a team assembled as a group with students organized in coach-assigned stable learning clusters of approximately 6 students (squads). The coach also designated 1 athlete per small group as the squad leader. The squad leaders led approximately 70% of ATHENA activities, with the coach or other team staff member acting as a facilitator and timekeeper, beginning and concluding the sessions. Prior to the first classroom meeting, squad leaders attended a 90-minute orientation session. They and the coach used scripted lessons to direct the meetings. Other student group members used workbooks, and all participants received a pocket-sized sport nutrition and training guide. The guide contained reference information and was used by participants when monitoring their protein and calcium intake and for tracking their daily mood and fun activities.

The curriculum scope is based on identified features of effective prevention programs,¹² sex-specific correlates of drug use and disordered eating behaviors,^{25,26} and our prior

survey results, which defined and prioritized factors relating to higher intentions toward these health-harming practices.^{15,16} Each classroom session was composed of 3 to 5 activities, designed to foster active learning and application of new abilities. Topics included a balanced presentation concerning the consequences of substance use and other unhealthy behaviors and the beneficial effects of appropriate sport nutrition and effective exercise training. The nutrition content focused on classifying foods as high in carbohydrates, protein, or fats, and the need for carbohydrates as muscle “fuel” for intense exercise and achieving adequate protein and calcium intakes. Unlike the ATLAS program for young male athletes, specific caloric intake goals were not presented.

Depression is more common among females, and a low mood is a risk for a female’s disordered eating and drug use.²⁷ To address this factor, ATHENA incorporated a depression prevention program with established efficacy,²⁸ using sequenced cognitive restructuring tasks adapted for the sport team setting. The curriculum countered media influences by deconstructing and remarking magazine advertisements. Students also practiced relevant refusal skills, and healthy norms were reinforced as squads created and presented to their teammates public service campaigns designed to discourage drug use and disordered eating practices. In addition, at each session, participants received a specific short-term health goal, such as eating breakfast daily and recording their 24-hour calcium intake, to complete before the next meeting. The control teams were offered preprinted pamphlets concerning disordered eating, drug use, and sports nutrition.

DATA ANALYSES

We monitored implementation and fidelity using direct observation and content checklists that mirrored the scripted lesson plans. To determine baseline equivalence and intervention effects, we used an analysis of covariance–based approach within the generalized estimating-equations random-effects model framework, which extends generalized linear models to deal with time dependence and data’s hierarchical structure.^{29–31} Because the ATHENA program was designed as primary prevention, we also determined the incidence of new users (ie, athletes who began a behavior after the baseline assessment) and compared conditions using a χ^2 test analysis. For those results, we report the risk ratio and its 95% confidence interval. An analogous format was applied to examine participants who stopped a behavior. Where appropriate, we adjusted the significance level for multiple comparisons using a modified Bonferroni procedure.^{32,33}

RESULTS

ATTRITION, FIDELITY, AND BASELINE CHARACTERISTICS

The ATHENA program was feasible and acceptable to coaches and student athletes. All enrolled teams assigned to the experimental and control conditions were retained in the study. Preseason to postseason student attrition was similar in both groups (**Table 1**) and comparable to the retention observed with male high school athletes.¹⁴ Unlike typical classroom programs, in addition to losses owing to study withdrawal and school transfer and drop out, attrition also included being cut from the roster, injury, and quit-

Table 1. Baseline Characteristics*

Variable	Experimental Group	Control Group
No. of schools	9	9
No. of sports	11	11
No. of total participating teams	20	20
No. of student athletes preseason	457	471
No. (% retained) of student athletes postseason	337 (74)	331 (70)
Parent with a college degree	66	61
Age, mean (SD), y	15.4 (1.2)	15.3 (1.2)
White	93.6	91.4
Self-reported prior alcohol use	52	47
Self-reported prior tobacco use	27	33
Self-reported prior marijuana use	19	19
Self-reported prior diet pill use	14	11
Self-reported prior fasting to lose weight	28	26
Self-reported prior anabolic steroid use	0	0.3

*Data are given as the percentage of participants unless otherwise indicated.

ting the team. Fidelity to the curriculum was high, and experimental teams covered 80.8% ± 0.2% (mean ± SD) of content items per session. Table 1 also lists descriptive information by condition at the preseason assessment. Prior to the intervention, experimental and control groups had similar demographic parameters, drug use indices, knowledge scores, and self-assessed behaviors and attitudes, except for understanding of anabolic steroids. For that construct at baseline, the experimental athletes had significantly greater knowledge than the control group ($P < .05$) (**Table 2**).

