Giving New Meaning to the Term "Taking One for the Team": Influences on the Use/Non-Use of Dietary Supplements among Adolescent Athletes

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Abstract: *The purpose of this article will be to discuss the results of the theory-based Survey to Predict Adolescent Athletes Dietary Supplement Use (r=.9479) to assess intentions, attitudes, and beliefs of 1737 adolescent athletes regarding dietary supplements. A critical review of the literature reveals that most of these products offer no nutritional or ergogenic benefits for normal young athletes. However, data show that athletes take dietary supplements above the national average, and parents, health professionals, coaches, athletic trainers, and the media are consistently cited as influences on use/non-use. Social scientists have called for theory-based research to look beyond what is being taken to the factors that influence use/non-use. Results are presented here with implications for school and athletic personnel who work directly with this population.*

A 13 year old JV baseball player, just the hint of a mustache on his upper lip, walks up to his math teacher/baseball coach and holds out a article about professional baseball player and homerun king Mark McGwire. The article features McGwire's use of Androstenedione, a dietary supplement praised by McGwire as helping him during his record-breaking season. The baseball player looks up from under his cap and asks "Hey coach, does this stuff work?" What the coach says next may hold significant personal and performance implications for this young athlete and may even have a direct result on their health status.

Dietary supplement use is a well-documented practice among adult and adolescent athletes. McGwire's mention of Androstendione elevated sales for that product that have not abated to this day. Makers of Androstenedione or "Andro" claim that it increases the hormone testosterone by 300 percent. Other dietary supplements such as Creatine and Chromium Picolinate have become household words in the athletic arena. As a whole, athletes continue to use dietary supplements at a rate higher than the general population. In an exhaustive review of the literature, Sobal and Marquart [1] examined existing studies of the prevalence and patterns of dietary supplement use among athletes. A meta-analysis of 51 studies provided data on 10,274 male and female athletes, with a dietary supple-

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ment use prevalence rate of 46%. General population studies show a use rate of 40%.[2] The influence of media coverage of professional and college athletes' use of dietary supplements on use in the general population have yet to be explored. It could be surmised that an influence may exist. And that, as general media coverage increases with the proliferation of materials available in the print, television and electronic media, use of dietary supplements in the general population and among adolescent athletes will also increase.

Among athletes, adolescents are a key target market of the dietary supplement industry.[3-6] Claims of increased energy, improved performance, and gains in muscular strength appeal to this population.[7,8] However, time and again the efficacy of these claims has been shown to be unsupported under scientific scrutiny.[9] Such claims may be especially influential to adolescents striving to improve their performance. As such, these athletes may be more influenced by performance than the threat of health complications sometime later in life. Product manufacturers are well aware of how to conduct market research to effectively determine what factors would be most influential in encouraging adolescents to use dietary supplements. Unfortunately, the health message can get lost in the barrage of media claims and information.

There has been a great deal of concern regarding risks of dietary supplement use among adolescent athletes. According to the U.S. Food and Drug Administration, the vast majority of dietary supplement products have not been subject to stringent testing standards, and deaths have resulted from hypertoxicity, allergic reaction, abuse,[10-12] and disability including hospitalization.[9,13-18] Although there has been renewed interest, few published studies exist that report on dietary supplement use among adolescent athletes. Of these studies, prevalence rates range from a high of 56%,[19,20] to a low of 23% reported from a small study done on 13 elite gymnasts.[21] Data show that adolescent athletes use supplements higher than the national average for all adolescents; however, very little is known about the initiation process of these substances, influences, or attitudes and beliefs towards supplements.

A number of authors [22-26] address a concern that no studies specifically examine adolescent athletes' influences for using/not using dietary supplements. The most widely published researchers in this area, Sobal and Marquart,[1] in their review of the literature, state that application of social science theories to dietary supplement use among athletes may provide insights that are not available in the current literature.

Therefore, the purpose of this study is to provide preliminary results of the theory-based Survey to Predict Adolescent Athletes Dietary Supplement Use (SPADDSU) [27,28] to assess influences of behavioral intentions, attitudes, and beliefs of adolescent athletes regarding dietary supplements.

