

DEVELOPMENT OF A THEORY-BASED INSTRUMENT REGARDING ADOLESCENT ATHLETES AND DIETARY SUPPLEMENTS

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Abstract: *Development of a Theory-based Instrument Regarding Adolescent Athletes and Dietary Supplements: Dietary supplement use is a well-documented practice among adult and adolescent athletes. Most recently the popular press was as interested in professional baseball player Mark McGwire's use of the dietary supplement Androstenedione as they were in his record-breaking homerun season. As a whole, athletes continue to use dietary supplements at a rate higher than the general population. Among athletes, adolescent's are a key target market of the dietary supplement industry. Claims of increased energy, improved performance, and gains in muscular strength appeal to this population. However, time and again the efficacy of these claims has been shown to be unsupported under scientific scrutiny. The purpose of this article will be to discuss the development of an instrument based on the Theory of Reasoned Action to assess intentions, attitudes, and beliefs of adolescent athletes regarding dietary supplements. A nine-stage model was used in the development of the instrument, titled the Survey to Predict Adolescent Athletes Dietary Supplement Use (SPAADSU). This model yielded a final form of the SPAADSU containing 36 items. Cronbach's alpha was .9409. It was concluded that the SPAADSU is a reliable instrument that can be used to assess behavioral intentions, attitudes, and beliefs of adolescent athletes regarding dietary supplements. It is felt that a valid and reliable instrument such as the SPAADSU will greatly benefit those groups of individuals who are responsible for the well-being of adolescent athletes; most specifically, but not limited to, coaches, athletic trainers, physicians, health educators, and parents/guardians. [Am J Health Studies 1999; 15(2): 71-80]*

With an increased emphasis on nutrition as a factor in disease prevention and health promotion, dietary supplement use among the United States population is growing (American Dietetic Association (ADA) Position Paper on Dietary Supplements, 1994). Surveys since 1970 have shown that dietary supplements are consumed daily or occasionally by 35-60% of the adult U.S. population and, of those users, 60 million take them daily (Food and Drug Administration (FDA), 1992). In addition, 1990 survey data imply that at least 40 percent of the U.S. population have taken a dietary supplement in the last 30 days, with

usage higher among women (FDA, 1992). In the U.S., dietary supplement use is prevalent among certain subgroups, most notably the elderly (Koplan, Annett, Layde, & Rubin, 1986; Stewart, McDonald, Levy, Schucker, & Henderson, 1985), women (Koplan et al., 1986; Stewart et al., 1985), and adult and adolescent athletes (Sobal & Marquart, 1994a). Medical evidence suggests only certain subgroups of people need dietary supplements, for example, increased iron needed for pregnant women, special formulas for infants and small children, folate for women of child bearing years, and calcium for adolescent girls and young women. Yet,

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many people self-prescribe dietary supplements for various reasons including concern about the adequacy of their diet, a desire to be healthier, or to treat or prevent an illness (ADA, 1994).

In recent years, the FDA has proposed stricter guidelines to ensure the safety and efficacy of these products. The FDA admits there are no guidelines established to test dietary supplements before they are placed on the market as these products are currently recognized as neither food nor drug (James Tanner, Assistant Director, Office of Special Nutritional's, FDA, Washington, D.C., personal communication). The lack of regulated testing standards has resulted in ingredients such as ecdysterone, an insect hormone with no known use in humans; levodopa, a prescription medication; and animal glandular material being found in dietary supplements (Philen, Ortiz, Auerbach, & Falk, 1992).

Dietary supplements are defined by the FDA as "Vitamins and minerals, amino acid products, and all other types of dietary supplement products, including nonessential chemical compounds, herbs without a documented history of traditional food use, plant extracts, and animal extracts (FDA

Dietary Supplement Task Force Final Report, 1992, p. 12)." In 1994, a Dietary Supplement Task Force Final Report approximately 3,400 unique, non-prescription dietary supplement products were produced by 600 manufacturers with retail sales of roughly 3.3 billion dollars annually (FDA, 1994). Estimates for 1997 sales were reported to be 12.8 billion (Washington Post, Nov. 18, 1998).

In 1991, a national task force was convened by FDA Commissioner David Kessler to study ways in which to regulate dietary supplements. In 1992, the task force's final report (FDA, 1992) made 20 recommendations for regulating dietary supplements including,

- 1) establish purity standards for ingredients in supplements;
- 2) label supplements with accurate information about ingredients; and
- 3) conduct education campaigns to give consumers accurate, scientifically objective information about the safety, use, benefits, and risks of supplements.