DISORDERED EATING BEHAVIORS AND BODY-SHAPING SUBSTANCE USE

Survey results prior to and within 2 weeks of the sports seasons’ conclusion indicated that following the intervention the experimental participants reported less recent (last 3 months) diet pill use ($P < .05$) (Table 2). The prevalence of creatine use was low, limiting the ability to demonstrate effects on use, and tobacco use decreased in both experimental and control student athletes during their sport seasons.

Although initiating drug use during the sport season was infrequent, differences between groups were observed for both diet pills and other body-shaping agents. Intervention athletes had fewer new users of diet pills ($P < .05$; relative risk [RR] for controls, 2.80; 95% CI, 1.02–7.68) and other body-shaping substances (amphetamines, anabolic steroids, and muscle-building supplements) ($P < .05$; RR for controls, 1.55; 95% CI, 1.03–2.31). After initiating the program, there also was a favorable trend for more experimental students stopping diet pills use ($P = .07$; RR for controls, 0.41; 95% CI, 0.15–1.13).

NUTRITION, EXERCISE ABILITIES, AND BELIEFS

The ATHENA experimental athletes reported significant positive changes in dietary habits and exercise train-

Table 2. Main Outcome Measures Prior to and Following the Sport Season*

Variable	Control Group		Experimental Group	
	Preintervention	Postintervention	Preintervention	Postintervention
Disordered Eating Behaviors and Body-Shaping Substance Use in the Last 3 mo†				
Diet pills use	0.05 (0.21)	0.07 (0.26)	0.06 (0.23)	0.03 (0.18)‡
Vomiting to lose weight	0.08 (0.45)	0.09 (0.53)	0.05 (0.29)	0.07 (0.51)
Tobacco use	0.26 (0.87)	0.22 (0.75)	0.24 (0.80)	0.18 (0.68)
Creatine (muscle-building supplement) use	0.02 (0.14)	0	0.01 (0.08)	0.01 (0.11)
Nutrition, Exercise Abilities, and Beliefs§				
Track my protein intake	2.11 (1.38)	2.03 (1.35)	2.16 (1.42)	2.54 (1.56)
Eating more protein in the last 2 mo	3.95 (1.68)	3.92 (1.75)	4.19 (1.77)	5.10 (1.65)
Know how to lift weights to improve strength	5.48 (1.30)	5.61 (1.41)	5.15 (1.51)	5.92 (1.23)
Self-rating of skill in strength training	5.48 (1.30)	5.61 (1.41)	5.15 (1.52)	5.92 (1.23)
Belief that nutrition affects sport performance	5.75 (1.31)	5.64 (1.39)	6.06 (1.34)	6.01 (1.23)‡
Additional Health-Influencing Behaviors				
Passenger in a car with an alcohol-consuming driver in the last 2 mo#	0.44 (0.90)	0.42 (0.90)	0.41 (0.89)	0.26 (0.72)‡
Usually wear a seatbelt when riding in a car	2.63 (0.65)	2.63 (0.68)	2.66 (0.63)	2.59 (0.75)‡
No. of sport injuries so could not train in the last 3 mo	0.32 (0.50)	0.36 (0.50)	0.32 (0.51)	0.26 (0.46)‡
Intentions Toward Future Disordered Eating Behaviors and Drug Use§				
Diet pill use	1.74 (1.45)	1.79 (1.49)	1.87 (1.66)	1.62 (1.35)‡
Vomiting to lose weight	1.66 (1.52)	1.76 (1.49)	1.62 (1.35)	1.57 (1.28)‡
Tobacco use	1.56 (1.28)	1.79 (1.58)	1.55 (1.32)	1.58 (1.34)‡
Creatine (muscle-building supplements) use	1.87 (1.46)	1.77 (1.42)	1.72 (1.33)	1.51 (1.14)
Knowledge§				
Effects of anabolic steroids	4.89 (1.26)	5.09 (1.24)	5.20 (1.20)	5.67 (1.20)
Performance-harming effects of alcohol	5.16 (1.63)	5.46 (1.51)	5.22 (1.50)	6.00 (1.51)
Disordered eating's consequences	5.53 (1.21)	5.62 (1.25)	5.65 (1.16)	5.88 (1.22)
Know the basics of a good diet for an athlete	5.75 (1.25)	5.69 (1.28)	5.74 (1.35)	6.23 (1.03)
Know my calcium needs	2.59 (0.85)	2.69 (0.88)	2.65 (0.71)	2.89 (0.75)**
Mood, Traits, and Beliefs†				
Believe my mood is better when I do fun things	6.29 (0.98)	6.17 (1.07)	6.25 (1.02)	6.46 (0.96)**
Know how to control my mood	4.71 (1.59)	4.74 (1.72)	4.79 (1.59)	5.10 (1.58)
Felt depressed in the last week	0.66 (0.85)	0.70 (0.90)	0.56 (0.77)	0.61 (0.78)
Self-esteem construct	5.86 (1.11)	5.86 (1.14)	5.90 (1.08)	5.99 (1.00)
Positive body image construct	4.10 (1.27)	4.24 (1.37)	4.10 (1.31)	4.25 (1.35)
I accept the risks of using drugs	2.17 (1.44)	2.36 (1.60)	2.33 (1.57)	2.24 (1.58)
I know how to turn down unhealthy weight loss behaviors	5.80 (1.95)	5.77 (1.99)	5.91 (1.95)	6.14 (1.67)‡
Media§				
Belief that advertisements are true	2.86 (1.34)	2.69 (1.44)	2.71 (1.38)	2.22 (1.40)
Belief that thin women are most attractive to men	4.65 (1.84)	4.61 (1.75)	4.36 (1.78)	4.16 (1.92)‡
Coach and Peer Effects§				
Coach tracks our body weights	2.24 (1.44)	2.11 (1.44)	2.60 (1.58)	2.08 (1.38)
Coach thinks thin is best	2.39 (1.50)	2.37 (1.54)	2.22 (1.39)	2.09 (1.39)
Closest friends use body-shaping drugs	2.12 (1.25)	2.19 (1.40)	2.22 (1.28)	2.14 (1.33)
Closest friends are against me using drugs	6.04 (1.45)	6.00 (1.50)	6.05 (1.61)	6.21 (1.35)
Pressure from other girls to lose weight	0.09 (0.29)	0.13 (0.34)	0.09 (0.29)	0.08 (0.28)‡
Pressure from teammates to lose weight	0.07 (0.26)	0.07 (0.26)	0.07 (0.26)	0.04 (0.20)
Female athletes at other schools with disordered eating or body-shaping drug use, %	14.2 (15.4)	12.5 (14.3)	13.7 (14.7)	11.8 (14.3)