Theoretical Framework and Instrumentation

The SPADDSU is based on the Theory of Reasoned Action (TRA).[28] The ultimate goal of the TRA is to predict and understand human behavior. In the case of this investigation, the behavior under study is use of dietary supplements, as demonstrated by adolescent athletes. For a behavior such as adolescent athletes' use/non-use of dietary supplements to be adequately explained by the TRA, two basic assumptions must be met. First, it should be assumed that humans are rational beings who possess the ability to use information available to them to arrive at a behavioral decision in a reasonable manner. The TRA also assumes that the behavior of interest is under the volitional control of the individual. In other words, the individual has the ability to easily perform or to refrain from performing the behavior if they are so inclined. The TRA has three guiding tenets: 1) attitude towards the behavior - whether something seems good or bad to the individual, 2) Subjective norms - the perception of what others in their life would think about the individual performing the behavior an their motivation to comply with that perception, and 3) Behavioral intention – the decision made to either perform or not perform the behavior based on the weight of the first two tenets (Figure 1). The SPADDSU was developed

and revised over a two-year time span with an initial pilot test study done on 400 athletes resulting in a chronbach's alpha-reliability of .9479.[27]

SURVEY METHODS

Subjects

The study sample consisted of 1737 students, ages 14 to 19 years, that were enrolled in grades nine through twelve in nine public middle and high schools in Georgia. In each class surveyed, all students were eligible to participate in the study.

Informed Consent

The lead author of this study was granted approval for administration of the Survey to Predict Adolescent Athletes' Dietary Supplement Use (SPAADSU), from the Institutional Review Board at the University where they are employed. Prior to the administration of the survey, a consent form was sent home for parents/guardians and students to

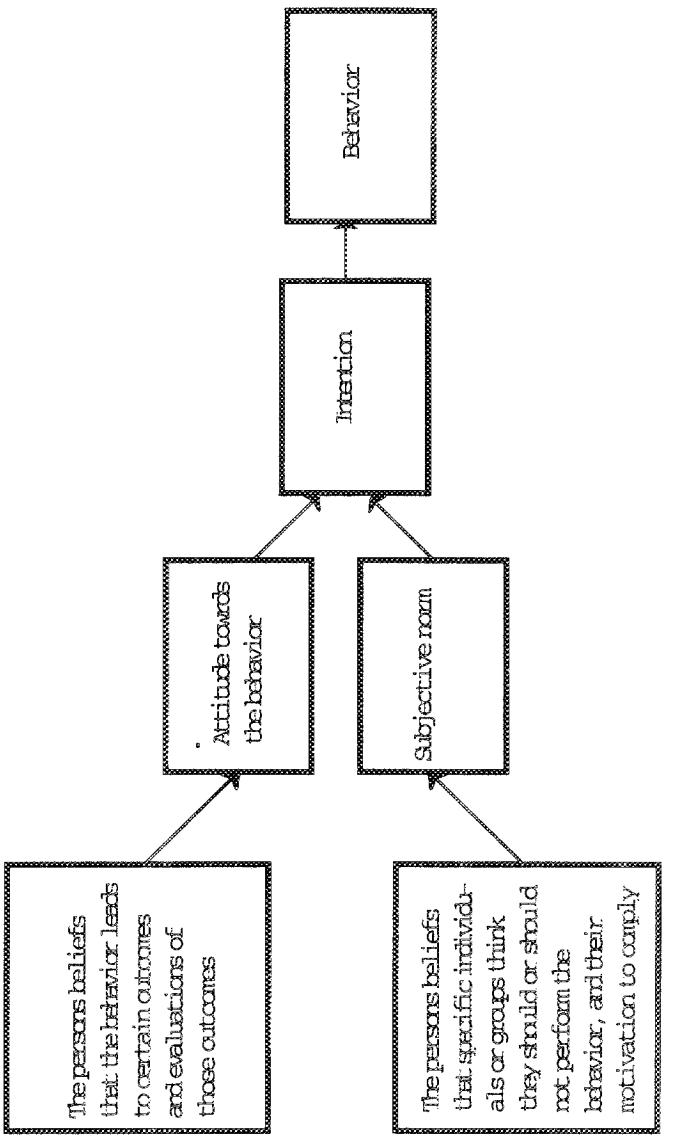

Figure 1. Factors determining an individuals behavior according to the Theory of Reasoned Action.

sign and return to the teacher who would administer the survey.

Sampling

The sample was one of convenience and selected teachers were personally asked to administer the survey to their students. Teachers did obtain permission from their principals before administering the SPAADSU. There were nine schools selected for sampling, which were located in Cherokee and Cobb County, Georgia, approximately 40 miles Northwest of Atlanta. Cherokee and Cobb Counties have populations of over 100,000 and 500,000 residents, and median household incomes of $41,052 and $43,297 respectively.

