

Definition and Outcome of a Curriculum to Prevent Disordered Eating and Body-Shaping Drug Use

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ABSTRACT: Almost one half of male and female students participate in high school-sponsored athletics, and high school also is a time when classroom health promotion curricula are less effective. The Athletes Training and Learning to Avoid Steroids is a sport team-centered drug-use prevention program for male high school athletes, which has been shown to reduce alcohol and illicit drug use. Just as anabolic steroid use is associated with male athletes, female sport participants may be at a greater risk for disordered eating and body-shaping drug use. Extending sport team-centered programs to young women athletes required defining and ranking factors related to developing those harmful behaviors. Survey results from a cross-sectional cohort of female middle and high school student athletes were used to identify and prioritize potential curriculum components, including mood and self-esteem, norms of behavior, perceptions of healthy body weight, effects of media depictions of women, and societal pressures to be thin. The derived sport team-centered program was prospectively assessed among a second group of female student athletes from 18 high schools, randomized to receive the intervention or the usual care control condition. The Athletes Targeting Healthy Exercise and Nutrition Alternatives (ATHENA) intervention is a scripted, coach-facilitated, peer-led 8-session program, which was incorporated into a team's usual training activities. The ATHENA program significantly altered the targeted risk factors and reduced ongoing and new use of diet pills and body-shaping substances (amphetamines, anabolic steroids, and sport supplements). These findings illustrate the utility of a structured process to define curriculum content, and the program's positive results also confirm the sport team's potential as a vehicle to effectively deter health-harming behaviors. (J Sch Health. 2006;76(2):67-73)

High school is a critical time for establishing healthy lifestyles. Teens who avoid harmful habits have a much-reduced risk of subsequently developing those problems.¹ Unfortunately, as adolescents age, adult authority lessens and gender differences emerge, coincident with greater influences from their peers.² At the same time, traditional high school classroom-based curricula to prevent health-harming behaviors, such as drug use³ and disordered eating habits,^{4,5} are limited in their positive effects.

Athletic teams have potential as natural settings for delivering gender-specific health promotion curricula. Since the early 1990s, sport team-based programs have been studied as means to deter drug use and promote healthy behaviors.⁶ The Athletes Training and Learning to Avoid Steroids (ATLAS) program is a student-led drug-use prevention curriculum for male high school athletes. When prospectively assessed, the ATLAS intervention significantly reduced use of alcohol and illicit drugs (marijuana, amphetamines, and narcotics), prevented new anabolic steroid use, and improved nutrition behaviors.^{7,8}

Following the ATLAS program's proven efficacy, a logical extension was to use the format with young female sport participants. However, because many drug-use risk and protective factors differ for young women and men,⁹

ATLAS could not be transferred directly to young women's sport teams. In addition, ATLAS focuses on deterring androgenic anabolic steroid use and presents healthy alternative means to increase muscle strength and size. Although young women's anabolic steroid use is of increasing concern,¹⁰ female sport participants have stronger links with disordered eating and body-shaping drug use.^{11,12} Unlike their male counterparts, young women athletes often want to be leaner and lighter,¹³ rather than bigger and stronger.

An effective curriculum to deter disordered eating and body-shaping drug use would be based on the risk factors for those problems. That hypothesis was tested by using findings from a cross section of female student athletes to identify and prioritize elements for a sport team-based program to deter disordered eating and body-shaping drug use. That empiric process was validated by determining the derived curriculum's effects on its targeted mediators and its primary behavioral outcomes.

METHODS

Subjects

Two groups of subjects participated in this project. Initially, anonymous questionnaires were administered to female students from 6 middle and 7 high schools in and around Portland, Ore. Schools were selected to provide a spectrum of sizes and urban to rural locations. During a 1-month interval, surveys were distributed to all students and collected in health or physical education classes by research assistants; school personnel were not involved with survey administration and collection. A total of 2090 young females from the 13 schools received and completed all or parts of the survey, and 1178 (56%) reported that they participated in school-sponsored sports, including dance and drill teams. We used the findings from this latter cross-sectional convenience sample of female self-reported athletes to define the curriculum.