*Data are given as the mean (SD) unless otherwise indicated.

†Scored 0 to 6 for times used with anchors of 0 indicating none; 1, 1 to 2; 2, 3 to 5; 3, 6 to 9; 4, 10 to 19; 5, 20 to 39; and 6, 40 or greater.

‡Significant differences between conditions following the sport season, $P \leq .05$.

§Scored using 7-item agreement scale ranging from 1 (strongly disagree) to 7 (strongly agree).

||Significant differences between conditions following the sport season, $P < .005$.

¶Significant differences between conditions following the sport season, $P < .001$.

#Scored 0 to 4 for times occurred with 0 indicating none; 1, once; 2, 2 or 3 times; 3, 4 or 5 times; or 4, 6+ times.

**Significant differences between conditions following the sport season, $P < .01$.

ing self-efficacy (Table 2). Following the intervention, experimental students indicated more tracking of their protein intake ($P < .005$), increased total daily protein consumption ($P < .001$), and greater confidence in their

strength-training skills ($P < .005$). Accompanying those favorable changes, intervention student athletes also had significantly greater belief that what they ate affected their sport performance ($P < .05$).

ADDITIONAL HEALTH-INFLUENCING BEHAVIORS

The groups differed in behaviors not specifically addressed in the curriculum. Following the program, experimental students were less likely to ride in a car with an alcohol-consuming driver ($P = .05$) and more likely to use seatbelts ($P < .05$). In addition, compared with experimental students more control participants became sexually active ($P < .05$; RR for controls, 2.50; 95% CI, 1.05-5.83). Not shown are results indicating that these favorable changes were specific to those behaviors, as no significant intervention effect was observed for “doing something against the law” and “skipping classes.” Owing to the intensity of practice and competitions, we expected recent sport injuries to be increased following the season. While that pattern was seen among control students, the experimental group’s sport injuries were reduced ($P < .05$), perhaps relating to the curriculum’s nutrition and physical training objectives.