Data Collection

Data collection took place during the Winter and Spring of 1999. Parental consent forms were sent to parents/guardians one week prior to the scheduled data collection date. The teachers who would administer the survey on-site at the participating schools distributed consent forms. Each teacher was instructed how to administer the survey based on guidelines developed for this study.

Students who returned completed consent forms before the survey date were allowed to complete the questionnaire. Those students who did not return a consent form or who chose not to participate in the study remained in the classroom while the other students completed the survey. Students recorded their responses directly on the questionnaire and upon completion turned them into the teacher. Confidentiality was protected by not allowing students' names on the questionnaires.

SURVEY RESULTS

Characteristics of participants

Distribution of the 1737 athletes by grade and gender were as follows: 9th grade students comprised 23.8% of the sample, 10th grade, 30.7, 11th grade, 26.4%, and 12th grade, 19.1%. Fifty-eight percent of the sample were male and 42% were female. Ages of the sample ranged from 14 to 19 years old. The ethnic make-up of the sample was 82.4% white, 8.4% African-American, 3.0% Hispanic-American, 1.8% Asian-American, 1.4% Native American, and 2.9% other.

Athletic Participation

The following are the interscholastic sports or athletic event signified by the sample as the main event they participated in for their school:

- Baseball Basketball
- Softball
- Diving
- Football
- Golf
- Gymnastics
- Soccer
- Swimming
- Tennis
- Track
- Volleyball
- Wrestling

Many athletes participated in two or more sports or athletic events for their school.

Attitudes towards Dietary Supplements

The questions on the SPADDSU were written to specifically to correspond with the tenets of the TRA. The tenet Attitude towards the Behavior corresponds to a person's positive or negative evaluation of personal performance of the behavior; in other words, a gut feeling about whether of not performance of the behavior will be a good or bad thing. In response to the statement "Most athletes my age need dietary supplements to improve sports performance", 17.7% agreed/strongly agreed. To the statement "Taking dietary supplements would help all athletes do better in sports" 27.4% responded they agreed/strongly agreed, and 32.7% agreed/strongly agreed that "Taking dietary supplements is a safe way for athletes to improve sports performance". In the same vein, when asked if "Taking dietary supplements is safe because they are tested by scientists",

25.1% (n=432) responded they agreed or strongly agreed, while 36% did not know or had no opinion. Forty-one percent agreed or strongly agreed with the statement "Taking dietary supplements give you more energy". Nearly one-third (32.7%) agreed or strongly agreed with the statement that "Taking dietary supplements is a safe way to improve strength" and another nearly half (44.8%) agreed or strongly agreed with the statement that "Taking dietary supplements is a good way to build muscle." More than half of the athletes disagreed or strongly disagreed with the statements "Dietary supplements are safe because pro athletes take them", 63%, and "Dietary supplements work because pro athletes take them", 62.9%.

Subjective Norms

According to the TRA, Subjective norm is described as an interaction between a person's perception of how significant others in his/her social environment feel about the individuals performance of the behavior and the persons motivation to comply with these significant others. While almost half at 41.8% voiced no opinion to the statement "My coach would support my using dietary supplements to improve sports performance" 32.7% agreed or strongly agreed, while 25.4% disagreed or strongly disagreed. However, when asked if their coach would support their using dietary supplements for general health reasons, 41.8% agreed or strongly agreed, while 19.1% disagreed or strongly disagreed. The same statements were asked about their parents, with 46.5% agreeing or strongly agreeing that taking dietary supplements would be supported for general health reasons, and 36% would be supported for taking dietary supplements to improve sports performance. While 44.4% agreed/strongly agreed with the statement that teammates would support their using dietary supplements for general health reasons, 45.9% said that teammates would support their using dietary supplements to improve sports performance. Only 25% agreed/strongly agreed that doctors would support their use of dietary supplements to improve sports performance, while nearly double that number (42.8%) felt that doctors would support dietary supplements use for general health reasons. Athletic trainers, it was felt, were more likely to support using dietary supplements for general health reasons (43.5%), than to improve sports performance (38.1%). An additional 3 questions were asked to gauge the relative influence of subjective norms. To the statement "I want to do what my parent or guardian wants me to do", 57.2% agreed/strongly agreed, while 52.8% responded the same for coaches, and 66.3% for doctors.