DIETARY SUPPLEMENT USE AMONG ATHLETES

Dietary supplement use is a well-documented practice among adult and adolescent athletes. Most recently the popular press was as interested in professional baseball player Mark McGwire's use of the dietary supplement Androstenedione as they were in his record-breaking homerun season. Makers of Androstenedione 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 (1994a) 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 supplement use prevalence rate of 46%.

Among athletes, adolescents are a key target market of the dietary supplement industry (Cowart, 1992; Friedl et al., 1992; Lightsey & Attaway, 1992; Pearl, 1991). Claims of increased energy, improved performance, and gains in muscular strength appeal to this population (Grunewald & Bailey, 1993; Philen et al., 1992). However, time and again the efficacy of these claims has been shown to be unsupported under scientific scrutiny.

There has been a great deal of concern regarding risks of dietary supplement use among adolescent athletes. Few published studies exist that report on dietary supplement use among this population. Of these studies, prevalence rates range from a high of 56% (Douglas & Douglas, 1984), to a low of 23% reported from a small study done on 13 elite gymnasts (Moffat, 1984). 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 (Krowchuk et al., 1989; Marquart & Sobal, 1993; Muncie & Sobal, 1987; Sobal & Marquart, 1994a, 1994b;

Sobal & Muncie, 1988) address a concern that no studies specifically examine adolescent athletes' influences or reasons for using dietary supplements. The most widely published researchers in this area, Sobal and Marquart (1994a), 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 was to develop a valid and reliable instrument, based on the Theory of Reasoned Action (Fishbein & Ajzen, 1970), to assess behavioral intentions, attitudes, and beliefs of adolescent athletes regarding dietary supplements.

THEORY OF REASONED ACTION (TRA)

The TRA was introduced by Martin Fishbein in 1967 (Fishbein, 1967), and later with Icek Ajzen to further develop, revise, and refine this promising social psychological theory. As a result of this collaborative work, several books have been published detailing the development of TRA instruments, applications, methodology, and evaluation (Ajzen, 1988; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975).

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 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. Ajzen and Fishbein also recognized that many behaviors (e.g., smoking cessation) have incomplete volitional control. They concluded that, for these behaviors, the TRA is not appropriate in predicting or understanding that behavior. Therefore, instrument development in this study assumed

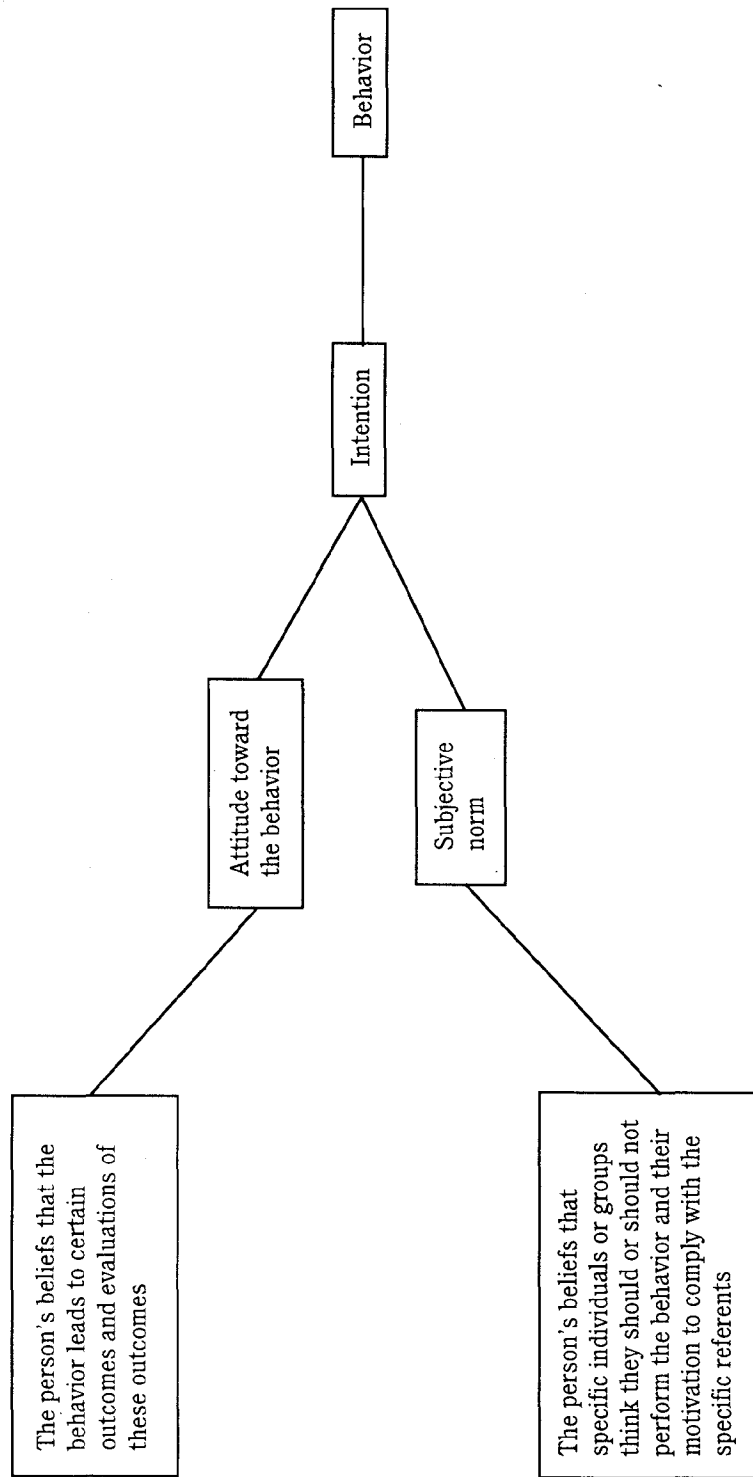
that adolescent athletes, at their particular developmental stage, are rational in their consideration of dietary supplements and that this behavior is under volitional control.

