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Dietary supplement use amongst junior college athletes

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DIETARY SUPPLEMENT USE AMONGST JUNIOR COLLEGE ATHLETES

A Thesis

Presented to

The Faculty of the Department of Kinesiology

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Eliseo R. Muñoz

August, 2008

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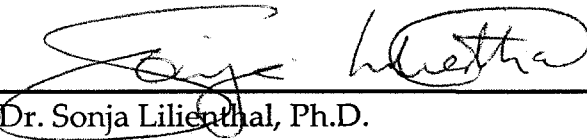
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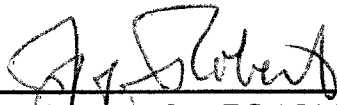
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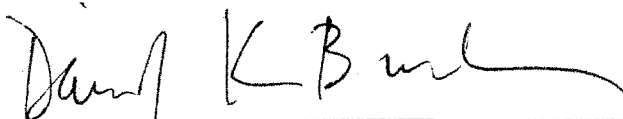


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ABSTRACT

DIETARY SUPPLEMENT USE AMONGST JUNIOR COLLEGE ATHLETES

by Eliseo R. Muñoz

This thesis addresses the topic of dietary supplement use amongst CA junior college (JC) athletes during the 2003-2004 academic years. The study examined the relationship between dietary supplements use and gender within the CA junior college population. In addition, the attitudes of student-athletes toward consumption dietary supplements, ethnicity, and factors influencing use were studied.

The current study revealed of the 130 subjects surveyed, 55% reported using dietary supplements. Approximately one third (29.23%) of subjects consuming to aid in athletic performance, most male and female users reported using to aid in athletic performance. Attitudes of dietary supplement users confirmed a lack of motivation to stop using dietary supplements. Family members were most likely to be influence subjects into using dietary supplements. Although no association was found between ethnicity and dietary supplement use, further research on this topic is recommended to identify and further investigate contributing factors to dietary supplement use.

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I would like to begin by thanking all the people who have contributed to my development as a student, person, and a professional. I would like to first give gratitude to my graduate advisor, Dr. Leamor Kahanov for helping me continue my academic journey and completion of my thesis.

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CHAPTER I

INTRODUCTION

Since the beginning of athletic competition, athletes have sought an edge to succeed on the playing field. When athletic ability does not enable the athletes to perform their best, many have focused on the use of dietary supplements to enhance performance. Dietary supplements, derived from ergogenic aids in sports, are typically used to assist athletes in performing with more speed and strength, and to endure more pain than normal (Naylor, Garder, & Zaichkowsky, 2001). Athletes at all levels explore ergogenic aids (Eichner, 1997). Silver (2001) and Sobal and Marquart (1994) describe athletes frequently use these ergogenic aids to improve performance through increased endurance, muscular strength/power, recovery from heavy workouts, and to prevent illness when severe exertions related to sport may decrease the autoimmune system; thus increasing the chances of winning. In order to gain an edge on the competition, many athletes have viewed dietary supplements as the key to success. Unfortunately, many athletes develop “win at any cost” mentality and are willing to do whatever is needed to enhance their chances of victory, even if it is both illegally and potentially physically harmful (Silver, 2001). The topic of

dietary supplement use and safety will be explored as it pertains to the easily influenced junior college athlete.

Various athletes are willing to take risks to reach the next level, especially when a celebrity endorser such as an athlete admits to consuming such dietary supplements as, creatine, androstenedione, and protein. When professional athletes admit using and/or market a dietary supplement product, young athletes will follow, because the professional athlete will attribute their success in part, to the dietary supplement product. For example, when St. Louis Cardinals'® slugger, Mark McGwire broke the Major League Baseball® homerun record and was linked to use of the supplement Androstenedione, shelves were left empty, and market sales of androstenedione soared (Jackson, 1998). High profile players have become role models. Their influence has led to the excessive use of dietary supplements among all levels of athletics, which could be considered a serious health concern (Shroder, Navarro, Mora, Seco, Torregrosa, & Tramullas, 2002). Although many dietary supplements promise gains and some deliver, various dietary supplements have been linked to cause of death or disability as a result of improper use. Dunn, James, Eddy, Wang, & Naggy (2001), explain that consuming more of the product than is recommended

athletes fail to consider the health related problems they may attain due to the consumption of these supplements.

Due to the popularity of sports in America, the possibility of earning millions of dollars at the professional level, and the use of promotional efforts by dietary supplement corporations, many athletes have chosen to experiment with dietary supplements. In 1997, the U.S. market made \$11.8 billion from dietary supplement sales (Ahrendt, 2001). Researchers have begun to collect data within the last twenty years on the causes of dietary supplement consumption and influences at the collegiate and high school level.

Studies on the consumption of dietary supplements by high school student-athletes have just recently been instituted due to the significant increase in use over the past decade (Dunn, James, Eddy, Wang, & Naggy 2001). The use of dietary supplements among adolescents seems to be influenced by their beliefs and attitudes that dietary supplements work (Dunn, et al.). This is why NCAA® student-athletes have also been studied. LaBotz and Smith, (1999) identified that approximately 33% of NCAA® Division I athletes surveyed admit to using the dietary supplement creatine in high school. Studies on junior college athletes and consumption of dietary supplements have yet to be conducted. Presently, due to the lack of substantial research and drug testing at the junior college level,

there is a lack of information on dietary supplement use. Findings in various student-athlete populations have led to the premise that junior college student-athletes may be using dietary supplements. This study will assess consumption, gender, ethnicity, and attitudes toward dietary supplement consumption in California (CA) junior college student-athletes.

PURPOSE OF THE STUDY

The purpose of the current study is to assess the frequency of dietary supplement use in California junior college student-athletes. In addition, gender, ethnicity and the attitudes of student-athletes toward consumption and factors influencing dietary supplements use will be described.

DELIMITATIONS

This study will be delimited to California junior college student-athletes who are of freshman or sophomore class standing and range from 18 to 25 years of age. This study has been delimited to survey CA junior college student-athletes participating in sports available at their junior college, such as: basketball, wrestling, baseball, volleyball, softball, track and field, swimming, diving, tennis, field hockey, gymnastics, football, lacrosse, cross country, soccer, and water polo. Full time academic fall, winter and spring male and female student-athletes will be surveyed.

LIMITATIONS

This study is limited by the following parameters: inability to sample all fall, winter, spring individual and, or team sports, because not all CA junior colleges have all sports. Due to this limitation, not all athletic sports will be surveyed, which limits sampling techniques and prohibits a complete representation of the CA junior college athletic population. This study is also limited to the responses of the athletes, which the researcher assumes is the truth. Untruthful answers may occur because the athlete may want to hide their dietary supplement habits and therefore may impose limits on the validity of the data. A lack of cooperation from CA junior college athletic school officials may be present, because school officials may not want their athletes surveyed, and school officials may feel threatened by the topic of dietary supplement consumption by their student-athletes. The focus of this study is California junior college student-athletes, which therefore limits the generalization of the study to the entire junior college student-athlete population across the country.

ASSUMPTIONS

Assumptions of this study include:

1. All subjects responded to the questionnaire honestly, truthfully and to the best of their ability.

2. Test administrator, peers, and school officials did not influence subjects.
3. Junior college student-athletes are knowledgeable and familiar with dietary supplements.

DEFINITIONS OF TERMS

The following terms are operationally defined for this current study.

Amino Acids – amino acids are the twenty building blocks of protein, which are organic acids containing an amine group and carboxyl group. Amino acids are molecules that contain a basic amino (NH₂) group, an acidic carboxyl (COOH) group and a side chain attached to an alpha carbon atom. The sequence of amino acids in a protein and, hence, the function of that protein, are determined by the genetic code in human DNA. Synthetic forms of amino acids have been formulated in a capsule form (e.g., Tyrosine, Glutamine, Arginine, Acetyl L-Carnitine, and Lysine).

Androstenedione – Androstenedione induces protein synthesis in muscle, stimulates release of growth hormone, and reverses effects of cortisol. Androstenedione has been promoted as a steroid precursor (e.g., 19-Nor 3-Andro®, Nor Andro fuel stack®, Anotesten®, and Andro poppers®).

Caffeine – Caffeine is an alkaloid. In doses of 100-200 mg. caffeine can increase alertness, relieve drowsiness and improve thinking. At doses of 250-700 mg/day, caffeine can cause anxiety, insomnia, nervousness, hypertension, and

insomnia. Caffeine is a diuretic and increases urination frequency. Caffeine enhances the contractility of skeletal and cardiac muscle, and helps metabolize fat, thereby sparing muscle glycogen stores (e.g., Coffee).

Calcium beta-hydroxy beta-methylbutyrate (HMB) – HMB helps to preserve muscle, improve performance and possibly aid in fat loss especially during the first month or two of weight training (e.g., Hmb Fuel® and Advance Steroidal complex™).

Celebrity endorser – Person of fame, a public figure, and or a star who sanctions, agrees to, authorizes and or gives the go ahead to use their fame to promote certain products for sale.

Chromium – Chromium is a dietary supplement that increases lean muscle mass while decreasing body fat (e.g., Chromium Picolinate, M2 Chromium™ and Mega Chromic Fuel®).

Contact or Collision sport – Sports placing the athlete at high (greater than normal) risk of traumatic injuries involving force (e.g., football, basketball, wrestling, lacrosse, field hockey, ice hockey, martial arts, diving).

Creatine – Creatine is a naturally occurring substance found in the skeletal muscle, heart, muscle, brain, testes, and other organs. Creatine enhances

intracellular production of ATP during muscle contraction and reduces muscle fatigue (e.g., Creatine Monohydrate, Creatine caps®, and Creatine liquid™).

Dietary supplement (dietary aid) – Dietary supplements are defined as a product (other than tobacco) intended to supplement the diet. Dietary supplements bears or contains one or more of the following: a vitamin, mineral, amino acid, herb or other botanical dietary substance for the used to supplement the diet by increasing the total dietary intake. Dietary supplements are: a concentrate, metabolite, constituent, extract, or combination of any ingredient described above and intended for ingestion in the form of a capsule, powder, soft gel, or gel-cap, and not represented as a conventional food or as a sole item of a meal or the diet (NIF, Office of Dietary Supplements). Dietary supplements observed in this study are Androstenedione, Creatine, Ephedrine, Caffeine, DHEA, Chromium, Amino Acids, HMB, Ma-Huang, Protein, and thermogenics.