Behavioral Intentions

The third tenet of the TRA, Behavioral intention, holds that the most immediate determinate of a persons behavior is that persons *intention* to perform or not perform that specific behavior. Generally speaking, that person will adopt the behavior associated with their strongest intention. This intention is the direct result of the two previous tenets, Attitudes towards the behavior, and Subjective norms. Questions on the SPADDSU were written specifically to assess a direct intention to perform a behavior. To the statement "I would use dietary supplements to improve sports performance", 50.9% agreed/strongly agree. To the statement "I would use dietary supplements to improve general health", 56 % agreed/strongly agree. Almost half, 46.3%, responded that they agreed/strongly agreed to the statement "I would use dietary supplements if my coach gave them to me", another 30.2 % agreed/strongly agreed to the statement "I would use dietary settlements if my parent or guardian gave them to me", and 57.3% agreed/strongly agreed they'd use dietary supplements if an athletic trainer gave them to them. A full 79% responded they agreed/strongly agreed that they would ask the coach if dietary supplements are safe, and 78.5% also agreed /strongly agreed to the statement "I would ask my coach if dietary supplements work". To the statement "I would ask parents or guardian if dietary settlements are safe", 72.9 % agreed/strongly agreed. Slightly less, 66.2% responded they agreed/strongly agreed with the statement "I would ask parent or guardian it dietary supplements work". Sixty-seven percent of all athletes agreed/strongly agreed with the statement "I would use dietary supplements that I know work" and 76% of all athletes agreed or strongly agree

with a statement "I would use dietary supplements that I know were tested and safe". Finally, 42.1% agreed/strongly agreed with the statement "I would used dietary supplements if I could afford to", while 55.1% agreed/strongly agreed that they would use dietary supplements that their parents or guardian bought them for them.

DISCUSSION

Descriptive survey results show a relationship to athlete's intention of use/non-use of dietary supplements and their attitudes towards the behavior and subjective norms. Coaches, parents, and physicians were all identified as having influence on the decision-making process.

The purpose of the study was a response to a call-to-action from social science researchers to assess intentions, attitudes and beliefs about adolescent athletes and dietary supplement use; to get below the surface of what adolescent athletes are taking and more importantly, to find out why. The descriptive results of this research serve as an initial step to shed some light on the factors that influence use/non-use in this population. Based on the Theory of Reasoned Action, whose ultimate goal is to predict and understand human behavior, the questions asked on the SPAADSU attempted to identify the weight of attitudes and subjective norms on the decision-making process. Results from the analysis showed that attitudes toward the use of dietary supplements reveal a gap in knowledge about dietary supplements particularly regarding need for, purported benefits, safety of, and whether or not they work. Although attitudes favoring use of dietary supplements were not indicated by the majority of respondents, a sufficient percent of the adolescent athletes surveyed voice a positive attitude toward supplement use for a variety of non-specific reasons. Among respondents, 17.7% felt that most athletes their age need dietary supplements to improve sports performance. According to the American Dietetic Association,[30] other than increased need for folate and calcium among females of childbearing years, normal adolescents need no nutritional or dietary supplementation if a proper diet is maintained. Twenty-seven percent of the athletes surveyed felt they would do better in sports, although there is very little documented evidence to support the ergogenic effect of dietary supplements.[8] Regarding whether or not dietary supplements are safe, 32% felt that dietary supplement use was a safe way to improve sports performance. Here the issue is larger in a contextual sense. Dietary supplements are not tested by any government regulatory agency. Safety standards for dietary supplements have been established but only in regards to labeling - as long as dietary supplement manufacturers make no claims on the label as to their products ability to cure or prevent disease or illness, it's caveat emptor. According to Dr. James Reilly, J.D., Visiting Professor of Law at the University of Cincinnati who specializes in Food and Drug Administration law, "Anybody can say virtually anything about these products without fear of reproach by the federal government. When it comes to dietary supplements today, it's the wild, wild west." [31]

While only 25.1% responded that dietary supplements are safe because they're tested by "scientists", more telling information is seen in the 38% who either did not know or had no opinion to this question. This may suggest a lack of credible knowledge sources for these athletes. Health educators, coaches and athletic trainers need to continue to discuss the lack of scientific data on the efficacy of dietary supplements. It's important to keep in mind that the commercial suppliers of dietary supplements continue to extol the performance enhancing aspects of these supplements without clear proof. Finally, most athletes put little credence in pro athletes use of dietary supplements, or the implication that just because a pro athlete takes them, then dietary supplements must work.