THEORETICAL CONSTRUCTS OF THE TRA

A graphic representation of the TRA is presented in Figure 1. As indicated in this figure, the TRA holds that the immediate determinant of a person's behavior is that person's intention to perform or not to perform that specific behavior. Generally speaking, individuals will adopt the behavior associated with their strongest intention. Referring back to Figure 1, the TRA model shows that behavioral intention is a direct function of two specific and independent determinants. Ajzen and Fishbein (1980) identified these determinants as attitude toward the behavior, which is a personal factor, and subjective norm, a factor reflective of social influence. Attitude toward the behavior is defined as a person's positive or negative evaluation of personal performance of the behavior. 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 person's motivation to comply with these significant others. For most behaviors under volitional control, both of these factors are strong predictors of behavioral intention. A summary of TRA research studies presented by Ajzen (1988) shows that the influence of attitude toward the behavior and subjective norm varies across behaviors and populations with correlations ranging from 0.40 and 0.73. For most behaviors, the influence of the attitudinal component outweighs that of the subjective component. Thus, based on TRA research, it is safe to assume that most individuals will intend to perform a behavior when they evaluate its consequences positively and they believe that significant others think they should perform the behavior.

Since its inception, the TRA has been successfully applied in explaining and predicting a variety of behaviors such as voting choice in a presidential election (Fishbein, Ajzen, & Hinkle, 1980), contraception use (Fishbein, Jaccard, Davidson, Ajzen, &

Figure 1
Factors Determining an Individual's Behavior According to the Theory of Reasoned Action



Loken, 1980), seat belt use (Wittenbacker, Gibbs, & Kahle, 1983), drug use (Budd, Bleiker, & Spencer, 1983), and mother's infant feeding behavior (Manstead, Proffitt, & Smart, 1983).

METHODS

Ajzen and Fishbein (1980) listed three steps in the construction of a standard TRA questionnaire that would permit prediction and explanation of behavior at a general level:

1. The behavior of interest should be defined in terms of action, target, context, and time element.
2. The corresponding behavioral intention should be defined and a format developed for measuring the behavioral intention.
3. The corresponding attitude and subjective norm should be defined and a format developed for measuring the attitude and subjective norm.

Fishbein and Ajzen (1975) believe any standard measurement scale can be used adequately with the TRA (p. 263). Therefore, the instrument developed in this research utilized Likert scales (Likert, 1932). In Likert scaling, quantification is accomplished by tallying respondents' affirmations of positive and negative beliefs about an attitudinal object. This scaling technique is relatively simple to administer; something that was taken into consideration relative to the ages of the population being studied, namely 13 to 18 year-old athletes. Furthermore, Likert scales retain a high reliability when they contain as little as 20 items, or questions (Mueller, 1986, p. 30). This was also considered given the attention span of adolescents.

