ERGOGENIC SUPPLEMENT USE BY NCAA VARSITY ATHLETES

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Master of Science

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Thank you to Mike and Mark Lesako, two of the nicest guys I could have ever worked with this year. You have provided me with an amazing experience, thanks for the support and encouragement.

Thank you Dad and Mom. I appreciate all the sacrifices you have made to get me here and I hope one day to return the favor. The two of you believe in me when no one else does. Thank you so much for your support.
Lastly, to Peyton and Logan- My biggest fans.
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“It starts with an innate human need to triumph, the driving force behind athletic competition. Victory at all costs?”¹ In 1998, Mark McGwire set a Major League Baseball record by hitting 70 home runs. However, this record-breaking triumph was held under controversy when McGwire admitted that for over a year he had been using a testosterone-boosting compound. Ten years earlier, Olympian Ben Johnson tested positive for drug use. He was stripped of his medal and banned from participating in competition. In the spring of 2005, Major League Baseball again fell under scrutiny when many of its star players were under investigation for steroid use.

Although many people think that the use of ergogenic aids like steroids and creatine are fairly new to the world of sports, the truth is that they have been used for centuries. In South Africa many centuries ago athletes and warriors used “dop”, a drink made of alcohol and cola. “Dop” made them feel fiercer and it also helped mask pain and fatigue. Today it is known as dope and has grown to include any substance used by athletes to enhance performance.²
Today, college athletes are using more dietary supplements than ever. According to a 2001 survey by the National Collegiate Athletic Association (NCAA), the use of ergogenic aids such as amphetamines, anabolic steroids and ephedrine has increased since 1997. However, social drug use appears to be on the decline. To most sports medicine physicians, athletic trainers and athletic directors, this is neither surprising nor reassuring. It is important to be informed about the scope of usage in college sports and which supplements have the greatest potential to harm our athletes. Investigating the reasons student athletes choose to use or not to use these supplements is of interest as well. The cases of athletes using anabolic steroids, amphetamines, and ephedrine has been on the rise in the past years.

Many athletes continue their use even after their athletic careers have ended. It becomes an addiction and can eventually lead to other drugs. Being removed from the athletic lifestyle can leave the athlete feeling lost and depressed.

The problem is not merely the collegiate student-athlete’s usage of ergogenic aids; it is their sources of information. Women are generally more likely to receive nutritional information than men. However, much of the
nutritional information is gained from possibly unreliable sources such as coaches, magazines, family members, friends, and television.⁴,⁵ Some other sources of information include athletic trainers, dietitians, strength coaches, and store nutritionists.⁴,⁵

There is a great deal of information available about the various performance-enhancing supplements, but what do the athletes using them know? Who informs them and what are they being told?

It is known that many of the performance enhancing supplements have adverse and negative side effects, yet for others we still do not know the long-term effects on health and performance. So, how much do the athletes using these supplements know about the risks involved? Were they ever informed? Would it have made a difference?

This study will attempt to answer the following questions: 1) Is there a difference between gender for the collegiate athlete's use of ergogenic aids? 2) Is there a difference among the types of sports for the collegiate athlete's use of ergogenic aids? 3) Is there a difference among division for the collegiate athlete's use of ergogenic aids?
METHODS

This section will include the following subsections: Research Design, Subjects, Preliminary Investigation, Instruments, Procedures, Hypotheses, and Data Analysis.

Research Design

The research design for this study was descriptive. The dependent variable was usage of ergogenic supplements. The independent variables were gender, sport and NCAA Division. One of the strengths of this study was that the subject sample included athletes from all three NCAA Divisions. A limitation of the study was that only student athletes from three colleges and universities were surveyed. Another limitation was the possibility that the questionnaire was not answered honestly.

Subjects

The subjects (N = 126) in this study consisted of National Collegiate Athletic Association athletes from Division I, II, and III institutions in southwestern Pennsylvania. The institutions participating in the study
included the University of Pittsburgh, Division I; California University of Pennsylvania, Division II; and Washington and Jefferson College, Division III. The subjects participated in at least one collegiate sport, including football, volleyball, men’s soccer or women’s soccer. It was a sample of convenient volunteers. A reliable survey was administered. Each participant was instructed to read and sign an Informed Consent Form (Appendix C1) which included the purpose of the study, researchers involved, and the right to remove himself/herself from the study without penalty. No names were included in the research study.

Instruments

The Ergogenic Supplement Use by NCAA Varsity Athletes Questionnaire (Appendix C2) was used in this study. This questionnaire was a modification of the survey used in the NCAA study of substance use and abuse habits of college student athletes research in 2001. The questionnaire was divided into six sections: demographics, health and athletic performance, anabolic steroids, nutritional supplements, amphetamines, and social drug consumption.
The demographic section required subjects to answer questions about gender, age, sport, year of eligibility, ethnicity, and knowledge of drug testing policies.

The health and athletic performance section asked about the relationship between ergogenic supplements and their effect on general health and athletic performance. This section consisted of two questions.

The anabolic agents section was meant to identify the subject’s pattern of using anabolic steroids. This section contained eight questions. These questions included how often the subject used anabolic steroids, when usage began, and the reason the subject used anabolic steroids. Whether or not the subject stopped using anabolic steroids was also examined.

The nutritional supplements section was to determine the subject’s pattern of nutritional supplement use. This section contained eight questions. These questions included which supplements the subject was using, when the subject’s used nutritional supplements and when usage began. Also examined was whether or not the subject stopped using nutritional supplements and their sources of information.

The intent of the fifth section was to recognize the subject’s usage pattern of amphetamines. This section
contained nine questions. These questions included information to determine if the subject was currently, or was at one time, using amphetamines. Reasons for usage, when subjects use amphetamines, and when usage began were also examined.

The last section of the questionnaire regarded the usage of peptide hormones and social drug use. Included in the category of social drugs were the following: alcohol, tobacco, marijuana and psychedelic drugs.

Procedures

The researcher was granted approval by the Institutional Review Board (Appendix C3) at the California University of Pennsylvania before conducting any of the research. The research was conducted at the University of Pittsburgh, California University of Pennsylvania, and Washington and Jefferson College, Division I, II, and III institutions, respectively.

The researcher provided a cover letter (Appendix C4) to the respective athletic trainers or coaches asking for a time to deliver the questionnaire to the athletes. The athletes who volunteered, were instructed to sign an
Informed Consent Form (Appendix C1) and complete the survey honestly and to the best of their ability.

The researcher distributed the questionnaires to the given teams as a whole at a team meeting. Upon completion, the athlete returned the questionnaire to the researcher who placed it into an envelope which was then sealed.

Hypotheses

The following hypotheses were based on a review of the literature and intuition of the researcher.

1) Males will use more ergogenic aids than females.

2) Use of ergogenic aids will be dependent upon sport.

3) Use of ergogenic aids will be dependent on NCAA Division level.

Data Analysis

All tests of statistical significance used an alpha level of .05. To test hypothesis I, a Chi-square for Independence Test was used. Hypotheses II and III were also analyzed with a Chi-square for Independence Test.
RESULTS

The purpose of this study was to explore the relationship of the use of performance enhancing supplements in collegiate athletics among gender, sport, and division. Subjects were surveyed using The Ergogenic Supplement Use by NCAA Varsity Athletes Questionnaire. The questionnaire consisted of six sections including demographics, health and athletic performance, anabolic steroids, nutritional supplements, amphetamines, and social drug consumption. The results are divided into three sections: demographic data, hypothesis testing, and additional findings.