As important as attitudes in decision-making, the weight of subjective norms help identify individuals in a person's life whose influence may provide the motivation to comply with a behavior. It this study, physicians, parents, coaches, athletic trainers, and peers were identified as having varying degree's of influence on dietary supplement use. It therefore becomes crucial to involve all in intervention activities. It doesn't seem much of a stretch to assume that given

the contact with these athletes, coaches would bear the brunt of providing education in this area. This, even though most coaches are not required to have a nutrition background to have gainful employment as a coach at the junior/senior high school level. In fact, numerous studies [32-35] show coaches consistently score poorly on general nutrition questions, have different nutritional concerns for young athletes, and include popular sports magazines as resources for nutrition information. Physicians and athletic trainers generally would be better prepared professionally to address nutrition related questions, but score lower as influences than coaches and teammates on the SPAADSU on the belief that they would be less likely to support dietary supplement use for sports performance. Keep in mind support can be active or passive. Providing Creatine in the Training Room (active) and not commenting when we see Creatine in a student's gym bag (passive), both send a message about subjective norms.

The third and final tenet of the TRA identifies behavioral intentions as the most immediate determinant of a person intention to perform a behavior. A large number of the SPAADSU population indicate that they would use dietary supplements for various reasons, such as sports performance and general health reasons, and under certain conditions, such as a coach, parent, or athletic trainer giving them to them. Nearly 4 out of 5 of the respondents indicate they would use dietary supplements that they knew were tested and safe, and that they knew worked. Actual behavior may be influenced by income and access to dietary supplements. Yet, behavior intent remains a powerful indicator of potential use. Since, as stated previously, no federal regulatory agency tests or approves safety standards for these products, the notion that only products that "work" would be taken is completely erroneous.

CONCLUSION

This study was one of the first to use theory as a framework in an effort to determine underlying determinates of dietary supplement use among adolescent athletes. The dietary supplement industry is not regulated by any federal agency, and the potential exists for users to experience adverse reactions due to a lack of purity standards for ingredients. This is an area of concern for health and sport professionals, and past studies have traditionally only presented data on what products were being *taken*, and developing interventions based on particular products. However, this often entails a one size fits all approach; putting all team members in a room and expounding on current research, side-effects of use, etc. Based on SPAADSU results, it's appears there are numerous factors that determine use/non-use of dietary supplement products. Would it not be more efficacious to develop interventions based on why athletes may use/not use these products in the first place. First Creatine, then Androstendione, next year something else. There will ALWAYS be something new marketed for an athletes needs. Recently the FDA developed a dietary supplement strategy that will be implemented over the next ten years. Included in the plan are activities aimed at safety, labeling, boundaries, enforcement, and research. They are clearly serious about protecting the health of the US consumer; it is hoped with the data from this study that sport and school/health educators will also take this serious as well.

REFERENCES

1. Sobal, J, Marquart, LF. Vitamin/mineral supplement use among athletes: A review of the literature. *Int J Sports Nutr.* 1994;4;320-334.
2. U.S. Food and Drug Administration. *Dietary supplements task force: Final report.* Department of Health and Human Services. Public Health Service;1994.
3. Cowart, V. Dietary supplements: Alternatives to anabolic steroids? *Phys Sports Med.* 1992; 20;189-198.
4. Friedl, K, Moore, RJ, Marchitelli, LJ. Steroid replacers: Let the buyer beware. *Natl Strength Cond Assoc J.* 1992;14;14-19.
5. Lightsey, DM., Attaway, JR. Deceptive tactics used in marketing purported ergogenic aids. *Natl Strength Cond Assoc J.* 1992;14;26-31.
6. Pearl, JM. Severe reaction to "natural testosterones": How safe are the ergogenic aids? *Am J of Emer Med.* 1991;11;188-189.