According to Mueller, instrument development that uses Likert scales consists of seven stages. The purpose of Mueller's procedure is not to function as an absolute but to lay a basic framework for the construction of a survey instrument using Likert scales. Therefore, although not listed by Mueller, two additional stages were added to strengthen the development process used in the formulation of the present instrument. These included review by expert panel and development of draft 1 of the SPAADSU between Stages 2 and 5. The following listing details the entire 9 stages. These 9 stages

are then outlined, in order, in the following section.

1. Identify the attitudinal object,
2. collect a pool of opinion items,
3. pool of items reviewed by panel of experts,
4. pilot test draft of the SPAADSU,
5. administer the item pool to a group of respondents,
6. score each item for each respondent,
7. sum respondents' item scores,
8. correlate item scores with total scale scores for all respondents,
9. apply statistical criteria for elimination of test items.

Stage 1—Identify the Attitudinal Object

The initial task in the development of an instrument to measure intentions, attitudes, and beliefs of adolescent athletes regarding dietary supplement use was to determine the parameters of content related to this area. Three separate efforts were used to determine these parameters including review of the literature, focus group interviews with adolescent athletes, and expert panel submission of related materials relevant to the topic area, (e.g., previous surveys or questionnaires). The initial task in the development of this instrument was to determine the efficacy of the TRA to measure intentions, attitudes, and beliefs, and the potential of dietary supplement use among adolescent athletes to be a risky behavior. This was established by reviewing both the TRA and dietary supplement literature. As the second component in identifying the attitudinal object in Stage 1, focus group interviews were conducted with adolescent athletes to determine belief and attitude parameters with respect to the constructs of the survey instrument. Also intended with the focus group interviews was a more precise use of the language. Focus group interviews, according to Basch (1987), are a qualitative approach to learning about population subgroups with respect to conscious, semi-conscious and unconscious psychological and sociological characteristics and processes.

Forty-one adolescent athletes (13 female, 28 males), representing the following sports, participated: Basketball (7 males, 3 females), soccer (4 males, 3 females), baseball (6 males), cross-country/track (3 males,

3 females), football (8 males), and volleyball (4 females). The adolescent athletes were a convenience sample chosen from a rural area in upstate New York and an urban area in south central Alabama. Responses to questions were tape recorded with the athlete's permission, and officials from participating schools were aware of and had approved the effort.

The focus groups provided insights into knowledge, beliefs, and attitudes displayed by various adolescent athletes about dietary supplements. For example, most of the athletes could name at least one dietary supplement they had heard of, with the products most often named being "weight gainers, protein powders, and energy pills." When asked where they saw these products advertised, one group from Alabama unanimously replied "GNC (General Nutrition Centers)." Other responses included magazines, gyms, Saturday morning T.V. shows, and ESPN. When asked what dietary supplements did they think really work, one athlete thought only certain brand names worked, the others were fakes. Other responses included "sounds like they would work," "weight gainer works," "I don't think they work, I threw up yesterday after taking some." When asked what parents would think of these products, the groups were split. One boy from NY. said his Mom "pours them down my throat because I'm so small." A few respondents said that their parents would want to look at them first and "maybe see if they were recommended by my family doctor." One athlete said "I bet most parents don't know much about them." Coaches, it was felt, would not mind their use by athletes "as long as they were legal." Others felt that coaches already took the products themselves. However, some respondents said that they thought their coaches would rather they eat naturally and that some coaches didn't like these prod-

ucts. When asked what someone like a principal or athletic director would think of athletes taking these substances responses included they would not mind"; depends on what is taken, even if legal"; "would not look good"; and "principal would think they are drugs." When asked who tests dietary supplements, responses were "someone from the magazine where they are advertised," "the pros," "FDA," and "scientists with rats." When asked what a specific dietary supplement called amino acids was and what it did, answers included "protein," "comes from protein," "not sure but they build muscle," "something that gives you energy," and, "makes you bigger and stronger." The responses provided by these focus group interviews showed a variance in knowledge about dietary supplements and different attitudes and beliefs surrounding them. The fact that these focus groups were done in different regions of the country helped to establish a range of responses that was not homogeneous to only one area. This type of information was crucial to the development of the SPAADSU as it followed the constructs of the TRA in regard to identifying behavioral intentions, attitudes about the behavior, and the subjective norms. Lastly, input from a panel of experts was solicited. This included requests for existing items and/or questionnaires, and guidelines for construction of attitudinal items provided by authors of test items.

Stage 2—Collect a Pool of Opinion Items

Using background information gathered in stage 1, 73 items were generated for inclusion in the initial pool of items. These items were divided into three constructs as shown in Table 1.