Demographic Data

A total of 126 subjects (N = 126) completed this study. The subjects were volunteer varsity athletes from National Collegiate Athletic Association Division I, II, and III institutions in southwestern Pennsylvania. The institutions participating in the study were the University of Pittsburgh, (Division I), California University of
Pennsylvania, (Division II), and Washington and Jefferson College, (Division III). The subjects were participants in at least one collegiate sport: football, volleyball, men’s soccer or women’s soccer.

The demographics of the subjects were as follows: The mean age of subjects was 19.83 (± 1.12). The frequency distributions of gender, sport and division can be viewed in Table 1, Table 2, and Table 3.

Table 1. Gender Distribution

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>69</td>
<td>54.8</td>
</tr>
<tr>
<td>Female</td>
<td>57</td>
<td>45.2</td>
</tr>
<tr>
<td>Total</td>
<td>126</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 2. Sport Distribution

<table>
<thead>
<tr>
<th>Sport</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>41</td>
<td>32.5</td>
</tr>
<tr>
<td>Volleyball</td>
<td>26</td>
<td>20.6</td>
</tr>
<tr>
<td>Men’s Soccer</td>
<td>28</td>
<td>22.2</td>
</tr>
<tr>
<td>Women’s Soccer</td>
<td>31</td>
<td>24.6</td>
</tr>
<tr>
<td>Total</td>
<td>126</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 3. Division Distribution

<table>
<thead>
<tr>
<th>Division</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Division 1</td>
<td>44</td>
<td>34.9</td>
</tr>
<tr>
<td>Division 2</td>
<td>38</td>
<td>30.2</td>
</tr>
<tr>
<td>Division 3</td>
<td>44</td>
<td>34.9</td>
</tr>
<tr>
<td>Total</td>
<td>126</td>
<td>100.0</td>
</tr>
</tbody>
</table>

At 78.6%, the majority of the subjects were of a white or Caucasian background. Other ethnicities included Black or
African American (16.7%), Mexican American or Chicano (0.8%), Puerto Rican or Latin American (0.8%), Oriental or Asian American (0.8%), and Other (2.4%). The percentage of subject living arrangements were as follows: 49.2% live in the dormitory, 40.5% off campus, 7.1% in a fraternity or sorority house, and 3.2% with their parents.

Hypothesis Testing

The following hypotheses were tested for this study. All tests of statistical significance used an alpha level of .05.

Hypothesis 1: Males will use more ergogenic aids than females.

Conclusion: A Chi-square for Independence Test was used to determine if ergogenic aid use was dependent upon gender. Significant findings yielded ($\chi^2 (2) = 15.616; P < .001$). The use of ergogenic aids was dependent on gender. Male athletes demonstrated a greater use of ergogenic aids than female athletes.
Hypothesis 2: Use of ergogenic aids will be dependent upon sport.

Conclusion: A Chi-square Independence Test was used to determine if the use of ergogenic aids was dependent upon sport. Results produced significant findings ($\chi^2 (6) = 18.520; P < .05$). The use of ergogenic aids was dependent on sport. Football athletes demonstrated the largest amount of moderate to high ergogenic supplement use at 32.5%.
Figure 2. Use of Ergogenic Aids and Sport

* Usage Scale of Low is indicative of those athletes whose ergogenic aids use was between 0 – 2. Usage Scale of Moderate is indicative of those athletes whose ergogenic aids use was between 3 – 4. Usage Scale of High is indicative of athletes whose ergogenic aids use was between 5 – 6.

Hypothesis 3: Use of ergogenic aids will be dependent on NCAA Division level.

Conclusion: A Chi-square for Independence Test was used to determine if the use of ergogenic aids was dependent on division level. No significant findings resulted ($\chi^2 (4) = 4.815; P = .307$). Use of ergogenic aids and NCAA division level appear to be independent of one another.
Figure 3. Use of Ergogenic Aids and Division

* Usage Scale of Low is indicative of those athletes whose ergogenic aids use was between 0 - 2. Usage Scale of Moderate is indicative of those athletes whose ergogenic aids use was between 3- 4. Usage Scale of High is indicative of athletes whose ergogenic aids use was between 5 - 6.

Additional Findings

After testing the hypotheses, further testing was conducted to determine if there were any relationships among gender, sport, and division and specific ergogenic aids including, anabolic agents, nutritional supplements, amphetamines, social drug use, reasons for using ergogenic aids, and sources of information for nutritional supplements.
The frequency distributions of ergogenic aids use are displayed in Table 4.

Table 4. Frequency Distributions of Ergogenic Supplement Usage

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>117</td>
<td>92.9%</td>
</tr>
<tr>
<td>Marijuana*</td>
<td>42</td>
<td>33.3%</td>
</tr>
<tr>
<td>Protein†*</td>
<td>40</td>
<td>31.7%</td>
</tr>
<tr>
<td>Other Nutritional Supplements</td>
<td>27</td>
<td>21.4%</td>
</tr>
<tr>
<td>Amino Acids†*</td>
<td>21</td>
<td>16.7%</td>
</tr>
<tr>
<td>Creatine†*</td>
<td>21</td>
<td>16.7%</td>
</tr>
<tr>
<td>Tobacco:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cigarettes††</td>
<td>18</td>
<td>14.3%</td>
</tr>
<tr>
<td>Smokeless††</td>
<td>15</td>
<td>11.9%</td>
</tr>
<tr>
<td>Thermogenics††</td>
<td>11</td>
<td>8.7%</td>
</tr>
<tr>
<td>Amphetamines†</td>
<td>10</td>
<td>8.0%</td>
</tr>
<tr>
<td>Anabolic Agents††</td>
<td>10</td>
<td>8.0%</td>
</tr>
<tr>
<td>Andro or norando products†*</td>
<td>9</td>
<td>7.1%</td>
</tr>
<tr>
<td>Ephedrine</td>
<td>8</td>
<td>6.1%</td>
</tr>
<tr>
<td>Psychedelics††</td>
<td>7</td>
<td>5.6%</td>
</tr>
<tr>
<td>HMB†</td>
<td>6</td>
<td>4.8%</td>
</tr>
<tr>
<td>HGH††</td>
<td>5</td>
<td>4.0%</td>
</tr>
<tr>
<td>Chromium</td>
<td>4</td>
<td>3.2%</td>
</tr>
<tr>
<td>HCG</td>
<td>1</td>
<td>0.8%</td>
</tr>
<tr>
<td>Epitesterone</td>
<td>1</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

† Indicates substances in which use was dependent upon gender
*Indicated substances in which use was dependent upon sport
On the basis of this distribution the use of creatine, protein, alcohol, and tobacco among gender, sport, and division were assessed.

When comparing the use of creatine to gender using a Chi-square for Independence Test, results reported ($\chi^2 (1) = 20.817; P < .001$). The use of creatine was dependent upon gender, with 21 males and 0 females reporting use. The usage of creatine among sports also resulted in significant findings ($\chi^2 (3) = 21.820; P < .001$) with 14 football athletes reportedly using creatine. Creatine use was not dependent upon division ($\chi^2 (2) = 1.430; P = .489$).

In a comparison of protein usage between genders a Chi-square for Independence Test yielded significant results ($\chi^2 (1) = 29.375; P < .001$). Protein usage was dependent upon gender, with 36 males reporting usage of protein in the last 12 months compared to 4 females. The usage of protein among sports also yielded significant results ($\chi^2 (3) = 30.103; P < .001$). Consumption of protein appears to be dependent upon sport with 23 football athletes, 13 men’s soccer, 2 volleyball, and 2 women’s soccer athletes reporting the use of protein supplements in the last 12 months. Protein usage was not dependent upon division ($\chi^2 (2) = .210; P = .900$)
Alcohol consumption and gender were independent of one another as 64 males and 53 females reportedly using alcohol within the last 12 months. No significant results were found in the comparison of consumption of alcohol among sport and NCAA division level.