INTENTIONS TOWARD FUTURE ACTIONS

The ATHENA program resulted in favorable changes in the experimental participants’ intentions toward future vomiting to lose weight ($P < .05$) and use of diet pills ($P < .05$), tobacco ($P < .05$), and creatine ($P < .005$). No statistically significant differences were seen in intentions toward either future or current use of alcohol and marijuana.

CURRICULUM CONTENT AND OTHER POTENTIAL INFLUENCES

Knowledge

Experimental participants increased their understanding and retention in the curriculum’s knowledge domains, including anabolic steroids’ effects ($P < .001$) and alcohol’s athletic-harming consequences ($P < .001$). They also had better knowledge of their calcium needs ($P < .01$) and the basics of sport nutrition ($P < .001$). Although baseline knowledge was highest for disordered eating’s consequences (ie, highest agreement with true statements), the program’s positive influence also approached significance ($P = .06$).

Mood, Traits, and Beliefs

Among experimental and control participants, agreement with feelings of depression was low (ie, in general, students strongly disagreed with statements characterizing depression) before and after the sport season. Despite that finding, following the ATHENA program, intervention students believed more strongly that their mood is affected by what they do ($P < .01$) and that they had greater skill in controlling their mood ($P < .005$).

The personality dimensions self-esteem and positive body image were similar for both conditions. However, personal vulnerability, indexed by disagreement with accepting the risks from drugs, differed between the groups ($P < .005$), with experimental students disagreeing more

across the sport season. Importantly, following the intervention, curriculum participants differed from controls by indicating greater ability to turn down an offer to engage in drug use and disordered eating behaviors ($P = .05$).

Media

Following the program, ATHENA athletes believed less in the truth of advertisements ($P < .005$) and disagreed more with a statement that men find thin women most attractive ($P < .05$).

Coach and Peer Effects

Perceptions about their coaches did not differ for the 2 conditions, although the observed trends among ATHENA experimental athletes were in the desired direction (Table 2). After participation, intervention students agreed less that their closest friends used body-shaping drugs ($P < .001$) and agreed more that their closest friends would be against their drug use ($P < .001$). Although perceived pressure from other females and teammates to lose weight was low, for the former, it significantly decreased among experimental student athletes ($P < .05$). Perceived school norms for disordered eating and body-shaping drug use did not differ between groups.

COMMENT

The ATHENA curriculum succeeded in most of its prevention and health promotion goals. Following their sport season, intervention students reported less ongoing and new diet pill use and less new use of athletic-enhancing, body-shaping substances (amphetamines, anabolic steroids, and muscle-building supplements). Experimental participants understood more about the presented topics, had improved self-reported dietary habits, and indicated greater self-efficacy for exercise training. They had better ability to control their mood, less belief in the media, and enhanced resistance skills. As was shown for males,¹⁴ a sport-team-centered, gender-specific, peer-led curriculum can be an effective means to alter a young female’s knowledge, attitudes, and behaviors.

Healthy changes also occurred in actions not specifically addressed during the curriculum, including riding in a car with an alcohol-consuming driver, wearing a seatbelt, and new sexual activity. Among adolescents the risk and protective factors for different health-harming behaviors frequently overlap,^{16,34,35} and that intersection may explain ATHENA’s extended benefits. In addition, experimental participants had reduced intentions for future disordered eating habits and body-shaping drug use. Studies have indicated that young female athletes may defer, rather than permanently avoid unhealthy habits,³⁶ and favorably altered beliefs and skills may help protect them from future health-harming behaviors.

The ATHENA student athletes improved their self-reported nutrition habits. Cross-sectional studies document that adolescent females’ diets are far from optimal.³⁷ The curriculum focused on understanding nutrients’ roles in sport performance; classifying common foods as

mainly carbohydrate, protein, or fat; eating enough protein and calcium; and choosing appropriate preworkout and postworkout snacks. To avoid the unintended adverse effects that can accompany disordered eating prevention,¹⁰ we did not include calorie counting in the curriculum.