Table 1
Items Measured by the Constructs of the TRA

Behavioral Intention	Questions 1 through 29
Attitude Toward the Behavior	Questions 30 through 46
Subjective Norm.....	Questions 47 through 73

Stage 3—Pool of Items Reviewed by Panel of Experts

A panel of experts was identified to evaluate the pool of opinion items. Sixteen experts were identified as possible reviewers. These experts came from the following fields: Adolescent athletics, sports nutrition, and test construction. Each expert was sent the first draft of the SPAADSU (73 items) and was instructed to evaluate each item. A total of 18 items were eventually omitted based on expert panel review. In general, items were eliminated because of duplication of similar items in the SPAADSU, poor or inappropriate wording of the item, too broad of a scope, lack of operationalization of terms used in the item, or the item was not representative of the construct being measured. Items which some reviewers accepted and others omitted were scored, ranked, and accepted or omitted according to evaluation criteria. Some items that reviewers felt should be omitted warranted being left in the SPAADSU based upon focus group results and review of the literature. The panel of experts did not suggest any additional items be added, and indicated that a sufficient number of items existed to measure each construct. The expert panel did suggest rewording of some items.

Stage 4—Pilot Test Draft of the SPAADSU

The pilot test draft of the SPAADSU included those questions not omitted by the expert reviewers.

Stage 5—Administer the Item Pool to a Group of Respondents

Concurrent with the expert's review of the draft SPAADSU, a convenience sample of adolescent athletes became available for a pilot test as they prepared to receive their sports physical examinations at a regional

medical center in south central Alabama. Prior to the pilot test date, five expert reviewers had returned their evaluation packets of the SPAADSU. Based on those expert reviewers who responded, six items were eliminated. Following the pilot test administration, four more reviewers returned evaluation packets, for a total of 9 of 16 reviewers who returned packets. As a result of those evaluation packets returned prior to the pilot test, 68 items remained on the initial draft of the SPAADSU that was administered to the sample of adolescent athletes. It was decided to utilize this sample to test the items in the first draft of the SPAADSU. Permission was requested from and granted by the regional medical center to administer the SPAADSU to those adolescent athletes ($N = 232$) who were there to receive physical examinations as required for interscholastic sports participation for the Fall and Winter sports seasons of 1995-1996.

Stage 6—Score Each Item for Each Respondent

Following pilot test, each item was scaled as having a positive or negative weight. Five responses, "strongly agree," "agree," "no opinion," "disagree," and "strongly disagree" were used as answer choices for each item. Positively scored items received a 5 for each "strongly agree," a 4 for "agree," and so on. For negatively scored items, a 5 was given for each "strongly disagree," a 4 for "disagree," etc. A 3 represented "no opinion" for all items.

Stage 7—Sum Respondents' Item Scores

Table 2 provides the mean score, standard deviation, and the minimum and maximum scores for respondents in each construct.

Table 2
Average Mean, Standard Deviation (SD), and Range of Scores of the SPAADSU Pilot Test, by Construct ($N = 232$)

	<u>Mean</u>	<u>SD</u>	<u>Range</u>
Behavioral Intention (25 items)	1.662	.297	1.160-2.440
Attitude Toward the Behavior (15 items)	2.079	.341	1.214-2.857
Subjective Norms (15 items)	1.920	.527	1.000-3.000

The Behavioral Intention construct measured respondents' intentions to use or not use dietary supplements. The Attitude Toward the Behavior construct measured beliefs that using dietary supplements would result in positive or negative outcomes. Subjective Norms measured respondents' perceived social pressures to use or not use dietary supplements. Responses indicating a positive attitude toward the attitudinal object resulted in high scale scores. Responses indicating a negative attitude toward the attitudinal object represented a low scale score.

Stage 8—Correlate Item Scores with Total Scale Scores for All Respondents

Each item score was correlated with total scale scores for all respondents. According to Mueller (1986), in a scale measuring a psychological construct, such as attitude, each item must contribute to the measurement of this construct. Items that don't discriminate among respondents in the same manner as the total score aren't measuring the same thing as the other items. Such items are typically rejected from the scale (p. 14).

In the item discrimination analysis performed at this stage, items were analyzed to determine how those respondents who scored positively in response to the total survey tended to respond to individual items. Those items which did not achieve a .3 correlation were eliminated. Based on this analysis, 12 items were removed from the pool. Ajzen and Fishbein (1980) state,

... correlations around .30 have been considered satisfactory, and we would suggest that correlations below this level are usually of little practical value. Correlations in the range .30 to .50 may be considered of moderate magnitude, while correlations exceeding .50 indicate relatively strong relationships between variables. (p. 99)

The cutoff for items being eliminated by item discrimination in Stage 8 was set at .30. This procedure eliminated 12 items from the SPAADSU.