Use of tobacco was found to be dependent upon gender with a Chi-square for Independence Test results yielding ($\chi^2 (2) = 12.766; P < .05$). The usage of tobacco products was dependent upon gender with 20.6% of males ($N = 26$) reporting the usage of cigarettes or smokeless tobacco within the last 12 months. The relationship among sport and tobacco use also resulted in significant findings. A Chi-square Independence Test resulted in ($\chi^2 (6) = 21.875; P < .05$). Usage of tobacco products is dependent among sport with more football athletes ($N = 17$) using cigarettes and smokeless tobacco than other sports.

Reasons for using nutritional supplements was also examined in this study. The distribution of reasons for using nutritional supplements is reported in Table 5.
Further analyses were indicated on the basis of this distribution and a Chi-square for Independence Test determined that prevention of injury was significantly dependent upon gender ($\chi^2 (1) = 4.370; P < .05$). Ten males and only two females reported injury prevention to be the reason for nutritional supplement usage in the last 12 months. Results yielded among sports revealed that improvement of athletic performance was the reason for using nutritional supplements in the last 12 months. Among NCAA division level physical appearance and weight loss or gain appear to be the reason for student athlete’s use of nutritional supplements.

The primary reason as to why student athletes have never used or stopped using performance enhancing
supplements was also addressed in this study. Table 6 is a report of the findings observed. Note that “I have no desire to experience the effects” was the reason selected most by the student athletes surveyed (N = 34). However, a further analysis of the data revealed that reasons not to use ergogenic aids was dependent upon gender. A Chi-square for Independence yielded the results ($\chi^2 (12) = 26.264; P < .05$) that were significant. Yet, across sport and division no significant relationship existed.

Table 6. One Main Reason Why Student Athlete Have Never Used or Stopped Using Ergogenic Aids

<table>
<thead>
<tr>
<th>Reason</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
</table>


Also examined in this study were the sources used by
the student athletes to obtain information about
nutritional supplements. Table 7 represents these
findings.

<table>
<thead>
<tr>
<th>Reasons</th>
<th>N</th>
<th>Reasons</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutritionist/Dietician</td>
<td>57</td>
<td>Strength Coach</td>
<td>34</td>
</tr>
<tr>
<td>Concerned about what it might do to my health</td>
<td>14</td>
<td>It costs too much</td>
<td>8</td>
</tr>
<tr>
<td>It did not get the desired effects</td>
<td>7</td>
<td>Its against my beliefs</td>
<td>5</td>
</tr>
<tr>
<td>Its against my beliefs</td>
<td>5</td>
<td>Other</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>It is illegal</td>
<td>2</td>
</tr>
<tr>
<td>It is illegal</td>
<td>2</td>
<td>Coaches rule</td>
<td>1</td>
</tr>
<tr>
<td>Coaches rule</td>
<td>1</td>
<td>I recovered from my injury or illness</td>
<td>1</td>
</tr>
<tr>
<td>I recovered from my injury or illness</td>
<td>1</td>
<td>I had a bad experience with it</td>
<td>1</td>
</tr>
<tr>
<td>I had a bad experience with it</td>
<td>1</td>
<td>Afraid of becoming addicted</td>
<td>1</td>
</tr>
<tr>
<td>Afraid of becoming addicted</td>
<td>1</td>
<td>Fear of losing my eligibility</td>
<td>1</td>
</tr>
<tr>
<td>Fear of losing my eligibility</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The most interesting results in further analysis of sources of information used by student athletes to gain information on nutritional supplements found that Division I student athletes sought the majority of their nutritional information from nutritionists/dieticians ($\chi^2 (2) = 10.421; P < .05$), athletic trainers ($\chi^2 (2) = 22.493; P < .001$), and strength coaches ($\chi^2 (2) = 26.206; P < .001$); while a large percentage of Division III student athletes looked to friends ($\chi^2 (2) = 11.973; P < .05$) and retail stores ($\chi^2 (2) = 8.736; P < .05$) to gain their knowledge of nutritional information.
DISCUSSION

The following discussion is divided into three sections: discussion of results, conclusions, and recommendations.

Discussion of Results

The purpose of this study was to explore the relationship concerning the use of performance enhancing supplements in collegiate athletes between gender and among sport and division.

It was initially hypothesized that the use of ergogenic supplements would be dependent upon gender. This study found statistical results in accordance with the hypothesis. As a whole, males reportedly used a higher number of ergogenic substances in the last 12 months. Consistent with the findings in previous studies, males generally tended to use more anabolic agents, marijuana, and tobacco products\(^1,2\) as well as other energy and protein products such as creatine, amino acids and androstenedione.\(^3,5\) Earlier research stated that female athletes charged the majority of their supplement use to health reasons;\(^5\) this study did not find such results.
Jacobsen et al\textsuperscript{21} reported that males were significantly more concerned with improvements in speed, power, agility, and strength; however, this study did not find a difference between genders in regard to improvement of athletic performance.

Of the athletes surveyed, football players were more often noted for using performance enhancing supplements. They consumed more NCAA banned substances as well as nutritional substances, within the last 12 months, than the athletes of the other sports surveyed. These findings are consistent with the belief of Jacobsen et al\textsuperscript{4} that sports with male participants are more likely to use substances that are manufactured to build muscle, burn fat, and flush nutrients into muscle cells.

The use of ergogenic aids was originally hypothesized to be dependent upon NCAA division level; however, based on the findings of this study, NCAA division level and the use of ergogenic aids appear to be independent of one another.

There may be several possible reasons as to why the results were not as expected. The most probable of these is that the sample size was small and restricted to a specific area. A large sample size would increase the range of competition levels and include trends exhibited in other areas of the country. The inclusion of more sports
relying on other energy systems or those sports commonly known for using and abusing performance enhancing supplements may have an effect on the outcome as well.

Another possibility is that subjects did not answer as truthfully and honestly as possible. This could be because they felt rushed or hurried when completing the survey or because they had reservations about the anonymity of the results.

Regarding the reasons athletes have never used or stopped using performance enhancing supplements the results of this study found that the most common answer was “I have no desire to experience the effects” and that the next most popular reason was “I am concerned with what it might do to my health.”

As in previous research studying the resources that athletes use to gain information about ergogenic aids and nutritional supplements\textsuperscript{5,6}, the results of this study found them to be quite diverse and sometimes unreliable. Unlike Froiland et al\textsuperscript{5}, this study produced larger percentages of athletes using reliable sources to gain nutritional information. However, this was mostly noted within Division I athletes. As a whole, a greater majority of Division I student athletes inquired about nutritional aids from nutritionists/dieticians, athletic trainers, and
physicians than those athletes in Divisions II and III. Similarly, high numbers of Division II and Division III athletes went to less reliable sources in search of nutritional information such as a teammate, friend, or retail store. An explanation as to why this trend occurred so strongly could be because the Division I institution surveyed held mandatory student athlete meetings with nutritionists. Other justifications as to why Division I athletes used more reliable sources for obtaining information about nutritional supplements may be because of closer working relationships with and proximity to athletic trainers and team physicians on a regular basis.

Conclusions

Based on the results of this study, it can be said that a majority of student athletes engage in some aspects of substance use and, in some cases, abuse. Whether it be supplements strictly aimed at improving performance, those used primarily with health benefits in mind, or those used principally for social reasons, athletes typically partake in some type of ergogenic substance use. It is evident that when it comes to the use of ergogenic aids differences exist between male and female athletes, as well as, among
sports and what kind of ergogenic aids they use. The student athlete’s reasons for using performance enhancing supplements, the reason they do not use, and their sources of information are also quite varied. To athletic trainers, athletic directors, coaches, and physician particular focus should be on sources of information and a means to educate student athletes on effects and advantages of commonly used ergogenic aids.