Dehydroepiandrosterone (DHEA) – DHEA is a testosterone precursor (e.g., Dhea 100®, Dhea Sublingual®, Dhea Fuel®, and spray®).

Ergogenic Aid - An ergogenic aid is defined as any means of enhancing energy utilization, including energy production, control, and efficiency. Dietary supplements are ergogenic aids.

Ephedrine – Ephedrine is an herbal stimulant that increases subjective energy, decrease appetite and increase metabolism without exercise (e.g., Stacker®, Hydroxycut®, Xenadrine®, Ripped Fuel®, and Betalean®).

Injury – Injury is an act that damages or hurts an individual. Injury may result by accident or influenced by self or other individuals.

Limited Contact sports – Sports placing the athlete at some (unspecified quantity) risk of traumatic injury (e.g., Baseball, softball, cross-country, volleyball, cheerleading gymnastics).

Ma Huang – Ma Huang has the same properties as Ephedrine.

Non-Contact sports – Sports were the athlete has a low (ranking below others) risk of traumatic injury as a result of force.

Protein – Protein is one of the three types of nutrients used as energy sources by the body. Proteins provide four calories of energy per gram. Proteins are the building blocks of muscle and a large class of naturally occurring complex of amino acids. Proteins are required for the structure, function, and regulation of the body's cells, tissues, and organs. Each protein has unique functions. Proteins are essential components of muscles, skin, bones and the body as a whole. Proteins enhance muscle repair and growth (Dietary supplements include, Myoplex™, Nitro-tech™, protein bars, shakes and meal replacement fluids).

Sport Classification – Classification of sports based on degree or level of contact and strenuousness of activity. Classifications include: Contact or collision, limited contact, and non-contact.

Student-Athlete – A full time student participating in a varsity sport at a junior college.

Supplement – A supplement is a nutritional ergogenic aid orally consumed, which completes or adds to the nutritional components of a diet.

Thermogenics – Thermogenics are weight loss products, which produce water loss, increase metabolism, burn fat, increase mental alertness and increase physical performance. Ephedrine is almost always used in conjunction with caffeine as a thermogenic (fat-burning) supplement (e.g., Ultra Slim tea®, Trim Maxx®, Herbal slim 450™, and Dexatrim™).

SUMMARY

In recent years the level of professional competition in athletics in the United States has increased. The physical demand of professional sports is so high that even the smallest advantage gained by an athlete can provide a benefit during competition. For this reason, top athletes sometimes use dietary supplements to improve performance (Shroder, Navarro, Mora, Seco, Torregrosa, & Tramullas, 2002). For many high school and college athletes who inspire to reach the professional level and lack that gifted athletic ability will do

just about anything to reach the top. Unfortunately, many may feel that consuming dietary supplements will help them get there regardless of the potential health hazards. Among athletes, adolescents are a key market of the dietary supplement industry (Perko, Bartee, Dunn, Wang, & Eddy, 2000), where claims of increased energy, improved performance, and gains in muscular strength appeal to this population. Since junior college student-athletes are young and more likely influenced by celebrity endorses, tied together with convincing evidence that high school and NCAA® athletes are using dietary supplements, creates a basis for the current research. The purpose of this study is to determine whether CA junior college student-athletes are consuming dietary supplements.

CHAPTER II

REVIEW OF LITERATURE

Dietary supplement use began to be examined in athletics during the 1980s and 1990s, with a focus on vitamin and mineral consumption and other popular dietary supplements. Current studies have focused on high school and collegiate athletes, but research in the junior college (JC) athletic level is lacking. The National Collegiate Athletic Association (NCAA®) has conducted several survey studies of its athletes in addition to their annual random drug tests during the academic year, and discovered interesting positive and negative findings such as increased levels of protein and lower use of ephedra. Since the National Junior College Athletic Association (NJCAA), is the governing body of intercollegiate athletics for two-year colleges, has no drug testing policy and dietary supplement regulations, dietary supplement use at this level is unknown. The purpose of this study is to determine dietary supplement use by California junior college student-athletes, in addition gender, attitudes, ethnicity, and factors facilitating consumption will be observed.

ERGOGENIC AID AND DIETARY SUPPLEMENT EVOLUTION

The origin of dietary supplements began in the 1970's after athletic governing bodies began to regulate and administer drug testing to their athletes

to prevent cheating. Dietary supplements are legal, ergogenic aids, which came to light as a result of drug testing to lower the playing field. The history of dietary supplements use dates back to the ancient Greek times when warriors consumed various types of vegetation, such as mushrooms and sesame seeds to enhance performance (Mangi, 1981). During the 1800's, European cyclists took heroin, cocaine "speedballs" and ether-soaked sugar tablets (Eichner, 1997) and in 1967, British Tour de France cyclist Tommy Simpson died from amphetamine consumption (Voy & Deeter, 1991). This demonstrates the use of supplementation to aid sport prior the 21st century.

During the 1950s, a U.S. physician named John Zeigler identified that Soviet athletes were taking testosterone. Thereafter, he developed anabolic steroids for United States' athletes to compete with the Russian team (Eichner, 1997). The use of anabolic steroids in athletics became prominent during the 1960's and 1970's in Olympic and bodybuilding competitions, until the International Olympic Committee (IOC®) began testing Olympic athletes. In 1968, the IOC® initiated drug testing for anabolic steroids (an ergogenic aid) and was identified as a major problem in Olympic competition. Currently, it is estimated that as many as 3 million athletes in the United States have used

anabolic steroids for non-medically prescribed applications. (Street, Antonio, & Cudlipp, 1996).

Athletic organizations followed the IOC® drug testing procedures, after the findings of cheating at the Olympic level were found. U. S. professional athletic organizations began to take the initiative to protect their athletes by drug testing their athletes to discontinue the rampant use of anabolic steroids and other dietary supplements.

The National Football League (NFL®) and NCAA® began drug testing in the 1980's. The organizations were followed by other professional athletic organizations (National Basketball Association® and National Hockey League®). Recently, Major League Baseball (MLB®) has been in the media spotlight due to the revelation of abundance use of non-detectable "athletic enhancers" and dietary supplements within the MBL® community. MLB® is the last professional sports organization in the U.S. to institute random drug testing for anabolic steroids and other "athletic enhancers". The proposed testing procedure began during the 2005 MLB® regular season due to government pressure.

NATIONAL JUNIOR COLLEGE ATHLETIC ASSOCIATION

The National Junior College Athletic Association (NJCAA) independent from the NCAA® and other athletic governing bodies was conceived in 1937 in

Fresno, California. The NJCAA has existed and grown to an approximately 550 institutions and currently, does not have a drug testing policy. In 1992 the NJCAA developed the Substance Abuse Education/Testing Committee and developed a brochure addressing the subject of steroid use reported in the *NJCAA History* (n.d., ¶ 67). No testing procedures are conducted at the junior college level in California. The vast majority of athletes at the junior college setting are adults and, therefore, if the NJCAA wanted to enforce drug-testing policies like the NCAA®, the organization could apply those regulations. Unfortunately, the NJCAA fails to take any steps towards this direction of lowering the playing field such as many other athletic organization have done so in the past.

In the *NJCAA Purpose Paper* (n.d., ¶ 3) it states:

The NJCAA accepts its responsibility by seeking to provide a competitive environment that is free from drug and substance use and abuse in any form for the purpose of facilitating or enhancing athletic performance by the any athlete engaged in competition that is either sponsored or sanctioned by the NJCAA.

The NJCAA believes athletic participation is a privilege, and anyone who violates such regulations will have his/her continuation of rights and privileges of participation by the individual or the institution will be reviewed or revoked. The NJCAA does not stipulate which “drugs” an athlete can or cannot use.

Therefore, athletes can use illegal athletic performing enhancement drugs, dietary supplements, and recreational drugs without the consequences of discipline, by coaching staff, sports medicine staff, or any school officials. It is important to note that even though the *NJCAA Position Paper* states they do not drug test, it does:

Serve as a resource and referral agency for any athlete, coach, or administrator who wishes to secure information relative the effects, consequences and potential avenues of treatment for substance abuse; to coordinate the efforts of coaches and athletic administration in their efforts to serve as educational liaisons for those student-athletes wishing to further their athletic careers at four-year institutions that are subject to drug testing procedures (n.d., ¶ 4).

Furthermore, the NJCAA states in their *Position Paper* (n.d., ¶ 7) to its member institutions regarding the issue of drug-use, awareness, and counseling, the following policies:

1. Development and implementation of drug and alcohol awareness education program for all members of inter-collegiate athletic department staffs and student-athletes.
2. Development and distribution of an institutional policy statement relative to the use and abuse of alcohol, tobacco, drugs, and other controlled substances. This policy statement should address participation and the expectations of the member institution for each intercollegiate athletic department staff member's and student-athlete's standard of behavior.
3. Development and implementation of a plan for referral, treatment, rehabilitation for all members of intercollegiate athletic department staffs and student-athletes with drug and/ or alcohol-related problems.

4. By using various resources of individual institutions in response to institutional needs and demands, investigate the feasibility of a complete and comprehensive drug use and abuse-screening program.

The NJCAA has no position on the legality of consumption or use of dietary supplements specified in the "Position Paper". It does demonstrate concern with student-athletes who consume social drugs, but fails to state a position regarding the use of illegal or banned dietary supplements; unlike other athletic governing bodies who have banned numerous dietary supplements to reduce cheating during competition. If the NJCAA does not mandate drug test policies and discover the prevalence use, as other athletic governing bodies have done, athletes will continue to consume dietary supplements regardless of potential health hazards.

DIETARY SUPPLEMENT HEALTH AND EDUCATION ACT OF 1994

When athletic governing bodies restricted the use of "athletic enhancers," such as steroids, amphetamines, and other dietary supplements U.S. manufactures developed legal dietary supplements to reportedly help an athlete gain strength, size, and speed by promoting athletic improvement. Haller (2002), explains in his article,

A number of dietary supplements available in the U.S. are promoted to increase muscle mass, burn fat, and improve exercise tolerance, and are

permitted by some sport organizations. The use of supplements such as herbal stimulants, trace minerals, amino acids, and hormone precursors appears to be widespread, even encouraged, among amateur and professional U.S. athletes, as well as law enforcement, fire-fighting and military occupations. (p. 315).