Stage 9—Apply Statistical Criteria for Elimination of Test Items

Data analysis of the pilot test consisted of factor analysis, item response discrimination, frequency distributions, and Cronbach's alpha.

Factor analysis was used to explore the pilot test data for patterns, and/or to reduce the variables to a more manageable number. Results of the factor analysis indicated that the behavioral intention, attitude toward the behavior, and subjective norms construct were measuring their respective constructs but not as strongly as hoped. Analysis showed that 29.1 % of the variance could be attributed to the variables in the behavioral intention's construct, as well as 31.9 % for attitudes toward the behavior and 53.9 % for the subjective norms construct. According to Rubinson and Neutens (1987), items in the factors that did not load at .300 should be eliminated. This resulted in four items being omitted. Item response discrimination helped to establish how well the item distinguished between the more positive and the less positive athletes. According to Mueller (1986, p. 13), "In general, items on which respondents are spread out across response categories are better than items on which respondents are clustered primarily in two or three response categories." Using the frequencies of responses, those items where respondents either scored above 80% or below 20% in response categories were dropped from the SPAADSU. This process eliminated two items. Cronbach's alpha (r) was used to determine the interpretability of each construct.

To summarize the procedure used to eliminate items, a listing of reasons for deletions is provided below. The initial pool of items included 73 items. Items were eliminated for the following reasons:

1. Rejected by panel of experts,
2. item discrimination,
3. factor analysis,
4. item response discrimination.

This yields a final form of the SPAADSU containing 36 items, with 13 items in the behavioral intentions construct, 10 items in the attitude toward the behavior construct, and 13 items in the subjective norms construct. Cronbach's alpha for the total 36 items was .9409

From these processes, it was concluded that the SPAADSU is a reliable instrument which can be used to assess behavioral intentions, attitudes, and beliefs of adolescent athletes regarding dietary supplements.

DISCUSSION

Now that the SPAADSU has been developed and has been shown to be reliable, a longitudinal database can be established. However, there is a need to apply this instrument to establish reliable and valid indicators. This can be done by gathering data, using the SPAADSU, from athletes in different sports in varying geographic regions controlling for a variety of independent variables such as gender, socioeconomic status, team/individual sports participation, coaches, parents and significant others, age, and ethnicity. The benefits of these studies may assist in identifying those variables that influence adolescent athletes' behavioral intentions, attitudes, and beliefs regarding dietary supplements. For example, would gymnasts have different influences than a soccer player? Ideally, these studies need to be considered longitudinally to best identify trends in subjective norms, attitudes towards the behavior, and intentions to perform the behavior.

The basic hypothesis of this research model was that the TRA would predict the intent to use dietary supplements among adolescent athletes. The next step, methods development, called for design and implementation intervention methods that influence the two major constructs of the TRA: Subjective norms and attitudes toward the behavior. To do so, the following recommendations for further study are offered.

1. Studies should be conducted to assess the influence of coaches on subjective norms, and,

2. Studies should focus on sport-specific attitude differences among athletes.

3. Controlled Interventions should now focus on the constructs of the TRA. For this phase some recommendations for further study would include, but not be limited to the following:

1. What is the impact of an educational intervention on the use of dietary supplements for coaches on the behavioral intent of athletes?

For the controlled intervention trials, the SPAADSU serves as the instrument to measure behavioral intentions, attitudes towards the behavior, and subjective norms. The results of the controlled intervention trials will be to add to the database discussed in the methods development phase.

One limitation of this study was the lack of applicable weights to the questions of the SPAADSU. Additional applications of the SPAADSU should concentrate on adding weights to the items in each construct as put forth by the TRA to determine the strength of relationships as they lead to behavioral intentions and, ultimately, prediction of behavior.

It is felt that a valid and reliable instrument such as the SPAADSU will greatly benefit those groups of individuals who are responsible for the well-being of adolescent athletes; most specifically, but not limited to the coaches, athletic trainers, physicians, and parents/guardians. Clearly, this study has borne out that these groups have the most to gain in terms of understanding and influencing adolescent athletes' intentions, attitudes, and beliefs regarding dietary supplements. Additionally, with the application of this instrument it is also expected that health educators could assist in the design gender, ethnic, and sport specific interventions directed towards these athletes.

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