Recommendations

The use of ergogenic aids between gender and among sport and NCAA division level as a means of enhancing performance have been illustrated though out this study. Therefore, a need for athletic trainers to put this knowledge to use is recommended. The following recommendations are suggested for athletic trainers to put into effect in daily practice: 1) Understand that many athletes are using performance enhancing supplements and make efforts to provide student athletes with credible information concerning these supplements; 2) Become more informed about the types of ergogenic substances student athletes are using as well as the potential advantages and adverse side effects associated with their use.
Recommendations for future research include 1) The inclusion of an increased range of sports with a variety of skill levels; 2) Examining the usage of other substances commonly used in athletics such as caffeine or diuretics; 3) Examination of when athletes began supplementation of ergogenic aids.
REFERENCES


REVIEW OF THE LITERATURE

The use of performance enhancing supplements such as caffeine, creatine, and anabolic steroids is commonly acknowledged among athletes in nearly every sport at every level. They offer the athlete the potential advantage of increasing strength gains, speed, and energy. While it has been proven that some of these supplements do benefit the performance of the athlete, the advantages of other supplements are merely correlations. Either way, the opportunity to gain a competitive edge is very attractive to the high school, collegiate, and professional athlete.

This literature review discusses previous literature regarding the effects of nutritional and performance enhancing supplements and use among collegiate student-athletes. The focus of the literature review is divided into four sections 1) Ergogenic aids: NCAA banned substances and nutritional supplements; 2) use among NCAA student-athletes: usage compared by gender, usage compared by sport and usage compared by division; 3) sources of information, and 4) reasons for use. A summary of the literature review will be provided at the end.
Ergogenic Aids

**NCAA Banned Substances**

The NCAA has composed a list of banned substances that are prohibited from use in college athletics. The list is subdivided into six categories: Central Nervous System (CNS) stimulants, anabolic agents, drugs banned from specific sports, diuretics, street drugs, and peptide hormones. Ergogenics are any substances that allow more work to be done under certain conditions enabling an athlete to improve performance. Many of the chemical ergogenic methods have different benefits and each has its own set of risks, or adverse effects.

Amphetamines, a prominent CNS stimulant identified by the NCAA banned substance list, include ephedrine, also known as the Chinese herb ma huang. It releases norepinephrine from storage in sympathetic nerve endings. This provides the athlete with increased motor function, mental alertness, decreased fatigue and usually a euphoric effect. Adverse effects include nervousness, insomnia, nausea and vomiting, diarrhea, dizziness, visual disturbances, tachycardia, mood changes and even death. Alarmingly, products sold in nutrition and health stores as
ephedra contain ephedrine as their primary active ingredient and athletes are buying them at an astounding rate.\textsuperscript{4}

Another CNS stimulant is methylphenidate. It blocks dopamine reuptake and stimulates the cortex and subcortex to increase alertness, lift spirits, and increase motor activity. Methylenidate is also thought to be a respiratory stimulant. Adverse effects include hypertension, uncontrolled bodily movements, rash, fever, increased bruising and abdominal pain.\textsuperscript{3}

Although caffeine is found in many foods, drinks and over-the-counter drugs, excessive amounts are banned by the NCAA. Concentrations exceeding 15 microgram/ml in the urine will produce a positive drug test.\textsuperscript{1} Doses of 100 to 150mg will stimulate the cortex to produce increased alertness and decreased motor reaction time and reduce fatigue.\textsuperscript{5} Large doses result in the slowing of the heart rate and vasoconstriction, decrease muscle fatigue and increase in both respiratory rate and contractural muscle force. Its adverse effects include increased temperature, irritability, increased sensitivity to pain, urination, confusion, dehydration, abdominal pain, nausea and vomiting, tinnitus, convulsions and headache.\textsuperscript{3}
Anabolic agents are perhaps the most well known and strongly discouraged ergogenic aids to use, especially for healthy athletes. However, the use of steroids is widespread. They are short cuts for today’s athletes. Instead of working out, training, and weight lifting with intensity, steroids are used to gain the same effects in a shorter amount of time. In 1990, the Anabolic Steroid Act classified steroids as a controlled substance and made it illegal to use anabolic agents without a physician’s prescription. They are synthetic derivatives of the male hormone testosterone. Generally, anabolic agents promote the growth of skeletal muscle and the development of the male sexual characteristics. Doses are usually 10 to 100 times larger than those used for medical conditions. Adverse effects include infertility, breast development, shrinking of testicles, excess growth of body hair, tendon rupture, enlargement of left ventricle, acne, baldness, increased risk of infection and mood changes.

Dehydroepiandrosterone (DHEA) falls under the class of anabolic agents. It was pulled by the Federal Food and Drug Administration (FDA) in 1985 because of links with liver damage. However, in 1994 as a result of the Dietary Supplement Health and Education Act, DHEA was reclassified as a dietary supplement and sold over-the-counter. There
has been little research done to examine the effects it has on body composition, fat distribution, strength, and athletic performance.\textsuperscript{10}

A compound chemically related to DHEA is androstenedione. It is a precursor to endogenous testosterone and is thought to provide significant gains in fat-free muscle mass.\textsuperscript{10,11} There are numerous variations of androstenedione available and athletes may not necessarily be able to know which forms of the substance are banned.\textsuperscript{4} Similarly to DHEA, research supporting claims that androstenedione produces performance enhancements are scarce.\textsuperscript{4} Note that side effects associated with both DHEA and androstenedione are unknown but may be consistent with other anabolic agents.\textsuperscript{10,12}

Diuretics are used to increase urination. Medically, they are used to control hypertension, reduce edema and treat congestive heart failure.\textsuperscript{3} Athletes use diuretics to achieve rapid weight loss or to reduce concentration of a drug in the urine. The primary concern associated with the use of diuretics is the threat of dehydration accompanying the excessive loss of electrolytes.\textsuperscript{8}

The most commonly known and used street drug on the NCAA banned substance list is marijuana. It causes changes in personality, induces hallucinations, delusions and
symptoms of psychosis. Its effects on the CNS include impairment of short-term memory and perception. Other concerns are tachycardia, bronchodilation, increased blood flow to the limbs, and decreased maximal work capacity.³

Lastly, human growth hormone (HGH) and erythropoietin (EPO) are members of the peptide hormone category of the NCAA banned substance list. HGH is a polypeptide hormone produced by the anterior pituitary gland. Its major function is stimulation of growth from birth through adulthood and it is important in energy production and storage.³ EPO is a glycoprotein that stimulates red blood cell production and is believed to increase oxygen absorption, reduce fatigue and improve endurance with the increase of red blood cells. Adverse effects include increased blood viscosity, which increases the risk of coronary and cerebral artery blockages.⁸

Nutritional Supplements

While some ergogenic aids are illegal and banned by the NCAA, others are very easily attainable as over-the-counter supplements and energy boosters. Claims have been made across the board regarding the performance enhancing benefits and side effects of nutritional supplements.³,⁴,¹¹,¹⁵ Because the Food and Drug Administration (FDA) does not
strictly regulate the supplement industry, the user is left vulnerable to the effects of the substance.\textsuperscript{11,13} For example, “mental enhancers” do not list ephedrine as an ingredient but it is often discovered to be included. The herbal product guarana, for instance, contains enough caffeine to result in a positive drug test.\textsuperscript{14} Circumstances like this can not only lead to an athlete’s positive drug test but may leave their health at risk.