Due to the quantity of manufacturing companies developing large amounts of dietary supplements, the Federal and Drug Administration (FDA) established the Dietary Supplement Health and Education Act (DSHEA) of 1994 in to protect the company rather than the consumer. Bove (2002), states the following in regards to the FDA,

Dietary supplements are regulated by the Food and Drug Administration under the DSHEA. Based on this act the supplement manufacturer must only ensure that a supplement is safe. Because of their status as a food, there are no requirements to document efficacy, and adverse event reporting is voluntary. (p. 19).

Once the DSHEA was instituted, manufacturing companies used this Act to promote dietary supplements as nutritional supplements and sell them in food stores. This allows small businesses to sell dietary supplements over the counter without any strict regulations. Currently, any business with a food license can sell these products. Due to the ready availability of dietary supplements, the U.S. population began to buy them in an attempt to balance their diet, prevent disease, ward off fatigue, enhance appearance, and improve athletic performance (Stephens, 2001). Athletes began to buy supplements to “enhance” their athletic

performance, produce slight anabolic effects, and/or increase a heightened awareness to increase their physical demands. Immediately thereafter, athletic governing bodies began to remove various dietary supplements from the “safe list” and add them to the “banned list”, which is subject to change by the executive committee. The *National Collegiate Athletic Association drug testing program* (2002, p. 6) reported no substance belonging to the prohibited class may be used, regardless of whether it is specifically listed as an example during 2002-2003 class listing. The DSHEA has been under review by the U.S. Congress as various deaths have been attributed to the use of certain dietary supplements, such as ephedra and creatine.

DIETARY SUPPLEMENTS FOCUSED IN THIS STUDY

While conclusive evidence has identified adverse effects associated with various dietary supplements, supplement use has increased significantly over the past decade (Dunn, et al., 2001). The U.S. Food and Drug Administration have minimal control over the production and sales of dietary supplements (DSHEA act of 1994), allowing manufacturers to sell dietary supplement products without providing proof regarding effectiveness of the product. The U.S. population continues to buy dietary supplements. In 1997 the U.S. market grew to \$11.8

billion in nutritional product sales, with approximately 50% of the population using some type of dietary supplement (Ahrendt, 2001).

The DSHEA (1994) defined a dietary supplement as “a product taken by mouth that contains a ‘dietary ingredient’ intended to supplement diet” (Retrieved January 21, 2002 from <http://fda.gov/opacom/laws/dshea.html>). A “dietary ingredient” must have one or a combination of the following: a vitamin, mineral, herb or other botanical, amino acid, a dietary substance of the use by man to supplement the diet by increasing the total dietary intake (enzymes or tissues from organs or glands), and/or a concentrate, metabolite, constituent or extract.

Various dietary supplements which have recently become illegal among certain athletic governing bodies include: growth hormone, androstenedione, beta blockers, blood doping, caffeine (> 15 mg's), DHEA, Diuretics, Ephedrine, GHB, HGH, and Ma Huang. Dietary supplements which are legal in most athletic governing bodies, include creatine, amino acids, caffeine (< 8 cups within an two-hour period), chromium, and protein products. These supplements can produce small, but significant effects when properly taken with the right nutritional diet and strengthening program. Although some dietary

supplements may provide a desired effect, the adverse effects and health hazards are not always understood or observed.

Amino acids are the twenty building blocks of protein. This dietary supplement, which can be attained through meat, has molecules that contain a basic amino (NH_2) group, an acidic carboxyl (COOH) group and a side chain attached to an alpha carbon atom, which help in protein synthesis. The sequence of amino acids in a protein and their function are determined by the genetic code in the human DNA. Complete amino acid supplementation can be reached by eating meat with 1-2 servings a day. Consumption of amino acids via dietary supplements has resulted in no physiological benefit in human performance, (Barnett & Conlee, 1984). Furthermore, Barnett and Conlee, tested the effects of amino acids on endurance athletes and determined that exercise caused a significant decrease in muscle glycogen, blood glucose levels, an increase in blood free fatty acids and lactate concentration(1984). Barnett and Conlee, concluded that the supplement had no beneficial effect of performance as indicated by its inability to alter significantly any metabolic or physiological parameter (1984). Although amino acids provide no benefits for athletic performance, an over consumption of amino acids will increase the possibility of attaining liver disease, muscular dystrophies, phenylketonuria, lead poisoning,

and develop folic acid deficiency (Retrieved November 21, 2002, from http://my.webmd.com/content/asset/miller_keane_2213). Amino acids are legal supplements allowed by athletic governing bodies.

Androstenedione is believed to exert its ergogenic effect through conversion to testosterone (Pecci & Lombardo, 2000). Very little research has been conducted on Androstenedione (andro) and the recommended dosage has not been found to cause any measurable change in testosterone levels, or provide any ergogenic benefit in inexperienced weight lifters (Pecci & Lombardo, 2000). One eight week study, evaluated androstenedione supplementation in 30 male subjects aged 19 to 29, and found subjects subjected to resistance training had no difference in muscle size, strength or overall body composition (King, Sharp, Vukovich, Brown, Reifenrath, and Uhl, 1999). King et al. (1999), researchers identified no increase in muscle mass or testosterone levels in men given daily dosages of 300 milligrams of androstenedione when compared to the control group. Androstenedione is produced by plants, which derive a natural alternative to anabolic steroids (Silver, 2001). It is sold as a nonprescription nutritional supplement, which manufacturers claim to build muscle mass and promote rapid recovery from injury. King, et al. (1999), suggested that consuming androstenedione, will increase the concentrations of estrogen and

increase the risk of cardiovascular disease, breast cancer, pancreatic cancer and gynecomastia. Androstenedione is a prohibited dietary supplement by the IOC®, NCAA®, NFL®, USOC® (United States Olympic Committee), and NBA® (National Basketball Association) (Silver, 2001). The sale of androstenedione became illegal in 2004 due to the FDA's crackdown on the supplement (Retrieved October 19, 2004 from http://www.fda.gov/bbs/topics/news/2004/hhs_031104.html).

Creatine is an amino acid derivative found in skeletal muscle, cardiac muscle, and brain (Silver, 2001). Creatine can be found in meat and fish and is synthesized primarily by the liver, kidneys, pancreas, and is excreted by the kidneys. The available creatine in skeletal muscle is the sum of free creatine and phosphocreatine, which both are important for the production of ATP (adenosine triphosphate) during anaerobic activity. Silver (2001), suggests oral creatine supplementation is considered ergogenic because of its potential to enhance ATP production during exercise. Ahrendt (2001), states that orally consuming creatine can increase muscle phosphocreatine stores by 6% to 8% and, thus, increase muscle stores of phosphocreatine causing faster regeneration of ATP. One study presented that consuming 20 grams of creatine per day improved sprint times over the placebo and control groups (Rockwell, 2001). Schilling, (2001) suggested that long-term (4 year) consumption of creatine

supplementation had no adverse effects on the subjects studied. A study performed on 25 football athletes consuming creatine over 28 days suggested that overall lifting volume increased 41 % during a controlled environment (Krieder, Ferreira, Wilson, Grindstaff, Plisk, & Reinardy, 1998). Creatine presents positive gains in short bursts of physical activity without significant side effects. The side effects of creatine consumption are muscle cramping, dehydration, gastrointestinal distress, nausea, seizures, and possible kidney dysfunction (Silver, 2001). Creatine is a legal product consumed by athletes and is not prohibited by athletic governing bodies.

Chromium is a supplement that increases muscle mass by increasing glucose uptake my muscle cells. Therefore, regulating lipid deposition and decreasing body fat (Rosenbloom, Millard-Stafford, & Lathrop, 1992). Rosenbloom, et al. (1992), suggested that, due to the possible results of chromium supplementation, athletes are intrigued with the role of chromium use with insulin injections. Rosenbloom, et al., noted that in a recent review of animal and human studies on chromium and exercise, exercise stress exacerbated the clinical signs of marginal chromium deficiency. This suggests that further studies on chromium must be collected to determine the actual effects of chromium. Consumption of chromium has no benefits in increasing lean mass when

consuming 400 µg of chromium when the individual is deficient in chromium (Ahrendt, 2001). A possible adverse effect is increasing insulin production. A positive effect with insulin increase detected with the administration of 220 mg of chromium has been shown to decrease fasting levels of insulin (Retrieved November 21, 2002 from <http://www.muscleandfitness.com/nutrition/supp/p/4631.jsp>). Chromium is a legal dietary supplement allowed by governing bodies.

DHEA (Dehydroepiandrosterone) is a precursor in the gonadal steroid pathway. In theory, DHEA may cause a physiologic testosterone synthesis (Ahrendt, 2001). DHEA has been studied in older men and women and found to increase a woman's testosterone level higher than a man's. Currently, there is a lack of published studies on the ergogenic benefits in younger athletes (Flynn, Weaver-Osterholtz, Sharpe-Timms, Allen, & Krace, 1999). Statistics on DHEA are inconclusive. Therefore, no long-term information is available on the effects of DHEA consumption on athletes and athletic performance during competition. Adverse effects of DHEA are similar to anabolic steroids, such as sexual and psychiatric effects, along with irreversible side effects such as hypertension, liver tumors, psychosis, deepening voice, clitoral hypertrophy, and premature closure of growth plates. The FDA banned DHEA as a natural steroid due to the lack of evidence of its safety and effectiveness as a drug; now sold as a dietary

supplement. DHEA is a prohibited dietary supplement by the OIC®, NCAA®, and NFL® as an anabolic steroid.