The ATHENA program promoted healthy alternatives to harmful actions. In a review of drug prevention programs, alternatives were the component with the largest effect size and most robust positive outcomes.³⁸ Unlike alternatives such as attending an Outward Bound experience, which may be infeasible,³⁸ ATHENA's nutrition and exercise content was applicable to all students and addressed adolescent athletes' immediate performance goals. Although not explicitly emphasized, the sport nutrition teaching also advanced components of the chronologically distant, typical school health education objectives.³⁹

Young female athletes' use of muscle-building agents, especially anabolic steroids, is of increasing concern.⁴⁰ Adolescent females predisposed toward anabolic steroid use share characteristics with those at higher risk for unhealthy eating habits,⁴⁰ suggesting that a prevention program for the latter also may deter anabolic steroid use. We found a low prevalence of anabolic steroid use, less than that in our prior study⁴¹ and that reported by others.⁴⁰ Perhaps, our current investigation's confidential (but not anonymous) questionnaire influenced athletes to underreport their anabolic steroid use. Interestingly, anabolic steroid use has been found more often among younger female adolescents,⁴⁰ and our findings also could reflect our subjects being older, high school-aged teenagers.

Gender-specific risk and protective factors were emphasized in the ATHENA curriculum. Among young females, depression is related to disordered eating habits and drug use.²⁷ Although regular exercise itself may protect from depression, among adolescents that effect seems to occur only among males.⁴² The ATHENA intervention's cognitive restructuring skill-building activities, used successfully in longer programs focusing exclusively on those tasks,²⁸ were incorporated easily and paralleled the behavioral goals and training activities typifying sport team practices.

The media depiction of idealized extremely thin, unhealthy female physiques may encourage harmful weight loss practices.^{5,43,44} Other health promotion programs have targeted the media.⁴⁵⁻⁴⁷ However, those are designed for younger teenagers, none are school-based, and their favorable outcomes have not been confirmed with prospective randomized trials. Among other eating disorder prevention programs studied,^{9,10} even the most recent attempts have failed to influence behaviors, despite favorable changes in knowledge and attitudes.⁴⁸

We recognize that our findings have limitations. As with any program, determining durability of change is important, and our results are relatively short-term. In addition, we found rates of substance use and unhealthy eating habits lower than those identified by national surveys.^{2,24} Our data are based on self-report, which can be biased by situational and cognitive factors,⁴⁹ and this discrepancy may indicate underreporting by or nonparticipation of those

What This Study Adds

Disordered eating habits and body-shaping drug use are prevalent health-harming behaviors among young females, especially the 50% participating in high school athletics. Previous universal disordered eating and drug use prevention programs have changed students' knowledge, but the influence on unhealthy behaviors has been limited. The ATHENA curriculum effectively altered targeted student abilities and reduced body-shaping drug use, while promoting healthy eating habits. As shown for male high school athletes,¹⁴ sport teams are an untapped resource for positively altering young females' beliefs and actions.

with health-harming practices. However, when assured of confidentiality, biochemical measures generally confirm self-reports,⁵⁰ and if underreporting was present, it would be expected to reduce positive program outcomes, making the ATHENA results more remarkable.

In addition, ethnic minorities were a low percentage of our study participants. This reflects both local demographics and the relatively lower participation of female minority students in school sports.⁵¹ Although recent evidence indicates risks for disordered eating are similar among ethnic groups,^{52,53} our findings may not be representative of minority student athletes. Finally, the ATHENA program did not influence use of alcohol and marijuana, the substances most used by adolescents.^{2,24} These were a minor component of the ATHENA curriculum. Longer follow-up, further emphasis on their athletic-harming effects, and reinforcement of the program's protective skills and attitudes may extend benefits to these agents.

Sport teams can be effective vehicles to promote healthy lifestyles and to deter drug use and other harmful behaviors. The format uses influential instructors and existing, single-sex, nondeviant bonded peer groups to deliver immediately relevant content. Effects may be enhanced by continuity of coaching staff, role modeling by older athletes, and reinforcement during the many hours of team activities. Reviews of sports' adverse consequences⁵⁴ suggest athletics has moved away from its original health-enhancing goals. Incorporating peer-led drug use prevention and health promotion curricula into these settings may help rekindle and strengthen sports' health-enhancing mission.

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