Creatine is a nitrogenous compound naturally synthesized by the liver, pancreas, and kidneys.\textsuperscript{11} It is a combination of the amino acids glycine, arginine, and methionine.\textsuperscript{12} Creatine can be obtained through the diet with the consumption of meats and fish.\textsuperscript{10,11} Rapid depletion of phosphocreatine (PCr), the body’s primary source of anaerobic energy, is believed to be the limiting factor during a maximal workout.\textsuperscript{15} When taken orally, creatine is absorbed by skeletal muscle to the limit of saturation. Supplementation of creatine can be done in two ways, either through a loading phase followed by a maintenance phase or with no loading phase.\textsuperscript{11}

Amino acids and proteins in over-the-counter supplements are widely used by athletes trying to improve performance and gain increases in muscle mass. Combinations of amino acids form proteins, the basic
structure of muscle tissue and source of muscle energy.\textsuperscript{16} While athletes generally require a higher intake of dietary protein, it is often not necessary to supplement large doses. Regular physical activity and dietary protein build adequate muscle mass.\textsuperscript{17} Supplementation of amino acids is thought to promote and increase formation of muscle proteins and energy. The amino acid l-carnitine is believed to promote aerobic and anaerobic endurance as well as fat loss.\textsuperscript{16} Many of the amino acids marketed are branched chain amino acids (BCAA) which are naturally released by the liver during exercise and delivered to the muscles. BCAA include leucine, isoleucine and valine. There are several adverse effects of protein and amino acid supplementation to be concerned about. Diets high in protein place an increased stress on the kidneys as well as possible fluid imbalances due to dehydration in response to an increase of nitrogen. An increase in some amino acids can interfere with the absorption of others and leucine can stimulate, or in some cases, over stimulate the pancreas’ secretion of insulin.\textsuperscript{16}

Athletes may also employ vitamins and minerals as sources to enhance performance. Manufacturers claim that supplementation of vitamins and minerals can reduce body fat, decrease pain and inflammation, promote mental well
being, increase muscle strength and endurance and propel aerobic and anaerobic capacity; however, these claims may only be coincidence. It is important for an athlete using such supplements to maintain an appropriate balance. Consumption of some vitamins including vitamin C, niacin, vitamin B6, and folic acid can result in adverse effects if not used within the limits set forth by the ADA.16

Use of Ergogenic Aids in Athletics

Usage Compared by Gender

Research done on the use of performance enhancement supplements has been varied. A study conducted by the National Collegiate Athletic Association (NCAA) surveying the use of substance abuse patterns of student athletes indicated that, since the study began in 1985, the trend of supplement use has decreased significantly. Yet use among athletes has been on the rise in the past ten years, particularly in male sports.18,19 Women tend to use multivitamins, calcium supplements, and mineral supplements more often than men, while men were more likely to use creatine and carbohydrate drinks as a source of fluid replacement.18,19 Male athletes tend to use a significantly higher percentage of energy and protein supplements
according to Froiland et al\textsuperscript{20} as well as ginseng, DHEA, amino acids, glutamine, HMB and androstenedione. The NCAA findings stated that amphetamine and alcohol use was greater among women’s sports. Anabolic agents, ephedrine, marijuana and smokeless tobacco use was found to be higher in men’s sports.\textsuperscript{18,19}

Usage Comparison by Sport

Baseball, water polo, lacrosse, rifle and skiing sports tend to report the greatest frequency of substance use. Baseball athletes are among the most prevalent users of banned substances such as amphetamines, anabolic steroids, and ephedrine. These athletes tend to use high percentages of social drugs including alcohol, marijuana, and smokeless tobacco.\textsuperscript{19} Creatine, calorie replacement supplements, and vitamin C are also used widely by participants in baseball.\textsuperscript{21}

Water polo athletes seem to use a large number of performance enhancing supplements which include amphetamines, anabolic steroids, and ephedrine. Their use of marijuana and alcohol are also high.\textsuperscript{19}

According to Froiland et al\textsuperscript{20} wrestlers are more likely to use caffeine, amino acids, and caffeine mixed with aspirin. Additional, social drug use is common among
wrestlers.\textsuperscript{19} A study conducted by Jacobsen et al\textsuperscript{21} states that wrestlers also consume high amounts of vitamin C and calorie replacement supplements.

Jacobsen et al\textsuperscript{21} reports that football athletes are the athletes using the most HMB, zinc, glucosamine, and DHEA supplements. This study also states that creatine usage is exceptionally high in football athletes.

Men’s and women’s soccer both report a low occurrence of anabolic steroid use according to a study conducted by the NCAA.\textsuperscript{19} Men’s soccer athletes seem to use moderate levels of energy supplements such as amphetamines and ephedrine products.\textsuperscript{19} Their social drug use, such as alcohol, marijuana, and smokeless tobacco, appears to be closer to moderately-high levels when compared to other sports. Unlike men’s soccer, trends in women’s soccer show that use of amphetamines is higher than other sports and that the usage of ephedrine products has increased in recent years.\textsuperscript{19} Social drug use among women’s soccer is moderate compared to other sports.

Volleyball athletes appear to have some of the lowest percentages of use of banned substances, nutritional supplements, and social drugs.\textsuperscript{19}
Usage Comparison by Division

According to the NCAA, the use of amphetamines, ephedrine, and anabolic steroids by Division I athletes has increased slightly. Social drug use of alcohol has decreased in past years in Division I with only 79.2% of the student athletes surveyed reportedly consuming alcohol.

Division II social drug use of alcohol has also decreased; 79.7% represents the Division II athletes admitting to use of alcohol. However, Division II was found to be the most frequent users of smokeless tobacco. Use of anabolic steroids and ephedrine have slightly increased and their use is more frequent in Division II athletes than Division I.

Although alcohol consumption has decreased in Division III athletics, it is most prevalent at the Division III level with 82.6% of the division III athletes surveyed reportedly using alcohol. Marijuana use has also decreased, but is most commonly used in Division III athletics. Ergogenic aids banned by the NCAA were found to be most regularly used by Division III athletes, particularly amphetamines, the use of which has decreased in the past eight years.
Sources of Information

The resources that athletes use to gain information about ergogenic aids and nutritional supplements are quite varied. Athletes often receive information from questionable sources such as media, coaches, television, family, friends, and magazines.\textsuperscript{20} In a study done by Froiland et al\textsuperscript{20} only a small percentage of athletes used reliable sources like pharmacists, university classes and dietitians to learn about performance enhancing and banned supplements. This study also showed that males were more likely to receive information from store nutritionists, fellow athletes, media, and coaches, while a greater number of females went to a family member for their information. Female athletes received more information overall. In relation to differences in sport, wrestlers stood out by getting a majority of their information from coaches.\textsuperscript{22}

Reasons for Use

Collegiate athletes have a variety of reasons for using ergogenic aids in competition. Their primary reasons include health benefits, increased energy, improved
strength and power, increased weight, increased muscle gain and increased metabolism. Weight loss also ranked highly as a reason for using supplementation, particularly among female athletes and wrestlers. Female athletes charge the majority of their supplement use “for their health” as a means of substituting for an inadequate diet.  

Males are significantly more concerned with improvements of speed, agility, strength and power. Specifically, creatine is used to increase energy in order to lift greater amounts of weight. In addition to muscle and weight gain, supplements are also used to burn fat and flush nutrients into the muscles. Females generally use calcium as a replacement for low calcium intake and bone health. Echinea and Vitamin E and C are used to enhance the immune system and prevent illness.  

Summary

The variety of ergogenic supplements is vast and the ways they improve athletic performance are numerous as well. Some substances such as anabolic steroids, peptide hormones and even creatine have proven to be effective means of increasing strength, endurance, power, and muscle mass. The adverse reactions are, in many cases, dangerous
or unknown. Many of these supplements, like creatine, amino acids, and hormone precursors are being sold in retail stores to athletes seeking an enhanced performance.