Stimulants such as Ephedrine, Caffeine, and Ma Huang enhance skeletal and cardiac muscle contractility. Stimulants aid in fat metabolism, thereby sparing muscle glycogen stores and increase individual awareness through central nervous system stimulation (Ahrendt, 2001). Combining caffeine with ephedrine or ma huang, doubles the effect. The stimulant combination increases subjective energy, decrease appetite, and increase metabolism without exercise (Ahrendt). Bell, Jacobs, and Zamecnik (1998) identified thru a double blind study of 8 patients, a prolonged time to exhaustion and decreased perception of exertion with a caffeine and ephedrine combination. Graham and Spriet, studied trained runners who ingested a caffeine dosage of 9mg/kg (high) before a pace race and found it increased the subjects' running endurance and decreased their cycling time by 44% to 51 % (1991). Health hazards when consuming a combination of these dietary supplements include restlessness, nervousness, insomnia, tremors, hyperesthesia, diuresis and death (Ahrendt, 2001). On December 30st, 2003, the Food and Drug Administration (FDA) issued a consumer alert on the safety of dietary supplement containing ephedra and the sale of ephedra products. The constitutional referendum placed by Congress,

states dietary supplements containing ephedrine alkaloids present an unreasonable risk of illness or injury; and would in effect ban ephedra products (Retrieved December 31st, 2003 from <http://www.fda.gov/oc/initiatives/ephedra/december2003/warningltr.html>). On April 12, 2004, the FDA took all ephedra alkaloid products off the shelves due to consumer safety concerns. (Retrieved November 10, 2004, from <http://www.fda.gov/bbs/topics/NEWS/2004/NEW01050.html>). Caffeine consumption is allowed by all athletic governing bodies, unlike ephedrine and ma huang, which are prohibited.

Protein and amino acids are the building blocks of muscle. Protein supplements are consumed to enhance muscle repair and growth. An inadequate intake of protein will reduce nitrogen levels in the muscle, therefore slowing muscle growth and increasing fatigue (Ahrendt, 2001). Studies on protein supplementation, presented experience resistance training athletes who consumed a daily allowance of 0.8 grams per kilogram of body weight had a negative nitrogen balance and a protein intake of 1.4 grams per kilogram produced a zero nitrogen balance (Tarnopolsky, Atkinson, MacDougall, Chesley, Phillips, & Schwarcz, 1992). An appropriate protein supplementation provided thru meat consumption can be reached, as recommended RDA levels for active people. Adverse effects of protein supplementation have not been presented

when consuming appropriate recommended protein supplements. Large consumptions of protein will convert protein into fat, contributing to excessive water removal from cells and leading to dehydration, kidney and liver damage (Arheim & Prentice, 1997). Protein is a legal supplement allowed by the athletic governing bodies.

Athletes are prohibited to use various dietary supplements by athletic governing bodies, because they may not be safe or insufficient data on the effectiveness has yet to be determined. The consumption of creatine has documented several side effects such as muscle cramping, dehydration, gastrointestinal distress, nausea, and seizures (Silver, 2001). King, et al. (1999), found a decreased levels of high-density lipoprotein and elevated levels of estrogen in subjects who received androstenedione. Low levels of high-density lipoprotein can contribute to cardiovascular disease risk. Ahrendt (2001), states that a combination of caffeine and ephedrine can cause restlessness, nervousness, tachycardia, arrhythmias, and hypertension, and, as of August 1998, at least 17 deaths have been linked to use of these products in combination. Safety is an important aspect of sport and regulating dietary supplements will prevent any unforeseen events. According to the U.S. Food and Drug Administration, the vast majority of dietary supplement products have not been subject to stringent

testing standards, and deaths have resulted from hyper-toxicity, allergic reaction, abuse, and disability including hospitalization (Perko, et al., 2000). It is essential for junior college athletes and the NJCAA to consider the health risks when their athletes are consuming dietary supplements, as the incidence of use by college and high school athletes will demonstrate in the following literature.

COLLEGE ATHLETES AND DIETARY SUPPLEMENTS

Studies have been conducted to assess the use of dietary supplements among student-athlete populations at various levels. The following reference document current trends with NCAA®. Sobal and Marquart (1994) conducted a study which detected approximately 76% of Division I college athletes used dietary supplements. The NCAA® research staff (1997) conducted survey study of 13,914 NCAA® Division I college athletes and determined substantial users of amino acids (8 %), creatine (13 %) and DHEA (1 %) (Retrieved from http://www.ncaa.org/library/research/substance_use_habits/1997/199709ABUSE.pdf). The following highlights the revision of the 1997 NCAA® study.

In 2001, the NCAA® research staff revised their research study of the NCAA® Study of Substance Habits of College Student-athletes. The study discovered several new factors different from the 1997 study (Retrieved from http://www.ncaa.org/library/research/substance_use_habits/2001/substance_use_

habits.pdf). Twelve percent of NCAA® colleges were surveyed, including Division I, II, and III athletic levels. Over 713 institutions were represented with 21,225 subjects sampled. Of the subjects surveyed, 61% were male, 38.9% were female and 0.09% did not indicate gender. The most significant finding regarding ergogenic aid use is that the use of amphetamines and anabolic steroids has increased since 1997. The use of amphetamines and steroids increased by 0.4% in Division I, but in Division II and III, amphetamine and steroids use declined. The rate of use of dietary supplements such, as ephedrine, first calculated in 1997, has also increased by 0.4%. Women have significantly increased the use of ephedrine, from 1.8% in 1997 to 6.7% in 2001. Women's ice hockey had increase of 11.8% from 1997. Women's gymnastics had a 7.2% increase of ephedrine use compared to field hockey with an increase of 5.7% and fencing with 4.1%. Athletes surveyed (57.3%) reported consumption of ergogenic aids/dietary supplements began during high school and 20.09% first used ergogenic aids/dietary supplements in their first year of college. Twenty seven percent report using ergogenic aids/dietary supplements to improve athletic performance. Eighteen point eight percent used ergogenic aids/dietary supplements to improving body appearance and 19.7% reported using ergogenic aids/dietary supplements for weight loss or an suppress their appetite. Six

percent report using ergogenic aids/dietary supplements for recovery from injury, another 19.6% report using ergogenic aids/dietary supplements for general health reasons, and 8.6% report using ergogenic aids/dietary supplements for injury prevention. Most athletes (58.7%) chose to purchase dietary supplements through a retail store. The 2001 NCAA® study demonstrates Division I athlete practices and attitudes, which are also seen in the following study focused on football players.

Johnnalagadda, Rosenbloom, and Skinner (2001) studied college football players' dietary supplement practices, attitudes, and physiological states. This study was conducted with 31 freshman football players at one NCAA® Division I school. Subjects were used to determine dietary supplement consumption, nutritional lifestyle, and reasons why they used dietary supplements. Forty-two percent reported using dietary supplements and 36% reported using creatine. Over 50% believed that protein supplements were necessary for muscle growth and development. Sixty five percent of subjects also believed that vitamins and mineral supplements increased energy levels. Although this study had a small sample size of thirty one subjects, a greater sample size is needed to correctly represent the population of freshman football players in Division I. These studies present the fact that dietary supplement consumption is a concern in the

collegiate athletic setting and therefore educating the athlete at this level and lower levels of athletic competition regarding the consequences are essential. The current collegiate research has traditionally focused on NCAA athletes only. It does not address the prevalence and cause of dietary supplement use by junior college student-athletes, highlighting the need for study of dietary supplement use by junior college student athletes.

HIGH SCHOOL ATHLETES AND INFLUENCES

According to the American College of Sports Medicine (ACSM®, 1998), the majority of elite male athletes and half of elite female athletes are consuming at least one or more supplement. ACSM® further estimates that over half of male high school athletes and about one-third of female high school athletes take supplements for performance enhancement (Roan, 1999). Roan (1999), helps establish the fact that dietary supplement use in high schools is a concern.

Massad, Shier, Koceja, and Ellis (1995), studied 509 high school athletes and reported a significant correlation ($p < 0.01$) to dietary supplement use and knowledge. The study discovered a correlation ($p < 0.01$) between dietary supplement use and gender. Massad et al. (1995), concluded that the greater a person's knowledge regarding dietary supplements, the less likely s/he was to use them, but males were more likely to use them than females. Massad et al.,

discovered athletes involved in contact sports, such as football and wrestling, had the highest incidence of supplement use. The authors believed dietary supplement use is more prominent in contact sports because these sports often require increase muscle mass and strength. Perko, et al. suggest 46% of athletes take dietary supplements above the general population of 40% (2000). Parents, health professionals, coaches, athletic trainers, and the media are consistently cited as influences of use/non-use (Perko, et al., 2000).

Skinner (1984) reported that one-third of high school students named their coaches as the prominent source of nutritional information. Skinner reported that 70% of adolescent subjects surveyed cited television as a source of nutrition information, 60% cited magazines, and 54% cited books as the source of dietary supplement information. Sobal and Muncie (1988) analyzed influences leading to dietary supplement consumption by high school athletes. Sobal and Marquart (1994) identified that boys ranked muscle development ($p < 0.04$) and sports performance ($p < 0.03$) higher than girls for reasons for using dietary supplements. Sobal and Muncie (1998), discovered that these subjects were more influenced by television/radio ($p < 0.01$) than by doctors ($p < 0.01$). Fleischer and Read (1982) reported that boys who were active participants in sports were significantly more likely to take supplements than non-participants. Fleischer

and Read discovered that 33 % of boys who took dietary supplements believed that the supplements specifically helped them in sports related activities.

Fleischer et al. also identified that boys who consumed supplements reported their close friends as frequent users. Similarly, those boys who were not supplement users reported having friends who were not users either. Douglas and Douglas (1984) recorded that 20% of high school athletes regularly used dietary supplements, with another 3% using strictly them during the season. Thompsen, Terry, and Amos (1987) identified that 59% of adolescent dietary supplement users believed that supplements helped them perform better in sports. These studies support the fact that the media provides a correlation between dietary supplement use and athletic participation. Coaches, friends, media, and athletic demands motivate many adolescents to use dietary supplements. Whether these are factors in junior college student-athletes has yet to be investigated.

OTHER INFLUENCES

Dietary supplement awareness has increased in the United States, as sport supplements have become widely used by U.S. athletes of all ages (Haller, 2002). Sales have escalated turning the supplement industry into a billion dollar per year business. Dietary supplement companies have used celebrity endorsers

such as Hollywood stars, professional athletes and bodybuilders to promote their products. This latest business tactic has been successful for the companies and the celebrity endorser, with dietary supplement sales reaching \$11.8 billion in 1997 (Ahrendt, 2001). The consequence for the consumer has yet to be fully investigated.