7. Grunewald, K, Bailey, R. Commercially marketed supplements for bodybuilding athletes. *Sports Med.* 1993;15;90-103.
8. Philen, RM, Ortiz, DI, Auerbach, S, Falk, H. Survey of advertising for nutritional supplements in health and bodybuilding magazines. *J Am Med Assoc.* 1992; 268;1008-1011.
9. Barron, R, VanScoy, G. Natural products and the athlete: Facts and folklore. *Ann Pharmacother.* 1993;27;607-615.
10. Huxtable, RJ. The myth of beneficial nature: The risks of herbal preparations. *Ann Inter Med.* 1992;117;165-166.
11. Kamb, ML, Murphy, JJ, Jones, JL, Caston, JC, Nederlof, K, Horney, LF, Swygert, LA, Falk, H, Kilbourne, EM. Eosinophilia-myalgia syndrome in L-tryptophan exposed patients. *J Am Med Assoc.* 1992;267;77-82.
12. Swygert, LA, Maes, EF, Sewell, LE, Miller, L, Falk, R, Kilbourne, EM. Eosinophilia-myalgia syndrome: Results of national surveillance. *J Am Med Assoc.* 1990;24;1698-1703.
13. Abelson, R. Killer acids. *Forbes.* 1991;Sept;144-145.
14. Clark, HW, Sees, KL, Nathan, JA. Clinical and legal aspects of nonphysician prescription of vitamins, amino acids, and other nutritional supplements. *J Psychoactive Drugs.* 1988;20;355-374.
15. Herbert, V. L-tryptophan: A medico-legal case against over-the counter marketing of supplements of amino acids. *Nutr Today.* 1992;March/April;27-30.
16. Luby, S, Jones, J, Zalewski, A. GHB use in South Carolina. *Am J Public Health.* 1992;82;128.
17. Ropp, KL. No-win situation for athletes. *FDA Consumer.* December, 1992;8-12.
18. Slavin, JL, Lanners, G, Engstrom, MA. Amino acid supplements: Beneficial or risky? *Phys Sports Med.* 1988;16;221-224.
19. Douglas, PD, & Douglas, JG. Nutrition knowledge and practices of college athletes. *J Am Diet Assoc.* 1984;84;1198-1202.
20. Krumbach, CJ, Ellis, DR, & Driskell, JA. A report of vitamin and mineral supplement use among university athletes in a division 1 institution. *Int J Sport Nutr.* 1999;9;416-425.
21. Moffat, RJ. Dietary status of elite female high school gymnasts: Inadequacy of vitamin and mineral intake. *J Am Diet Assoc.* 1984;84;1361-1363.
22. Krowchuk, DP, Anglin, TM, Goodfellow, DB, Stancin, T, Williams, P, Zimet, GD. High school athletes and the use of ergonenic aids. *Sports Med.* 1989;143; 486-489.
23. Marquart, L, Sobal, J. Beliefs and information sources of high school athletes regarding muscle development. *Pediatr Exerc Sci.* 1993;5;377-382.
24. Muncie, HL, Sobal, J. The vitamin/mineral history. *J of Fam Prac.* 1987; 24;365-368.
25. Sobal, J, Marquart, LF. Vitamin/mineral supplement use among high school athletes. *Adolescence.* 1994;29;635-844.
26. Sobal, J, Muncie, HL. Vitamin/mineral supplement use among adolescents. *J of Nutr Educ.* 1988;20;314-318.
27. Smith, MA. Development of an Instrument to Assess Intentions, Attitudes, and Beliefs of Adolescent Athletes Regarding Dietary Supplements. Unpublished manuscript, University of Alabama. 1996.
28. Smith, MA. Development of a Theory-based Instrument Regarding Adolescent Athletes and Dietary Supplements. *Am J Health Studies.* 1999;15; 71-80.
29. Fishbein, M, Ajzen, I. *Belief, attitude, intention and behavior: An introduction to theory and research.* Reading, MA: Addison-Wesley. 1975.
30. American Dietetic Association. Positions of the American Dietetic Association: Enrichment and fortification of foods and dietary supplements. *J Am Diet Assoc.* 1994;94;661-663.
31. Reilly, J. Personal communication. October, 10, 1999.
32. Parr, RB, Porter, MA, Hodgeson, SC. Nutrition knowledge and practice of coaches, trainers, and athletes. *Phys Sports Med.* 1984;12;127-138.
33. Graves, KL, Farthing, MC, Smith, SA, & Turchi, JM. Nutrition training, attitudes, knowledge, recommendations, responsibility and resource utilization of high school coaches and trainers. *J Am Diet Assoc.* 1991;91;321-324.
34. Spear, BA, Lummis, BH, Jennings, DR, Reinold, JJ, Craig, CB, Feinstein, RA. *Nutrition knowledge, attitudes and practices among high school coaches in Alabama.* Unpublished manuscript, University of Alabama at Birmingham. 1994.
35. Sossin, K, Gizis, F, Marquart, LF, Sobal, J. Nutrition beliefs, attitudes, and resourse use of high school wrestling coaches. *Int J Sport Nutr.* 1997;7;219-228.