Trends illustrate that as a whole, the use of ergogenic aids is increasing and that, in most cases, males are higher users than females. The research also shows that usage among sport and division varies from study to study.

The research also shows that more athletes receive information about ergogenic aids from unreliable sources such as friends, family, and the internet rather than athletic trainers, physicians or registered dietitians.
APPENDIX B

The Problem
The Problem

Statement of the Problem

The purpose of this study was to explore the relationship concerning the use of performance enhancing supplements in collegiate athletes between gender and among sport and division. Athletes at every level are exposed to the usage of performance enhancing supplements. They offer the athlete a possible means to increase speed, strength, endurance and energy. However, the use of these performance enhancing supplements in the sports arena raises interesting questions: Is it fair for all those competing? Is it in the best interest of the health of the athlete? There is much information about the various performance enhancing supplements, but what do the athletes using them know, and what are they being told?

Definition of Terms

The following terms are used throughout the study and therefore will be defined as they pertain to this specific research:

1) Ergogenic Aids - Any substance or supplement that claims to enhance athletic performance by improving physical work capacity and physiological function.
NCAA Banned Substances and Nutritional Supplements are included as ergogenic aids.

2) NCAA Banned Supplements – Six categories of drug-classes composed by the NCAA Executive Committee which ban the use of these substances in athletic competition. Categories include: CNS stimulants, anabolic agents, diuretics, street drugs, peptide hormones and analogues, and substances banned for specific sports.

3) Nutritional Supplements – products taken orally that contain a dietary ingredient intended to supplement the diet. These ingredients may include: vitamins, minerals, herbs, amino acids, creatine, and prohormones.

**Basic Assumptions**

The following are basic assumptions that can be made for this study:

1) All athletes are NCAA varsity athletes. No intramural or other athletes will be included in this study.

2) Athletes will answer all the questions honestly and to the best of their knowledge.
3) No athlete received assistance from any individual on any question.

4) The sampling is representative of its population.

Limitations of Study

The following are possible limitations of the study:

1) The subjects may not have answered the questions honestly or received help from another source.

2) A true sampling was not received due to only surveying one Division I, one Division II, and one Division III school.

Significance of the Problem

With the supplement companies bringing in billions of dollars annually through the sales of ergogenic supplements and their increased use in NCAA athletics, it is becoming important that coaches, athletic trainers, team physicians and athletic directors become aware of this use. There is a need to know what supplements are most often used or even abused by athletes as well as which supplements carry the greatest potential for harm. It is necessary that athletic trainers, team physicians and athletic directors are knowledgeable of what information athletes know about substances they are putting into their bodies.
APPENDIX C

Additional Methods
APPENDIX C1

Informed Consent Form
Informed Consent Form

1. Rebecca Knor, a graduate assistant at California University of Pennsylvania, has requested my participation in a research study at this institution. The title of the research is The Use of Ergogenic Aids by NCAA Student- Athletes.

2. I have been informed that the purpose of the research is to determine if there is a difference in ergogenic aids between gender and among sport, division and sources of information.

3. My participation will involve answering a questionnaire.

4. There are no foreseeable risks or discomforts by participating in this study.

5. There are no feasible alternative procedures available for this study.

6. I understand that the possible benefits of participating in the research are increasing knowledge and awareness of ergogenic aids.

7. I understand that the results of the research may be published but that my name or identity will not be revealed. In order to maintain confidentiality of my records, Rebecca Knor will maintain all documents.
in a secure location in which only the student researcher and research advisor can access. This will be done by the use of subject codes.

8. I have been informed that I will not be compensated for participation.

9. I have been informed that any questions I have concerning the research study or my participation in it, before or after my consent, will be answered by Rebecca Knor, 211 Cody Road, Herminie PA 15637. (724)309-7779. kno2299@cup.edu or by Bruce Barnhart, 255 California Avenue, California PA 15419. (724)938-4562. barnhart@cup.edu.

10. I understand that written responses may be used in quotations for publication but my identity will remain anonymous.

11. I have read the above information. The nature, demands, risks, and benefits of the project have been explained to me. I knowingly assume the risks involved, and understand that I may withdraw my consent and discontinue participation at any time without penalty or loss of benefit to myself. In signing this consent form, I am not waiving any legal claims, rights, or remedies. A copy of this consent form will be given to me.
Subject’s signature__________________________________Date____________

12. I certify that I have explained to the above individual the nature and purpose, the potential benefits, and possible risks associated with participation in this research study, have answered any questions that have been raised, and have witnessed the above signature.

13. I have provided the subject/participant a copy of this signed consent document.

Investigator’s signature__________________________________Date____________

Approved by the California University of Pennsylvania Institutional Review Board
APPENDIX C2

Ergogenic Supplement Use by NCAA Varsity Athletes
Questionnaire
Ergogenic Supplement Use by NCAA Varsity Athletes

INSTRUCTIONS

1. This questionnaire is divided into several sections. Read the information at the beginning of each section carefully.

2. Read the questions carefully. Most questions ask you to “mark one” but some ask you to “mark all that apply” or to write a short answer. Please print as clearly as possible when answering the short answer questions.

3. **DO NOT WRITE YOUR NAME ON THE QUESTIONNAIRE.**

4. When finished, return your questionnaire to the individual administering the survey.

5. If you have any questions, please ask.

________________________________________

DEMographics

The following questions ask background information about yourself. We are asking these questions so that we can better compare college athletes to other college students.

1. How old are you? _____ years

2. What is your gender? (Mark one) ___Male ___Female

3. How do you describe yourself? (Mark one)
   ___American Indian ___Puerto Rican or Latin American
   ___Black or African American ___Oriental or Asian American
   ___Mexican American or Chicano ___White or Caucasian
   Other (please specify)_________________________________

4. Where do you live now? (Mark one)
   ___Dormitory ___Parent’s home
   ___Fraternity/sorority house ___Off Campus
   Other_________________________________

5. What is your main sport?
   ___Football ___Men’s Soccer
   ___Volleyball ___Women’s Soccer
6. What year of eligibility are you in? (Mark one)
   ___ First year   ___ Fourth year
   ___ Second year   ___ Fifth year
   ___ Third year

7. Does your college or university have a drug testing program for student-athletes?
   ___ No --- Go to Question 10
   ___ Yes
   ___ Not Sure --- Go to Question 10

8. Have you ever been tested in your college’s drug testing program?
   ___ No
   ___ Yes

9. Has the threat of drug testing by your college discouraged you from using banned substances?
   ___ No
   ___ Yes
   ___ I would not have used banned substances regardless

10. To your knowledge, has the NCAA used drug testing on student-athletes at your college?
    ___ No --- Go to Section 1
    ___ Yes
    ___ Not Sure --- Go to Section 1

11. Has the threat of drug testing by the NCAA discouraged you from using banned substances?
    ___ No
    ___ Yes
    ___ I would not have used banned substances regardless

SECTION 1

1. What effect has your use of the following had on your athletic performance? (Mark one for each line)
   (Mark one for each line)
   a. Anabolic steroids Have never used Harmful No Effect Helpful
   b. Amphetamines (uppers) Have never used Harmful No Effect Helpful
   c. Weight loss products Have never used Harmful No Effect Helpful
   d. Nutritional supplements Have never used Harmful No Effect Helpful
   e. Vitamins and minerals Have never used Harmful No Effect Helpful
2. What effect has your use of the following had on you general health?