In the 1998 MBL® baseball season, the race to break Roger Maris' single season homerun record turned into controversy once Mark McGwire and Sammy Sosa admitted to using androstenedione and/or creatine. In competitive events, where the difference between winning and losing is small, many athletes seek ergogenic aids/dietary supplements that have no side effects and are not banned (Schroder, et al., 2002). These two high profile athletes are not the only athletes who have come forward and admitted to using dietary supplements. Baltimore Orioles™ outfielder Brady Anderson, former Dallas Cowboys™ quarterback Troy Aikman, former Denver Bronco™ tight-end Shannon Sharpe, Olympic sprinters, Linford Christie, Michael Johnson, and Donovan Bailey, as well as several Los Angeles Lakers™ consume dietary supplements (Bamberger, 1998). Bamberger reported that an estimated 75% of the Denver Broncos™ football team was on Experimental Applied Science (EAS®) dietary supplements. The endorsement of androstenedione, creatine, and DHEA by these

athletes/celebrities has helped dietary sales soar nationwide. In theory, young athletes hoping to reach the collegiate and professional levels are possibly associating the success of their role models with their prominent use of dietary supplements. Since a sport mirror society, the field of competition is on stage where athletes enact social values, and if winning is everything, some athletes may try anything to win (Eichner, 1997).

Bamberger (1998), reported in *Sports Illustrated*TM the prominent evidence of creatine use by adolescents as he interviewed 17-year old high school baseball player, Chad Oliva. Bamberger reports that Oliva's hero is Brady Anderson who he hopes to become one day. Oliva states in his interview, "Look at him, he's cut, but he's not a monster. He looks like a ball player" admiring the EAS[®] spokesman (Brady Anderson) an ardent creatine user (1998). When Bamberger questioned Anderson about kids and dietary supplements, Anderson was hesitant and responded with "It's not a magic potion...use it properly...read up on it...get advice from an adult. What would you tell a kid?" "I don't know." (1998). When posed with the same question, former Denver Broncos'TM tight end and EAS[®] spokesman, Shannon Sharpe, also showed some uncertainty about creatine's role concerning young athletes. He believed that dietary supplements have potential of being beneficial, but stressed adult and highly skilled athletes

should be the ones taking them. Given that young athletes are influenced by the practices of the professional, the continued use of dietary supplements by these athletes has the potential to trickle down into lower athletic divisions.

Professional athletes have an uncanny effect to influence young athletes who admire them and look up to them. Many of them are role models. This is why it is important to educate young people about the risks of consuming dietary supplements. Obviously, further studies need to be performed on the influence by celebrity endorsers such as professional athletes on student-athletes, which is yet to be determined by any student-athlete population.

SUMMARY

From Greek times to Olympic competition and from high school to collegiate and professional athletics dietary supplement use has been prominent. Due to the lack of research on junior college student-athletes, the question is whether this population has the same disposition with the use of dietary supplements as to compare NCAA athletes. Since the NJCAA does not randomly test their athletes, the use of dietary supplements among Junior College athletes is unknown. This study will describe the consumption of dietary supplements relating to CA junior college student-athletes.

CHAPTER III

METHODS

The purpose of this study is to determine the relationship of consumption of dietary supplements by CA junior college student-athletes. Secondly gender, ethnicity, factors influencing and attitudes towards dietary supplement use by CA junior college student-athletes will be described. The methods section will be presented in 4 sections: 1) sampling techniques, 2) description of the instrument, 3) data collection protocol, 4) analytical design.

SAMPLING

The subjects were obtained from 5 different California junior colleges, which represent different state demographic regions. During the 2003-2004 academic years a total of 130 subjects were surveyed. Sampling size was determined by using the GPOWER.EXE program provided by the Kinesiology lab at San Jose State University attaining a .50 effect size to provide reliability. All subjects were full time varsity student-athletes in CA junior colleges, who participated in: basketball, wrestling, baseball, volleyball, softball, track and field, swimming, diving, tennis, field hockey, gymnastics, football, lacrosse, cross country, soccer, or water polo. Subjects were first-year or second-year athletes

only, due to two-year playing limitation rules at junior colleges. A convenience sample will be used to attain the desired sample size.

DESCRIPTION OF INSTRUMENT

A questionnaire was developed by the researcher to collect the data. The questionnaire consists of 16 questions divided into five sections: prevalence of use/non-use, reason for consumption, history, personal beliefs, and demographics. A pilot study was conducted to assess content, accuracy, and clarity for each item and given to an expert review panel of five professionals; three certified athletic trainers and two registered dietitians in the allied health profession with a minimum of five years experience (see Appendix D & E). Approval from the Human Subjects committee at San Jose State University was obtained prior to administrating the survey. Reliability was assessed by calculating an interclass R for each factor, to express correlation within each factor, $R = (MS_S - MS_E) / MS_S$ (see Appendix A & B).

DATA COLLECTION PROTOCOL

The researcher contacted various CA junior college athletic department officials and athletic trainers in January, 2003 prior to the beginning of the semester, to determine willingness to participate along with the intended method of questionnaire distribution. A copy of the survey, along with documentation of

confidentiality, was presented via mail to school officials after gaining approval at each institution. The study purpose and instrument was reviewed and approved by the San Jose State University, Human Subjects Committee on January 28, 2003.

After receiving approval, CA junior college athletic trainers and officials were contacted days prior to instrument administration. A date and time were selected to meet with athletic staff officials to deliver the instrument and instructions to administrators. Staff athletic trainers administered the instrument to subjects on a selected day of the week. Athletes who entered the college's athletic training room were randomly asked to participate in survey study to determine dietary supplement use. Subjects who participated were instructed to complete the survey in an empty classroom/office near the athletic training room. Administrators implementing the instrument informed the subjects of the purpose of the study and the importance of their honesty. The administrator provided a copy of the consent form to all subjects. Subjects were informed all data provided by them will not be traced back to the school, sport, or, athlete and the only person seeing the responses will be the researcher. Subjects were informed of no risk or penalties for responding honestly. Subjects were handed a questionnaire and given a pen or pencil. Thereafter, they were

asked to read the instructions thoroughly and complete the survey. Survey completion took approximately 5 minutes. After completing the survey, subjects were thanked for their participation and allowed to leave. Subject who declined to complete the survey, were allowed to leave. The instrument and materials were returned to the test administrator via a stamped envelope. See Appendix B for the Questionnaire.

ANALYTICAL DESIGN

Descriptive statistics were used to describe variables. Descriptive analysis is presented in cross-tabulation tables to assess categorical data. Descriptive scores were used to determine percentages and frequencies for each question. Data was analyzed by using Statistical Package feature on Microsoft Excel, for PC's (Version XP, 2000). The results of this study will be presented to the Kinesiology faculty at San Jose State University and submitted to the SJSU Martin Luther King Library (see Appendix A).

CHAPTER 4

ANALYSIS OF DATA

The purpose of this study is to assess the relationship dietary supplement use among CA junior college student athletes. An evaluation of gender, ethnicity, and attitudes of student-athletes toward consumption of dietary supplements and factors influencing use will be described. A descriptive analysis was used to assess the scores of each question.

PRESENTATION OF DATA

A total of 275 surveys were distributed during the 2003-2004 athletic school year. One hundred thirty surveys were returned at a rate of 47% (n=130), higher than the 35% Melevin, P., Dillman, D., Baxter, R., and Lamiman, C. (1998) gathered with a mail only survey method. According to Dillman's Tailored Designed Method (2000), the possibility of attaining 68% return rate is possible with pre and post incentives and when follow ups are used. This study did not perform any follow ups or incentive for subjects surveyed, and therefore only attaining a 47% return rate. Descriptive statistics for each survey question will be presented first, followed by four 2 x 2 contingency tables describing cross-tabulation scores. See Appendix B for a copy of questionnaire, Appendix F for the raw data. Scores were rounded to its nearest hundredth percentile.

Demographics

The demographics in this study addressed gender, age, and ethnic background. Subjects varied in age and ethnicity. Subject's gender was distributed with the majority of 58% (n=75) being male subjects and 42% (n=55) female subjects (see Table 1).

Table 1.

Subjects' gender surveyed (N=130).

Gender	Frequency	%
Male	75	58
Female	55	42
Total	130	100

Age

Age demographics for the 130 subjects ranged from ages 18 – 25, the majority of subjects (n=43, 33%) were 19 years of age, followed by 18 (n=34, 26.1%) and 20 (n=27, 20.7%) years old. Twenty-one (12.3%) year old subjects constituted the least high number of athletes surveyed. Twenty-two, 23, and 25 year-old subjects responded less often to the survey. Twenty-four year olds were not surveyed (see Table 2).

Table 2.

Age of subjects surveyed (N=130).

Age	Frequency	%
18	34	26.1
19	43	33
20	27	20.7
21	16	12.3
22	4	3.07
23	4	3.07
25	2	1.53
Total	130	100

Ethnicity

An evaluation of ethnicity revealed the majority of subjects (n=59, 45.3%) responded by describing themselves as White. Hispanic or Latino (n=29, 22%) subjects were the next highest ethnic group described. The least high ethnic group reported by subjects surveyed (n=24, 18.46%) was Black or African-American. Other ethnic diversity less represented were American Indian,

Alaskan Native, Asian, Native Hawaiian, Pacific Islander and other subjects identified themselves of mixed ethnic background (see Table 3).

Table 3.

Ethnic background of subjects surveyed (N=130).

Ethnicity	Frequency	%
White	59	45.3
Black or African American	24	18.46
American Indian & Alaskan Native	1	0.77
Asian	2	1.53
Native Hawaiian & Pacific Islander	2	1.53
Hispanic or Latino	29	22
Other	13	10
Total	130	100

Sports Participation

Of the total 130 subjects surveyed, the majority of subjects (n=32, 24.61%) participated in track and field. Subjects who participated in either football or basketball (n=29, 22.3%) were the next highest athletic group surveyed, followed by softball players (n=12, 9.23%) and baseball players (n=10, 7.69%). Volleyball

participants were the least surveyed (n=9, 6.15%), along with soccer (n=5, 3.84%), cross-country (n=4, 3.07%), and golf (n=1, 0.77%) athletes. Sports available at the junior college level, but not represented in this survey include wrestling, swimming, diving, lacrosse, field hockey, cheer, ice hockey, water polo, gymnastics, martial arts, and tennis (see Table 4).