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Different schools and a second group of subjects were used for the prospective assessment of the derived curriculum. For this aspect, 18 high schools were recruited and underwent a balanced randomization to receive the curriculum or become a standard practices control condition. All women's sport teams, including dance and cheerleading, at intervention schools were offered participation, and those teams electing involvement were matched at the corresponding control school. A total of 20 experimental and 20 control teams participated, and all completed the study. School personnel were not involved in athlete recruitment, and students and their parents or guardians provided written informed consent, which was returned to research staff. Study information highlighted that neither team membership nor playing time would be influenced by study participation. All study methods were approved by the Oregon Health & Science University Institutional Review Board and read and agreed to by the administration at each school.

Survey Instruments

For the initial cross-sectional anonymous survey, students completed a 118-item questionnaire assessing modifiable risk and protective factors for disordered eating and body-shaping drug use. The assessment included items from our previous studies¹⁴ and items from validated instruments measuring disordered eating,^{15,16} depression,¹⁷ perception of body size,¹⁸ self-esteem,¹⁹ and the impact of the media and society.²⁰ Most items used a 7-point Likert agreement scale, with anchors ranging from "strongly agree" to "strongly disagree." Current drug use and other unhealthy practices were indexed using items from standard national surveys.²¹

A different confidential questionnaire was administered to the female high school athletes participating in the randomized prospective program assessment. It was similar in design, and in addition to items from the original survey,¹⁴⁻¹⁹ the questionnaire was tailored to the study goals and the potential mediating variables addressed in the curriculum. The final survey used with experimental and control participants contained 177 questions and could be completed in approximately 30 minutes. Construct scores were calculated using the mean of individual items, and construct reliability was acceptable (standardized alpha reliability greater than .78).

Curriculum Definition

For the cross-sectional data, although all subjects completed the questionnaire, each student did not answer every question. For some surveys, certain items were left blank, and those omissions may not have occurred at random. Those skewed missing responses could lead to invalid inferences. Accordingly, we corrected missing values using NORM software, which imputes or fills in absent responses using multivariate probability models.²² Following those corrections, we excluded questions that related to nonmodifiable demographic information, such as age, items relating to defining sport participants, and questions that were measures of disordered eating behaviors and drug use. We used exploratory factor analysis to reduce the original 60 remaining survey items to a manageable number of constructs. We applied the conventional criterion of retain-

ing factors with eigenvalues greater than 1.0. The factor arrays and loadings were inspected, and items with the lowest loadings were removed sequentially by backward stepwise elimination until those remaining were assigned to only 1 factor and had loadings of more than 0.3. Eleven robust dimensions were defined by the factor analysis. The questionnaire items comprising these factors, their factor loadings, and their reliability in defining the factor are listed in Table 1. The items that failed to load on these factors or define additional factors related to students' knowledge of drug and disordered eating effects and feelings of anxiety.

Because our goal was preventing harmful behaviors, we wanted to identify those at greatest risk for disordered eating and included survey items about intentions toward those future unhealthy actions, such as "I would use diet pills in the future, if I gained more weight." Individuals with any level of agreement with those future statements were classified as higher intent or at greater risk for those future behaviors. Using that criterion, 48.5% of the initial cross-sectional group was at higher risk. Once the cross-sectional subjects were dichotomized as higher and lower risk, we examined each factor's contribution to correctly making that distinction using discriminant function analysis. Each of the 11 factors contributed, and together the scores correctly identified whether an individual was at higher or lower risk for 73.1% of the total sample, indicating that those factors were related to future development of disordered eating (Wilks' Lambda .731, $p < .001$). Although each related to risk, their contributions varied, and the 11 factors' relative contributions to correctly identifying a young woman's risk status are shown by their standardized discriminant function coefficients (Table 1). As a result of those findings, all the modifiable factors became curriculum elements for our team-based program to prevent disordered eating and body-shaping drug use.

Curriculum Content and Process

Those factors with the greatest contribution to the risk for disordered eating and body-shaping drug use were mood and self-esteem, norms of behavior, health/normal body weight, media depictions of women, and societal pressures to be thin. Of note was the major influence of mood and self-esteem, which led to their prominent role in the curriculum. To address mood, the program incorporated aspects of a teen depression prevention program with established efficacy.²³ That curriculum aspect was designed to build skills for controlling one's mood using sequenced cognitive restructuring tasks, which were adapted for the sport team setting. The curriculum also countered media influences by directing student athletes to discuss, deconstruct, and remake magazine advertisements for cigarettes, alcohol, and nutritional supplements. Although media awareness and recognition of gender-specific harmful messages have been included in previous programs,²⁴ our sport team setting and focus on athletic performance were unique. Participants further established healthy norms by hearing stated expectations for behaviors, practicing refusal skills, and creating and presenting to teammates public service campaigns to discourage drug use and disordered eating practices.