(Mark one for each line)

a. Anabolic steroids Have never used Harmful No Effect Helpful
b. Amphetamines (uppers) Have never used Harmful No Effect Helpful
c. Weight loss products Have never used Harmful No Effect Helpful
d. Nutritional supplements Have never used Harmful No Effect Helpful
e. Vitamins and minerals Have never used Harmful No Effect Helpful

SECTION 2

The following questions are about ANABOLIC STEROIDS

Examples: boldenone nandrolone stanozol testosterone

1. Have you used any anabolic steroids in the last 12 months? (Mark one)
   ___ No --- Go to question 7
   ___ Yes, but I’ve stopped now. --- Go to question 6
   ___ Yes

2. What is the ONE MAIN REASON you use anabolic steroids? (Mark one)
   ___ For sports-related injury or illness
   ___ For a non-sports related injury or illness
   ___ To improve athletic performance
   ___ To prevent injury
   ___ To improve physical appearance
   ___ For weight loss

3. Where do you usually get your anabolic steroids? (Mark one)
   ___ Coach  ___ Athletic Trainer
   ___ Team physician  ___ Other physician
   ___ Teammate or other athlete  ___ Friend or family
   ___ Pro scout or agent  ___ Strength coach
   ___ Website/Mail order  ___ Retail Store

4. During the competitive season of your sport, do you use anabolic steroids more or less than during the off-season? (Mark one)
   ___ I do not use anabolic steroids during the competitive season
   ___ Less during the competitive season
   ___ No difference between competitive season and off-season
__More during the competitive season

5. Do the members of your coaching staff know you use anabolic steroids? (Mark one)

___I am certain they know
___I am not sure if they know or not
___I am certain they do not know

6. When did you start using anabolic steroids? (Mark one)

___Junior high or before
___High school
___Freshman year of college
___After freshman year of college

7. If you have never used or have stopped using steroids, mark the ONE MAIN REASON why.

___I recovered from my injury or illness
___Concerned about what it might do to my health
___It is against my beliefs
___They are hard to get
___I had a bad experience with it
___I did not get the desired effects
___I was afraid of the consequences of being caught
___No desire to experience the effects
___Fear of losing my eligibility
___Coaches rules
___It is illegal
___Others would disapprove
___It costs too much
___It hurt my athletic performance
___I was afraid of becoming addicted
___Other

SECTION 3

The following questions are about NUTRITIONAL SUPPLEMENTS.

1. Have you used nutritional supplements (excluding multi-vitamins) in the last 12 months: (Mark all that apply)

___No --- Go to Question 7
___Yes, but I have stopped now. --- Go to Question 6
___Yes --- Please check all that apply

___Amino acids
___Creatine
___DHEA
___Andro or norandro products
___Ephedrine or ma haung
___HMB
___GHB
___Thermogenics (weight loss)
___Chromium
___Protein products
___Other supplement products
___Other
2. What are the reasons you use nutritional supplements? **(Mark all that apply)**

___For health reasons in general
___To recover from any injury or illness
___To improve athletic performance
___To prevent injury
___To improve physical appearance
___For weight loss/weight gain

3. Where do you usually get your nutritional supplements? **(Mark all that apply)**

___Coach    ___Friend or family
___Athletic Trainer   ___Pro scout or agent
___Team physician   ___Nutritionist/dietician
___Strength coach   ___Website/Mail order
___Other physician   ___Retail store
___Teammate or other athlete Other source___________________

4. During the competitive season of your sport, do you use nutritional supplements more or less than during the off-season? **(Mark one)**

___I do not use nutritional supplements during the competitive season
___Less during the competitive season
___No difference between competitive season and off-season
___More during the competitive season

5. Do the members of your coaching staff know you use nutritional supplements? **(Mark one)**

___I am certain they know
___I am not sure if they know or not
___I am certain they do not know

6. When did you start using nutritional supplements? **(Mark one)**

___Junior high or before    ___Freshman year of college
___High school            ___After freshman year of college

7. If you have never used or have stopped using nutritional supplements, mark the **ONE MAIN REASON** why.

___I recovered from my injury or illness
___Concerned about what it might do to my health
___It is against my beliefs
___Coaches rules
___It is illegal
___Others would disapprove
8. Which of the following are sources of information for taking nutritional supplements: (Mark all that apply)

___ Nutritionist/dietician
___ Coach
___ Athletic trainer
___ Strength coach
___ Teammate or other athlete
___ Team physician
___ Other (please specify)____________________________

SECTION 4

The following are questions about AMPHETAMINES. These are sometimes used to lose weight or to gain energy.

**Examples:** Benzedrine Preludin Dextroamphetamine
**Also called:** Speed Dexies Uppers Black Beauties Bennies

1. Have you used amphetamines the last 12 months? (Mark one)

___ No --- Go to Question 9
___ Yes, but I have stopped now. --- Go to Question 8
___ Yes

2. What is the **ONE MAIN REASON** you use amphetamines? (Mark one)

___ To give me more energy
___ For a sports-related injury or illness
___ To improve athletic performance
___ For a non sports related injury or illness
___ To improve physical appearance
___ For social or personal reasons
___ As an appetite suppressant to lose weight
___ Other (please specify)____________________________________

3. Where do you usually get your amphetamines? (Mark one)
4. During the competitive season of your sport, do you use amphetamines more or less than during the off-season? (Mark one)

___ I do not use amphetamines during the competitive season
___ Less during the competitive season
___ No difference between competitive season and off-season
___ More during the competitive season

5. Do you use amphetamines at the following times? (Mark all that apply)

___ Before practice
___ During practice
___ After practice
___ Before competition
___ During competition
___ After Competition

6. On how many different occasions have you used amphetamines during the last 12 months? (Mark one)

___ 1-2 times
___ 3-9 times
___ 10 or more times

7. Do the members of your coaching staff know you use amphetamines? (Mark one)

___ I am certain they know
___ I am not sure if they know or not
___ I am certain they do not know

8. When did you first use amphetamines? (Mark one)

___ Junior high or before
___ High school
___ Freshman year of college
___ After freshman year of college

9. If you have never used or have stopped using amphetamines, mark the ONE MAIN REASON why.

___ I recovered from my injury or illness
___ Concerned about what it might do to my health
___ It is against my beliefs
___ Coaches rules
___ I do not like it
___ Others would disapprove
___They are hard to get
___I had a bad experience with it
___I did not get the desired effects
___I was afraid of the consequences
  of being caught
___No desire to experience the effects
___Fear of losing my eligibility
___It costs too much
___It hurt my athletic
  performance
___I was afraid of becoming
  addicted
Other_____________________

SECTION 5

The following question is about **Other Substances**

1. Have you ever used any of the following in the last 12 months: (Mark all that apply)

   Peptide Hormones
   __ Human growth hormone (HGH)
   __ Epitestosterone
   __ Erythropoietin (EPO)
   __ Clenbuterol
   __ Human chorionic gonadotrophin (HCG)

   Social Drugs
   __ Alcohol
   Tobacco:  ___ cigarettes  ___ smokeless
   __ Marijuana
   __ Psychedelics
APPENDIX C3

IRB Human Subjects Form
California University of Pennsylvania

PROTOCOL for Research Involving Human Subjects

Institutional Review Board (IRB) approval is required before beginning any research and/or data collection involving human subjects.

(Reference IRB Policies and Procedures for clarification)

Project Title: Ergogenic Supplement Use by NCAA Varsity Athletes
Researcher/Project Director: Rebecca A. Knor
Phone #: (724) 399-7779 E-mail Address: kmo2999@sop.edu
Faculty Sponsor (if required): Dr. Bruce Barnhart
Department: Health Science and Sport Studies
Project Dates: February 2006 to April 2006
Sponsoring Agent (if applicable):

Project to be Conducted at: California University of Pennsylvania, Washington and Jefferson College and the University of Pittsburgh

Project Purpose: X Thesis □ Research □ Class Project □ Other

Keep a copy of this form for your records.