Table 4.

Sports participation of junior college student-athletes surveyed (N=130)

Sport	Frequency	%
Track and Field	32	24.61
Football	29	22.30
Basketball	29	22.30
Volleyball	8	6.15
Golf	1	0.72
Cross Country	4	3.07
Softball	12	9.23
Baseball	10	7.69
Soccer	5	3.84
Total	130	100

Supplement Use

The majority of athletes surveyed (n=72, 55%) answered, "Yes" to question 2, "Have you ever used dietary supplements excluding a multi-vitamin?" The remaining subjects (n=58, 45%) responded that they did not use dietary supplements. Subjects who responded "No" to question 2, was asked to skip to question 13 and complete the rest of the survey (see Table 5).

Table 5.

Junior college student-athlete response to dietary supplement consumption (N=130).

Response	Frequency	%
Yes	72	55
No	58	45
Total	130	100

Purpose for Dietary Supplement Use

Question 3 in the survey asked, "Why do you use dietary supplements?", and asked subjects to state the most important reason. Of the 130 subjects questioned, 72 (55%) responded to question 3, the most common reason why subjects used dietary supplements was to improve athletic performance (n=38, 29.23%). The second most common reason why subjects (n=12, 9.23%) used

dietary supplements was to aid in weight loss. The least common reasons subjects used dietary supplements are to aid in injury recovery, health reasons, improve physical appearance, prevent injury, and weight gain. Of the 130 surveyed 58 (45%) did not respond to question three (see Table 6).

Table 6.

Motive for dietary supplement use (N=130).

Dietary Supplement Use: Purpose	Frequency	%
No Response	58	45
Health reasons	6	4.61
Prevent injury	2	1.53
Injury or Illness recovery	4	3.08
Improve physical appearance	3	2.31
Improve athletic performance	38	29.23
Weight gain	1	0.77
Weight loss	12	9.23
Other	6	4.61
Total	130	100

Duration of Dietary Supplements Use

Responses to the amount of time the athletes have used dietary supplements include the most common period of time from 0 – 6 months (n=34, 26%). The next highest period of time subjects (n=16, 13%) have used dietary supplements is for a continued time of 2 years and over and is followed by subjects (n=13, 10%) who have consumed for a continuous time of 1-2 years. The least amount of subjects (n=9, 6%) who consumed dietary supplements have used continuously for a period of 7 months to a year. Of the 130 subjects surveyed 58 (45%) did not respond to question 4, (see Table 7).

Table 7.

Duration of dietary supplements use by junior college student-athletes (N=130).

<i>Duration of Supplement Use</i>	<i>Frequency</i>	<i>%</i>
No Response	58	45
0 - 6 months	34	26
7 months - 1 year	9	6
1 -2 years	13	10
Over 2 years	16	13
Total	130	100

Description of Dietary Supplements Used

Subjects were allowed to describe more than one dietary supplement used for the question pertaining to the types of supplements used. Of the 72 (55%) subjects who responded, 28 subjects reported using more than one dietary supplement. A total of 193 dietary supplements were reported used by subjects in Question 5. Of those who are taking dietary supplements, the majority of subjects (n=41, 21.24%) surveyed ingested a protein supplement such as a bar or in powder form. Creatine, the dietary supplement used most after protein supplements (n=25, 12.95%) was noted in either liquid or powder form. Stimulants such as ephedra, caffeine, and or ma-huang are the next most prevalent dietary supplement subjects (n=23, 11.91%) are consuming. Other dietary supplements used by subjects surveyed were amino acids (n=20, 10.36%), thermogenics (n=7, 3.62%), and androstenedione (n=5, 2.59%). The least amount of dietary supplements used was chromium (n=2, 1%) and DHEA (n=1, 0.51%). Several subjects (n=9, 4.66%) described using other various dietary supplements not listed on this survey, such as ecchanacia, chodroitin, and sports drinks. Of the 130 subjects surveyed 58 (45%) did not responded to question 5 (see Table 8).

Table 8.

Dietary supplements used by junior college student-athletes (N=193).

Type of Supplements Used or Using	Frequency	%
No Response	58	30.5
Amino Acids	20	10.36
HMB	2	1
Creatine	25	12.95
Thermogenics	7	3.62
DHEA	1	0.51
Chromium	2	1
Androstenedione	5	2.59
Protein Products	41	21.24
Ephedra, Caffeine, Mu Huang	23	11.91
Other	9	4.66
Total	193 ^a	100

Note. Subjects were allowed to score more than one variable in survey.

^aA total of 193 variable were recorded for the available dietary supplements from subjects surveyed.

Time Period of Dietary Supplements

Question 6 in the survey asked, "During the competitive season of your sport, do you use dietary supplements more or less than during the off-season?" Of 72 (55%) subjects who reported using dietary supplements, the majority (n=31, 24%) reported using less dietary supplements during the athletic season. Twenty-two (17%) subjects reported using more during the athletic season and 19 (14%) reported not using dietary supplements during the athletic season. Of the 130 subjects, 58 (45%) did not respond (see Table 9).

Table 9.

Point in time of supplement use by junior college student-athletes surveyed (N=130).

Period of use	Frequency	%
No Response	58	45
Don't use during season	19	14
Less during season	31	24
More during season	22	17
Total	130	100

Location of Purchase

Of the 130 subjects surveyed, a majority of (n=53, 41%) subjects reported purchasing dietary supplements at a retail store. Other variables with fewer scores were reported. Subjects did not report athletic trainers, coaches, pro scout or an agent as a source of attaining dietary supplements. Fifty-eight (45%) subjects did not respond to question 7 (see Table 10).

Table 10.

Dietary Supplement Purchase location (N=130).

Purchase location	Frequency	%
No Response	58	45
Retail Store	53	41
Nutritionist/dietician	3	2.3
Family member	6	4.61
Physician	1	0.77
Teammate	4	3.07
Website	1	0.77
Other	4	3.07
Total	130	100

Initial Period of Dietary Supplement use

The most frequent period when subjects (n=44, 34%) first began using dietary supplements was during high school. First year college freshman (n=18, 14%) had the next highest group of subjects using dietary supplements for the first time. Less incidence of first-time use were reported during the subjects' second year in college and junior high school. Of the 130 subjects surveyed, 58 (45%) did not respond to question 8 (see Table 11).

Table 11.

Initial period JC student-athlete surveyed used dietary supplements (N=130).

Initial time of use	Frequency	%
No Response	58	45
Junior high school or before	3	2.3
High School	44	34
Freshman year in college	18	14
After 1 st year in college	7	5.38
Total	130	100

Introduction to Dietary Supplements

A family member was named the most common individual to first introduce the subjects to dietary supplements (n=20, 15.38%). The next highest people named as the first to introduce subjects to dietary supplements were a friend (n=14, 10.76%) and teammates (n=14, 10.76%). Other individuals such as coaches, athletic trainers, strength coaches, nutritionists, news reports, and retail stores had less incidence of exposure of dietary supplements to subjects surveyed. Physicians and the internet were not sources subjects in this study identified as a resource for initial exposure to dietary supplements. Of the 130 subjects surveyed, 58 (45%) subjects did not respond (see Table 12).

Dietary Supplement Information Source

Subjects answering this question were allowed to describe more than one source of information on dietary supplements. Of the 72 (55%) subjects who responded, a total of 193 scores were documented for question 10. The majority of subjects (n=21, 10.88%) surveyed claimed a teammate as main source of dietary supplement information. Athletic trainers (n=18, 9.32%), family members (n=18, 9.32%), coaches (n=17, 8.80%), retail stores (n=16, 28%) and nutritionists (n=13, 6.73%) were named as sources of information on dietary supplements. Variables such as websites, magazines, strength coaches, physicians, and

academic journals were less noted as source of dietary supplement information.

Of the total 193 scores, 30% (n=58) of subjects surveyed did not respond to question 10 (see Table 13).

Table 12.

Individual who 1st presented dietary supplements to JC student-athletes (N=130).

People of interest	Frequency	%
No Response	58	45
Coach	5	3.8
Athletic Trainer	1	0.77
Strength Coach	4	3.07
Teammate	14	10.76
Friend	14	10.76
Family member	20	15.38
News reports	3	2.3
Nutritionist	1	0.77
Retail Store	6	4.61
Other	4	3.07
Total	130	100

Table 13.

Dietary supplement resource of information by JC student-athletes (N=130).

Source of Information	Frequency	%
No Response	58	30
Coach	17	8.80
Athletic Trainer	18	9.32
Nutritionist/dietician	13	6.73
Strength Coach	6	3.1
Teammate	21	10.88
Magazine	10	5.18
Family Member	18	9.32
Academic Journal	2	1.03
Physician	4	2.07
Website	10	5.18
Retail Store	16	8.29
Total	193 ^a	100

Note. Subjects were allowed to score more than one variable in survey.

^aA total of 193 scores were recorded for the available variables from subjects surveyed.

Subjects' Persistence to Dietary Supplement Use

Question 11 in the survey asked, "I will continue to use dietary supplements until..." Less than one-fifth of subjects (n=21, 16.15%) responded they would continue to use dietary supplements and would not stop.

Furthermore, 15 (11.53%) reported they would continue to use until the desired effects are not experienced.

Table 14.

Decision to continue dietary supplements among JC student-athletes (N=130).

Use until	Frequency	%
No Response	58	45
Received counseling	1	0.77
Compete in NCAA®	13	10
Don't experience effects	15	11.53
Experience side effects	12	9.23
See no need to stop	21	16.15
Other	10	6.15
Total	130	100

Thirteen (10%) subjects stated they would continue to use dietary supplements until they compete at the NCAA® level. Lastly, 12 (9.23%) subjects claimed they would continue to use until they experience side effects. Other subjects reported other reasons why they would continue use dietary supplements. Of the 130 surveyed, 58 (45%) subjects did not respond (see Table 14).

Do Non-Testing Policy Affect Subject's Dietary Supplement Use

Most of the subjects (n=42, 32%) responded by stating that the National Junior College Athletic Association non-testing policy does not affect whether or not they consume dietary supplements at the junior college level. The remaining subjects (n=30, 23%) reported, since the NJCAA does not have a "banned list", it does influence whether they consume dietary supplements. Of the 130 surveyed, 58 (45%) subjects did not respond to question 12 (see Table 15).