The curriculum provided information about sports nutrition and strength training. Previous programs to deter

Table 1
Derived Factors

Factor and Its Survey Items	Item's Factor Loadings	Cronbach's Alpha	Discriminant Function Coefficient
Mood and self-esteem		.85	.65
I am pretty happy with myself these days	.86		
I feel that many things about me are good	.83		
I am able to do things as well as most people	.78		
All in all, I feel that I am a failure	.78		
In the past week, I felt depressed	.63		
In the past week, I had crying spells	.56		
I wish I had more respect for myself	.54		
Friends with disordered eating		.79	.39
Of 5 closest friends, number using laxative	.85		
Of 5 closest friends, number making themselves vomit	.75		
Of 5 closest friends, number using diet pills	.74		
Actual body size		.71	-.37
I believe my weight is under, normal, overweight	.84		
People think I am too thin	.83		
Picture that you think you look like	.78		
Societal gender and weight issues		.42	.32
Life is a lot easier for boys than girls	.76		
Thin women are more physically attractive to men	.59		
My friends are trying to lose weight	.47		
Friends use drugs		.91	.32
Of 5 closest friends, number using cigarettes	.91		
Of 5 closest friends, number using alcohol	.87		
Of 5 closest friends, number using marijuana	.86		
Disordered eating norms		.87	-.29
Out of 100 female students at your school, number with disordered eating	.88		
Out of 100 female seniors at your school, number with disordered eating	.87		
Out of 100 female athletes at your school, number with disordered eating	.86		
Family		.82	.28
There is a feeling of togetherness in my family	.85		
My family members help and support each other	.82		
There is very little group spirit in my family	.78		
Media/magazines		.57	.28
Products in magazines do as they say	.81		
Models are fit and healthy	.70		
Protein powder is cheaper than food	.61		
Friends care about my disordered eating behaviors		.94	.24
Closest friends would care if I used diuretics	.93		
Closest friends would care if I vomited	.93		
Closest friends would care if I used anabolic steroids	.93		
Closest friends would care if I took diet pills	.85		
Win at all costs		.75	.23
I will do whatever it takes to win	.89		
When on a team, I want to win no matter what it takes	.88		
Playing team sports is all about winning	.61		
Pictorial body image		.71	.21
Picture you think looks best	.84		
Picture you most want to look like	.82		
Picture you think boys think looks best	.68		
Picture you think looks healthiest	.61		

disordered eating have not reduced those behaviors or paradoxically have increased that potential.^{4,5} The latter observation and evidence that a heightened attention to calories and body weight may trigger disordered eating were reasons that the program does not address specific caloric or body weight objectives. Strength training has been reported to increase women's self-esteem.²⁵ And the program's female-only, peer-led format may have further increased participants' self-esteem, assertiveness, and social skills.^{26,27}

The derived curriculum was entitled Athletes Targeting Healthy Exercise & Nutrition Alternatives (ATHENA). Similar to the ATLAS program for male student athletes, ATHENA is delivered during a team's sport season. Its eight, 45-minute sessions were scheduled at the coaches' discretion and integrated into the usual practice activities. For ATHENA sessions, the athletes met as a team, with students partitioned into stable learning groups of approximately 6 members, with 1 student per group functioning as the assigned squad (peer) leader. Squad leaders and coaches used manuals that contained scripted lesson plans, and other teammates used matching workbooks. All received a pocket-sized nutrition and exercise guide. The scripted format assisted fidelity, resulted in coaches and squad leaders needing minimal training, and greatly reduced preparation time prior to each session.

Curriculum Assessment

For the 20 experimental and 20 control teams participating in the prospective assessment of the derived curriculum, athletes completed questionnaires at baseline (immediately before 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. For experimental teams, research assistants observed the sessions and used lesson plan checklists to monitor implementation and fidelity. An analysis of covariance-based approach within the Generalized Estimating Equations random effects model framework was

used to determine baseline equivalence and intervention effects. Because the intervention was designed to prevent harmful behaviors, onset of disordered eating and body-shaping drug use was an important outcome, and chi-square analyses were used to compare this aspect of the control and experimental conditions. Where appropriate, analyses were adjusted for baseline differences and significance levels amended for multiple comparisons using a modified Bonferroni procedure.