Required IRB Training
The training requirement can be satisfied by completing the online training session at http://cme.nci.nih.gov/. A copy of your certification of training must be attached to this IRB Protocol. If you have completed the training at an earlier date and have already provided documentation to the California University of Pennsylvania Grants Office, please provide the
A. The purpose of this study is to explore the relationship between the knowledge and education of performance enhancing supplements and their use in college athletics. Athletes at every level are exposed to the usage of performance enhancing supplements. They offer the athlete a possible means of increasing speed, strength gains, endurance and energy. However, the use of these performance enhancing supplements in the sports arena raises interesting questions: Is it fair for all those competing? Is it in the best interest of the health of the athlete? There is much information about the various performance enhancing supplements, but what do the athletes using them know? And what are they being told? The following hypotheses were based on a review of the literature and intuition of the researcher.
1.) Males will use more ergogenic aids than females.
2.) Use of ergogenic aids will be dependent upon sport.
3.) Use of ergogenic aids will be dependent on NCAA Division level. All tests of statistical significance will use an alpha level of .05. To test hypothesis I a Chi-square for goodness of fit will be used. Hypotheses II and III will be tested with a Chi-square for independence.

B. Section 46.11 of the Federal Regulations state that research proposals involving human subjects must satisfy certain requirements before the IRB can grant approval. You should describe in detail how the following requirements will be satisfied. Be sure to address each area separately.

a. How will you insure that any risks to subjects are minimized? If there are potential risks, describe what will be done to minimize these risks. If there are risks, describe why the risks to
participants are reasonable in relation to the anticipated benefits.

There are no foreseeable risks.

b. How will you insure that the selection of subjects is equitable? Take into account your purpose(s). Be sure you address research problems involving vulnerable populations such as children, prisoners, pregnant women, mentally disabled persons, and economically or educationally disadvantaged persons. If this is an in class project describe how you will minimize the possibility that students will feel coerced.

This study will be based on its population for each sport on a voluntary basis. If a subject is 17 years old, or younger, they will be excluded from the study.

c. How will you obtain informed consent from each participant or the subject’s legally authorized representative and ensure that all consent forms are appropriately documented? Be sure to attach a copy of your consent form to the project summary.

I will provide a written copy of the informed consent as well as reading the informed consent aloud to the subjects.

d. Show that the research plan makes provisions to monitor the data collected to insure the safety of all the subjects. This includes the privacy of subjects’ responses and provisions for maintaining the security and confidentiality of the data.

Once the data is collected it will be placed in a sealed envelope and kept in a lock box at the researcher’s residence. The questionnaires will be destroyed will all the data is recorded.

C. Check the appropriate box(es) that describe the subjects you plan to use.
<table>
<thead>
<tr>
<th>X Adult volunteers</th>
<th>X Mentally Disabled People</th>
</tr>
</thead>
<tbody>
<tr>
<td>X CAL University Students</td>
<td>X Economically Disadvantaged People</td>
</tr>
<tr>
<td>X Other Students</td>
<td>X Educationally Disadvantaged People</td>
</tr>
<tr>
<td>□ Prisoners</td>
<td>□ Fetuses or fetal material</td>
</tr>
<tr>
<td>□ Pregnant Women</td>
<td>□ Children Under 18</td>
</tr>
<tr>
<td>□ Physically Handicapped People</td>
<td>□ Neonates</td>
</tr>
</tbody>
</table>

D. Is remuneration involved in your project? □ Yes or X No. If yes, explain here.

E. Is this project part of a grant? □ Yes or X No. If yes, provide the following information:
   - Title of the Grant Proposal: ____________________________
   - Name of the Funding Agency: ____________________________
   - Dates of the Project Period: ____________________________

F. Does your project involve the debriefing of those who participated? □ Yes or X No.
   If Yes, explain the debriefing process here. If your project involves a questionnaire interview, ensure that it meets the requirements of Appendix ___ in the Policies and Procedures Manual.
Project Director's Certification
Program Involving HUMAN SUBJECTS

The proposed investigation involves the use of human subjects and I am submitting the complete application form and project description to the Institutional Review Board for Research Involving Human Subjects.

I understand that Institutional Review Board (IRB) approval is required before beginning any research and/or data collection involving human subjects. If the Board grants approval of this application, I agree to:

1. Abide by any conditions or changes in the project required by the Board.
2. Report to the Board any change in the research plan that affects the method of using human subjects before such change is instituted.
3. Report to the Board any problems that arise in connection with the use of human subjects.
4. Seek advice of the Board whenever I believe such advice is necessary or would be helpful.
5. Secure the informed, written consent of all human subjects participating in the project.
6. Cooperate with the Board in its effort to provide a continuing review after investigations have been initiated.

I have reviewed the Federal and State regulations concerning the use of human subjects in research and training programs and the guidelines. I agree to abide by the regulations and guidelines aforementioned and will adhere to policies and procedures described in my application. I understand that changes to the research must be approved by the IRB before they are implemented.

Professional Research

Project Director's Signature

Department Chairperson's Signature
The Institutional Review Board for Research Involving Human Subjects has reviewed this application to ascertain whether or not the proposed project:

1. provides adequate safeguards of the rights and welfare of human subjects involved in the investigations;
2. uses appropriate methods to obtain informed, written consent;
3. indicates that the potential benefits of the investigation substantially outweigh the risks involved.
4. provides adequate debriefing of human participants.
5. provides adequate follow-up services to participants who may have incurred physical, mental, or emotional harm.

☑ Approved  ☐ Disapproved

Chairperson, Institutional Review Board  3/2/06 Date
APPENDIX C4

Cover Letter
Dear Athletic Trainer,

I am conducting a study on the use of ergogenic supplements by NCAA varsity athletes. For my study to be accurate it is critical that I obtain my data directly from the athletes. My goal is to determine if there is a difference between gender, as well as among sport and division for the usage of ergogenic aids. The results of the study may be used to inform student-athletes, coaches, and athletic trainers of the need for drug education programs.

The results of the study will be completely confidential and participation in the study entirely voluntary. Athletes may volunteer to anonymously complete a questionnaire. An informed consent form will be given out prior to the questionnaire. I will administer the questionnaire to the athletes and will ask you to please leave the room to eliminate any participation bias. If you have any questions do not hesitate to contact me at 724-309-7779 or kno2299@cup.edu.

Thank you for your time and assistance.

Sincerely,

Rebecca Knor
REFERENCES


ABSTRACT

Title: ERGOGENIC SUPPLEMENT USE BY NCAA VARSITY ATHLETES

Researcher: Rebecca A. Knor

Advisor: Dr. Bruce Barnhart

Date: April 24, 2006

Research Type: Descriptive Design

Purpose: The purpose of this study is to explore the relationship between the knowledge and education of student athletes regarding performance enhancing supplements and their use in college athletics.

Method: A total of 126 subjects completed the Ergogenic Supplement Use By NCAA Varsity Athletes Questionnaire. The subjects were volunteers of NCAA athletes from Division I, II, and III institutions in southwestern Pennsylvania.

Findings: It was found that use of ergogenic supplements was dependent upon gender and sport. However, when comparing use of ergogenic supplements and divisions, no significant relationships existed. Further analysis found sources of information on nutritional supplements was dependent upon division.

Conclusion: Based on the results of this study, it can be said that a majority of student athletes engage in some aspect of substance use. Therefore athletic trainers should take steps to inform Division II and III athletes as to the advantages and hazards of ergogenic aids.