Reasons for Not Using Dietary Supplements

Subjects were asked to describe the main reason why they never used or had stopped using dietary supplements. Most (n=54, 42%) reported they had never used or stopped because the cost was too high. The next highest reason as to why subjects (n=27, 20.7%) stopped or never used dietary supplements was due to experienced side effects. Subjects (n=15, 11.53%) reported a decline in athletic performance as the next highest reason why they have stopped using.

Subjects reported with less frequency, competition in the NCAA, disapprove from others, health concerns, recovery from injury, against beliefs, no desire, unable to reach desired effects, and afraid of consequences as the reasons for not using or stopped using dietary supplements. Coaches' rules were not reported as a reason why subjects chose to use dietary supplements (see Table 16).

Table 15.

Do the non-existent NJCAA "banned list" policy affect supplement use (N=130).

NJCAA and consumption	Frequency	%
No Response	58	45
Yes	30	23
No	42	32
Total	130	100

Table 16.

Motive for dietary supplement use/non-use among subjects surveyed (N=130).

Rationale	Frequency	%
Compete in NCAA®	2	1.53
Disapprove from others	5	3.84
Health concerns	2	1.53
Hinders athletic performance	15	11.53
Recovered from injury or illness	2	1.53
Does not apply	1	0.77
Cost too much	54	42
Didn't experience effects	8	6.15
Against personal beliefs	6	4.61
No desire for effects	3	2.3
Experienced side effects	27	20.7
Afraid of consequences	2	1.53
Other	3	2.3
Total	130	100

CROSS-TABULATION TABLES

Two-Way Comparison of Dietary Supplements and Gender

A two-way cross-tabulation table was constructed between dietary supplement use (Q-2) and gender (Q-15). Of the 72 (55%) subjects who reported using dietary supplements, at least 1/3 of the subjects were male (n=45, 34.6%). Female subjects (n=27, 20.77%) constituted approximately 1/4 of the total subjects using dietary supplements. Of the 58 (45%) subjects who reported not using dietary supplements, the majority were male (n=30, 23.08%). Female subjects (n=27, 21.54%) not using dietary supplements consisted of approximately one quarter of total subjects surveyed, (see Table 17).

Table 17.

A cross-tabulation between dietary supplement use and gender (N=130).

Gender	Does use		Does not use		Total	
	Frequency	%	Frequency	%	Frequency	%
Female	27	20.77	28	21.54	55	42
Male	45	34.6	30	23.08	75	58
Total	72	55	58	45	130	100

Two-Way Comparison between Gender and Reason for Dietary Supplement use

A second two-way comparison table was constructed to determine frequency between gender (Q-15) and reason for dietary supplement use (Q-3). The most of males surveyed (n=31, 23.85%) reported using dietary supplements to help improve their athletic performance. Male subjects (n=4, 3.08%) also reported aid in weight loss and other variables not described in the survey as reasons for using dietary supplements. Most female (n=8, 6.15%) subjects used dietary supplements to aid in weight loss. Also, females' (n=7, 5.38%) second highest reason for using dietary supplements was to aid in increasing athletic performance. Other reasons such as health reasons, improved appearance, weight gain, injury prevention and recovery were less frequent reasons why both genders used dietary supplements (see Table 18).

Table 18.

A two-way comparison between gender and dietary supplement use (N=130).

Purpose	Male		Female		Total	
	Frequency	%	Frequency	%	Frequency	%
No response	30	23	28	21.53	58	44.62
Health reasons	2	1.54	4	3.08	6	4.62
Prevent injury	1	0.77	1	0.77	2	1.54
Injury recovery	3	2.31	1	0.77	4	3.08
Improve appearance	2	1.54	1	0.77	3	2.31
Improve performance	31	23.85	7	5.38	38	29.23
Weight gain	1	0.77	-	-	1	0.77
Weight loss	4	3.08	8	6.15	12	9.23
Other	1	0.77	5	3.84	6	4.62
Total	75	58	55	42	130	100

Note. Stub variables with a dash score were not recorded.

A Comparison between Gender and Attitude towards Continued Use

A third two-way comparison cross-tabulation between gender (Q-15) and attitude towards continued dietary supplements use was created (Q-11). Male

subjects provided various reasons to continue dietary supplement use. The main reason subjects (n=15, 11.5%) reported was that male athletes perceive no need to stop. Male subjects also reported a desire to continue dietary supplement use through NCAA® competition level (n=10, 7.7%) and or, experience side effects (n=10, 7.7%). Other male subjects (n=9, 6.9%) reported desire to continue dietary supplement use until desired effects cease to work. Female subjects provided two main reasons for continued use of dietary supplements. Female subjects (n=6, 4.6%) reported they would continue use until the desired effects cease and six (4.6%) separate female subjects reported no need to cease dietary supplement use. Female subjects (n=9, 6.92%) reported Other as another reason why they would continue to use, and receiving counseling was less noted as a reason why subjects would continue to use dietary supplements (see Table 19).

Table 19.

Two-way cross-tabulation between gender and attitude towards use (N=130).

Attitude	Male		Female		Total	
	Frequency	%	Frequency	%	Frequency	%
No response	30	23	28	21.53	60	46
Receive Counseling	-	-	1	0.8	1	0.8
Compete in NCAA®	10	7.7	3	2.3	13	10
Don't see desired results	9	6.9	6	4.6	15	11.5
Experience side effects	10	7.7	2	1.5	12	9.2
I don't need to stop	15	11.5	6	4.6	21	16.2
Other	1	0.77	9	6.92	8	6.2
Total	75	58	55	42	130	100

Note. Stub variables with a dash score were not recorded.

A Comparison between Ethnicity and Dietary Supplement Use

A final two-way comparison cross-tabulation table was constructed to determine if ethnicity (Q-16) contributed to dietary supplement use (Q-2).

Dietary supplement use among White (n=36, 28%) subjects was more common.

Subjects identifying themselves as Hispanic or Latino (n=17, 13%) were the next highest ethnic group using dietary supplements. Black or African American

subjects (n=11, 8.46%) were the least ethnic group using dietary supplements. Of the remaining subjects who reported not using dietary supplements, White (n=23, 17.69%), Black or African American (n=13, 10%) and Hispanic or Latino (n=12, 9.23%) scored the highest. Subjects identifying themselves as American Indian or Alaskan Native, Asian, Chinese, Filipino, and Japanese, Native Hawaiian or Pacific Islander, or other were less represented (see Table 20).

Table 20.

Two-way comparison between dietary supplement use and ethnicity (N=130).

Ethnicity	Yes		No		Total	
	Frequency	%	Frequency	%	Frequency	%
White	36	28	23	17.69	59	45.38
Black	11	8.46	13	10	24	18.46
American Indian	-	-	1	0.77	1	0.77
Asian	1	0.77	1	0.77	2	1.53
Native Hawaiian	1	0.77	1	0.77	2	1.53
Hispanic or Latino	17	13	12	9.23	29	22
Other	6	4.61	7	5.38	13	10
Total	72	55	58	45	130	100

DISCUSSION OF THE FINDINGS

The results of this study demonstrated that most of these athletes (n=72, 55%) used dietary supplements while participating as student-athletes at the junior college level in California. The current questionnaire exposed some important descriptive variables for dietary supplement use and how athletes associated use with increased athletic performance. The survey identified that seventy-two (55%) student-athletes reported using dietary supplements, with 38 (29.23%) of them reportedly using supplements to improve athletic performance and an additional 12 (9.23%) using for weight loss. Sobal and Marquart (1994) detected similar high scores of dietary supplement use as they discovered up to 76% of Division I college athletes used dietary supplements. Sobal and Marquart also suggested that most athletes used supplements to improve performance through increased endurance, muscular strength/power, recovery from heavy workouts, and to prevent illness. The NCAA®'s research study of 2001, revealed that 27.3% of all NCAA® athletes surveyed had consumed dietary supplements to improve athletic performance of and an additional 19.7% used supplements for weight loss, with 6.7% females using ephedra supplements to aid in weight loss. This study discovered 29.23% of CA junior college athletes surveyed used supplements for improvement in athletic performance and 9.23% used

supplements for weight loss. Of the student-athletes using dietary supplements to improve athletic performance, 31 (23.85%) subjects were male and seven (5.38%) subjects were female. Those student-athletes who reported using dietary supplement for weight loss, eight (6.15%) were female and four (3.08%) were male. Female subjects in the NCAA®'s 2001 research to used ephedra at 6.7% for weight loss, comparing favorably to the current study regarding female athletes and dietary supplement use. The results of this study demonstrate how athletes perceive the importance of dietary supplements to enhance sports performance as suggested by Sobal and Marquart (1994).

Students who reported using or have used dietary supplements described other important attitudes and beliefs towards consumption of dietary supplements. Specifically, the survey discovered that of the student-athletes who reported using dietary supplements, 44 (34%) began using during high school and 18 (14%) began using during their 1st year in college. This data correlates with LaBotz and Smith, (1999) who described that approximately 33% of NCAA® Division I athletes surveyed admitted to using dietary supplements in high school, and the NCAA®'s research study (2001) reported 20.09% of all subjects surveyed began using dietary supplements during their first year in college. The information is relevant because all three playing levels, high school,

2-year, and 4-year college athletics, have similar percentages in regards to the first time dietary supplements were used. The possibility of a relationship could exist and further studies would justify conclusive results, allowing professionals to educate athletes at the high school level on the benefits and consequences of dietary supplement use.

The importance of length of time of continuous dietary supplement consumption was also assessed in this study, and it was identified that most of (N=34, 26%) subjects used for a continuous time span of six months. Various athletes (N=16, 13%) also reported using dietary supplement for a consistent time span of two years and over, and an additional 13 (10%) reported using for a time of 1-2 years. Douglas and Douglas, (1984) recorded that 20% of high school athletes regularly used dietary supplements, with another 3% using strictly during the season. This CA junior college study discovered 17% (n=22) of subjects surveyed used dietary supplements more during the athletic season. This evidence may suggest subject's use of dietary supplements during the season to possibly improve athletic performance, maintain athletic performance and/or aid in weight loss as found in this study. Continuous periods of supplement use suggest athletes are using during the off-season, pre-season, and

season not allowing the body to rest, which could possibly lead to long term side effects as presented in the literature.