RESULTS

Subject Characteristics

Table 2 lists the characteristics of the initial, convenience cross-sectional sample and the second group of female high school athletes in the prospective intervention trial. For the second group, no significant differences were present in the baseline characteristics of the control and intervention student athletes. Preseason to postseason attrition also was similar for experimental and control participants and comparable to the retention observed with male high school athletes.⁹

Curriculum Results

All enrolled teams assigned to the experimental and control conditions were retained in the study. All intervention coaches found it feasible to implement the curriculum, as evidenced by all experimental teams incorporating the 8 ATHENA sessions, with high fidelity to the curriculum, covering $80.8 \pm 0.2\%$ (mean \pm SD) of content items per session.

Following ATHENA, experimental athletes reported significantly less ongoing diet pill use ($p < .05$) (Table 3). Importantly for this prevention program, new use of diet pills ($p < .05$, relative risk for controls 2.80 with confidence interval [CI] 1.02-7.68) and athletic-enhancing substances (amphetamines, anabolic steroids, and sport supplements) ($p < .05$, relative risk for controls 1.55 with

Table 2
Baseline Characteristics for the 2 Student Groups

	Initial Cross-Sectional Cohort	Student Athletes in Prospective Efficacy Trial	
		Intervention	Control
Number of schools	6 middle and 7 high schools	9 high schools	9 high schools
Number of students preseason	1179	457	471
Number of students postseason (% retained)	N/A	337 (74)	331 (70)
Mean age in years (SD)	14.6 (1.4)	15.4 (1.2)	15.3 (1.2)
Parent with college degree (%)	71.8	66	61
Percent white	83.6	93.6	91.4
Self-reported prior alcohol use (%)	59	52	47
Self-reported prior tobacco use (%)	35	27	33
Self-reported prior marijuana use (%)	22	19	19
Self-reported prior diet pill use (%)	17	14	11
Self-reported prior fasting to lose weight (%)	53	28	26

CI 1.03-2.31) were both significantly less for girls in the experimental program. Parallel significant reductions in experimental athletes' intentions toward disordered eating behaviors and body-shaping drug (diet pills and tobacco) use ($p < .05$ for each) suggest that the intervention may result in fewer future harmful behaviors. The ATHENA athletes had concurrent positive changes in strength training self-efficacy ($p < .005$) and healthy eating behaviors ($p < .001$). The components addressed in the curriculum

were significantly altered in the appropriate direction (controlling one's mood [$p < .005$], refusal skills [$p = .05$], belief in the media [$p < .005$], and perceptions of closest friends' body-shaping drug use [$p < .001$]).

DISCUSSION

The ATLAS program for adolescent male high school athletes demonstrated that sport teams could be effective

Table 3
Outcomes for Control and Experimental Participants

Variable	(Mean [SD]) [†] Control		(Mean [SD]) [†] Experimental	
	Preintervention	Postintervention	Preintervention	Postintervention
Disordered eating behaviors and body-shaping drug use				
Diet pills use in the past 3 months [‡]	0.05 (0.21)	0.07 (0.26)	0.06 (0.23)	0.03 (0.18)*
Nutrition and exercise behaviors and abilities				
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 past 2 months	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-rated skill in strength training	5.48 (1.30)	5.61 (1.41)	5.15 (1.52)	5.92 (1.23)***
Intentions toward future disordered eating behaviors and drug use				
Intent toward future diet pill use	1.74 (1.45)	1.79 (1.49)	1.87 (1.66)	1.62 (1.35)*
Intent toward future vomiting to lose weight	1.66 (1.52)	1.76 (1.49)	1.62 (1.35)	1.57 (1.28)*
Intent toward future tobacco use	1.56 (1.28)	1.79 (1.58)	1.55 (1.32)	1.58 (1.34)*
Knowledge				
Knowledge of anabolic steroids	4.89 (1.26)	5.09 (1.24)	5.20 (1.20)	5.67 (1.20)****
Understanding that alcohol is a toxin that damages muscles	5.16 (1.63)	5.46 (1.51)	5.22 (1.50)	6.00 (1.51)****
Knowledge of disordered eating's effects	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)****
Knowledge of 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 past week	0.66 (0.85)	0.70 (0.90)	0.56 (0.77)	0.61 (0.78)
Self-esteem	5.86 (1.11)	5.86 (1.14)	5.90 (1.08)	5.99 (1.00)
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				
Pressure from teammates to lose weight	0.07 (0.26)	0.07 (0.26)	0.07 (0.26)	0.04 (0.20)
Closest friends are against me using drugs	6.04 (1.45)	6.00 (1.50)	6.05 (1.61)	6.21 (1.35)****
Closest friends use body-shaping drugs	2.12 (1.25)	2.19 (1.40)	2.22 (1.28)	2.14 (1.33)****
Percent 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)

* $p < .05$; ** $p < .01$; *** $p < .005$; **** $p < .001$.

[†] Unless indicated, scored using 7-item Likert scale from 1 = strongly disagree to 7 = strongly agree.

[‡] Scored using a continuum of times used with 0 = none, 1 = 1-2, 2 = 3-5, 3 = 6-9, 4 = 10-19, 5 = 20-39, 6 = 40+.

vehicles for health promotion and drug-use prevention.⁷ Using that setting with female student athletes required determining and prioritizing the risk factors that relate to future disordered eating and body-shaping drug use. The derived ATHENA program was designed to favorably influence those identified factors. Recently, we reported outcomes from a controlled prospective, randomized study of the ATHENA curriculum.¹² The program significantly affected the targeted risks and significantly reduced new and ongoing disordered eating and body-shaping drug use. With its outcomes now established, presenting the background and development of the ATHENA intervention closes the loop relating defined curriculum objectives to program outcomes.

Much of the previous research on eating disorders has been conducted with individuals who already have those conditions. For them, associations with disordered eating may be a consequence of, rather than a risk factor leading to, the problem. Working with a general cross section of students allowed using their self-reported intent or future risk of disordered eating and body-shaping drug use to identify a higher risk subgroup. The potential risk and protective factors derived from the same cohort of young women were examined for their contribution to whether a participant was at higher or lower risk. Although intent has been used as an index of future behavior in other settings,²⁸ it had not been used previously for curriculum design. The factors that we identified are those typically recognized as relating to disordered eating.⁴ However, the major influence of mood and self-esteem was unexpected. The curriculum's resultant repeated cognitive restructuring tasks aligned well with practicing sports skills and achieving "team spirit" and a "winning attitude."

The sport team has several features that support its use for health promotion. Team members are a bonded peer group, where healthy behaviors and attitudes can be modeled and reinforced. The program's peer-facilitated format parallels player-led training activities that are common in athletics. Meta-analysis of drug-prevention programs concluded that peer-led interventions can be superior to teacher-directed programs,²⁹ and ATHENA's scripted format allowed implementation with minimal training. In addition, sport teams usually are single sex, and adolescents report greater comfort when discussing personal issues in a same-sex setting.³⁰ The female-only format also avoids the greater focus on male students' needs documented across grades and content areas.²⁶

Coaches have been referred to as the missing link in health promotion, as their contact with student athletes is estimated at 150 to 200 hours during a sports season.³¹ That association often is repeated annually during an athlete's school sports career. In contrast to classroom teachers who may reinvent a proven drug-use program and, in doing so, reduce its effectiveness,³² coaches' many other sport-season demands, limited experience in teaching this content, and familiarity with explicit playbooks may have contributed to the observed high fidelity to the scripted curriculum.

We recognize that our findings have limitations. The results are relatively short term and based on self-reported behaviors. However, when assured of confidentiality, biochemical measures generally confirm students' self-reported rates of drug use and other harmful behaviors.³³ And if underreporting was present, it would be expected to

attenuate, rather than augment, positive program outcomes. In addition, although the program's outcomes appear to validate our method of defining learner needs,³⁴ that relationship is not the proof of causality. Other individual and environmental influences, which may not be amenable to alternation by a prevention curriculum, such as family issues, menarche age, and body type, may have important roles in the development of harmful behaviors. Approximately one half of young women participate in school-sponsored sports,³⁵ and in general, their rates of harmful behaviors and drug use are similar to their nonparticipant classmates.³⁶ However, because of its format, females not involved in school athletics could not participate in ATHENA. Also, our findings may not be generalizable to other sites in the United States. In particular, minority representation, although reflecting the local demographics, was limited in our study population, and our results may not extend to female minority athletes.

During the past 2 decades, young women's sport participation has increased,³⁵ and while athletics may have many benefits, today's school sports neither prevent drug use and other harmful behaviors nor ensure lifelong physical activity.³⁷ Society's current focus on winning may have diminished sports' fun and health-enhancing potential. The ATLAS and ATHENA programs' positive findings support strengthening sports' health-enhancing mission by incorporating harm reduction and health promotion curriculum into the athletic team setting. ■

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