Subject's influences and decisions to consume dietary supplements were also described in this study to assess how people surrounding the athlete affected their choices on consuming dietary supplements. For subjects who reported using dietary supplements, 20 (15.38%) named a family member as the first person to introduce them to dietary supplements. An additional 14 (10.76%) named a friend(s), and another 14 (10.76%) subjects named a teammate as the people who first introduced them to dietary supplements. Of those people who influenced their choice of consuming dietary supplements, it was discovered that 21 (10.88%) subjects named a teammate as the main source of information on dietary supplements, along with 18 (9.32%) team athletic trainers, 18 (9.32%) family members, and 17 (8.8%) coaches. Skinner (1994) reported that 33% of all high school students named their coaches as the prominent source of nutritional information. A study by Perko, Roderick, Bartee, Michael, Dunn, Wang, and Eddy (2000), suggested that athletes using dietary supplements also named parents, health professionals, coaches, athletic trainers, and the media as influences of use. The current study revealed, along with previous research, that subject's relatives, peers, and people in their athletic circle had the most influence

on dietary supplement use and information. The percentages vary from Perko, et al. (2000) and Skinner, (1994), and the reason could be that those two studies were conducted on high school subjects and this study was conducted on college aged subjects, which could rationalize the reason for a distribution of percentages. High school athletes tend to listen to adult figures, unlike college student-athletes who tend to listen and rely on peers to make personal decisions.

The percentages varied in question five, "what kind of dietary supplements have you used?" which allowed for a broad description of dietary supplements used at the CA junior college level. Subjects in this question were permitted to describe more than one dietary supplement. The current study suggest that most commonly used dietary supplement by was protein. Forty-one (21.24%) scores were reported for protein products, with 25 (12.95%) scores reported for creatine supplements, followed by 23 (11.91%) scores for ephedra, ma huang, and caffeine products, and lastly 20 (10.36%) scores were reported for amino acids. The 2001 NCAA® study determined that 32.3% of all subjects surveyed (21,225) used protein supplements, 25.8% used creatine, and 10.4% used amino acids, correlating slightly with the high scores of this study. Johnnalagadda, Rosenbloom and Skinner, (2001) reported that 36% of subjects studied used creatine with an additional 50% using protein supplements to aid in

muscle growth and development. Massad, Shier, Koceja, and Ellis (1995) reported that 21.71% high school students used protein supplements, Froidland, Koszewski, and Hingst, (2004) found in their NCAA study that 37.2% of Division I athletes used creatine. Results from the current study vary from the Rosenbloom et al., (2001), the 2001 NCAA® study, the Massad et al., (1995), and the Froidland et al., (2004) studies, but they do all demonstrate that, at different levels of athletic participation, protein and creatine are the most common dietary supplements used by student-athletes. Occasionally, other dietary supplements scored higher in different study populations, demonstrating the broad spectrum of dietary supplements obtainable.

The availability of dietary supplements was researched by the NCAA® in the 2001 study, along with the main reason why student-athletes chose not use dietary supplements. In the NCAA® study, 41% of subjects reported the more common place to purchase dietary supplements was a retail store. The NCAA® 2001 study, reported an athlete's (58.7%) predominant choice of purchasing dietary supplements was also thru a retail store. The current study identifies more than half (n= 72, 55%) of subjects surveyed used dietary supplements, and also further investigated why 45% (n= 58) of subjects did not use dietary supplements. Subjects (n=54, 42%) indicated the cost of dietary supplements was

the main reason why they did not use, or stopped using dietary supplements. Furthermore, an additional 27 (20.7%) subjects reported not using or having stopped using due to experienced side effects. Another 15 (11.53%) reported not using due to hindered athletic performance. The NCAA® 2001 research study described the main reason why NCAA® athletes did not use dietary supplements was because 39.7% did not have a desire to experience side effects, followed by 15.9% of subjects who were concerned about what dietary supplements could do to their health. Perko, Bartee, Dunn, Wang, and Eddy, (2000) it is not clear why athletes chose or did not chose to use dietary supplements. Perko et al., (2000) state there are numerous factors that determine use or non-use of dietary supplement products. They do identify behavior intentions as the most immediate determinant of a person's intention to perform a behavior. Thus, there could be various factors why an athlete may chose to use or not use dietary supplements, but the athlete's psyche is the determining factor on whether they use or don't use dietary supplements according to the Perko et al., theory of behavior intentions. When comparing the results from this study and the 2001 NCAA® research study, it is evident that the athletes' reasons for not using dietary supplements differ, allowing speculation that income may be a

deterrent as to why CA junior college student-athletes in this study did not consume dietary supplements.

The demographics in this study are that 58% of subjects were male (n=75) and 42% were female (n=55) subjects. The majority of subjects' age was 19 years of age, with a mean average of 19.5 years. In the current study, most of the subjects described their ethnic background as White (n=55, 45.3%). The NCCA® 2001 research study also suggest most of the collegiate subjects surveyed (78%) were White, and 13.7% were Black or African American. An additional study on race and supplements by Kelly, Kaufman, Kelley, Rosenberg, and Mitchell (2006) suggest different results. That study determined that White (19%) subjects had the highest percentage of supplement use followed by Hispanics (12%) and African-Americans (9.5%). The ethnicity percentage results from the 2001 NCAA® study, Kelly et al., (2006) study and this study were slightly similar in ranking. Subjects in this study also described themselves as Hispanic or Latino (n=29, 22%) and Black or African American (n=24, 18.46%). The comparison of the three studies demonstrates some discrepancy in percentages between the more common races identified. Further investigation on the topic of dietary supplements and ethnicity would better predict factors determining dietary supplement use.

The principle of this study was to determine whether there was dietary supplement use at the CA junior college athletic level. It was found that more than half subjects use dietary supplements. As presented in the latter part of this study, athletes have different reasons for using dietary supplements, as well as when they first started using and who influenced them to use. It is important to recognize the importance of this topic and what can be done to properly educate and inform this population regarding dietary supplementation.

CHAPTER V

CONCLUSION

The purpose of this study was to assess the incidence of dietary supplement use among CA junior college student-athletes. The majority of research on dietary supplement use conducted in previous years typically focused on high school and collegiate athletics. The junior collegiate athlete population has yet to be addressed, creating the basis for this current study. Previous research reveals a common reason for dietary supplement use by athletes. Sobal and Marquart, (1994) indicated subjects used dietary supplements for improving athletic performance, increased muscular strength and increased energy levels. The desire for the junior college athletic population to succeed athletically and possibly advance to higher levels of competition led this author to seek for information on dietary supplement use at the junior college athletic level.

A descriptive study was performed do determine incidence of dietary supplement use in this study group. This study revealed more than one-half (55%) among these CA junior college student-athletes were consuming dietary supplements during the junior college playing time. The result of the current survey revealed an approximate equal amount of users to non-users of dietary

supplements, the data also revealed that approximately one-third (29.3%) of all users distinctly used supplements to improve athletic performance. The study discovered little difference between gender and use/non-use of dietary supplements. Lastly, the author found no discrepancy in the comparison of ethnicity and dietary supplement.

In conclusion, the subject of dietary supplement use by CA junior college athletes described the number of incidence, influences, and attitudes toward dietary supplement use by this population. Although only a slight number over one-half of subjects used dietary supplements, athletic departments at the junior college level should not overlook the topic of dietary supplement use since a large portion of the athletic participants across gender and ethnicity find supplements to be a viable asset to athletic performance enhancement. Educating junior college student-athletes and athletic staff at this level and other lower athletic levels on the risk of continued dietary supplement consumption should be a directive since junior college athletes do not have policies controlling dietary supplement consumption.

Continued investigation on the topic dietary supplement consumption and sport class in this population is recommended in addition to other mitigating variables not assessed in this study, such as socio-economic class, team standing

and perhaps other variables. A larger sample size with the sports surveyed in this study may allow greater propensity to assess relationships between sports and level of competition. Also, an updated dietary supplement survey would allow researchers to identify new dietary supplements in the current market. An updated survey may allow for various contingency tables for each observed sport and dietary supplements. Additional questionnaire items for non-user would describe the non-user's attitudes towards dietary supplements and athletes who are using. Lastly, further investigating subjects' demographics, such as, a survey geared toward only male and female student-athletes, a questionnaire solely studying the correlation of between ethnic race and dietary supplement use, and study on the impact of economic status and dietary supplement consumption may be advised. Although all topics on the subject of dietary supplement consumption at the junior college athletic level were not explored, further research on this population is recommended to view the overall effect of dietary supplement use at this level.

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APPENDIX A
COVER LETTER

Dear student-athlete:

You are being asked to be part of an important study in the field of human performance. This questionnaire is part of a CA junior college study for student-athletes, which asks about your opinions and experiences with dietary supplements.

If this study is to be helpful, it is important that you answer each question honestly and truthfully. If you cannot answer a question truthfully, leave the question blank. **The information you have provided will be kept anonymous and strictly confidential.** The only person who will view the questionnaires is the researcher. The results from this questionnaire will be reported; no individual athlete, team, or school results will be identified. **No one will be able to identify you and your answers.**

Your participation in this study is voluntary. You can omit answers to any question or discontinue your participation in the study at any time without penalty. Your voluntary completion of this questionnaire constitutes your informed consent to participate in the study.

Be sure to read the instructions carefully before you begin. If you have any questions, ask the individual administering the survey. Thank you for your help in this important California study.

Thank you for your help!

Sincerely,

Eliseo R. Munoz, ATC

APPENDIX B
DIETARY SUPPLEMENT SURVEY

DOES SPORT CLASS FACILITATE DIETARY SUPPLEMENT USE BY JUNIOR COLLEGE ATHLETES

Instructions

- Read the questions carefully. Most questions ask you to “mark one answer” but some ask you to write a short answer. Please print as clearly as possible for the short questions.
- Mark the box with an check mark (✓) that indicates your answer.
Do not write your name on the questionnaire. When finished, return your questionnaire to the individual administrating the survey.
- Please complete the following questions regarding *dietary supplements*. Dietary supplements are products that supplement the diet by increasing the total dietary intake. (ex. Dietary aids, nutritional supplements, ergogenic aids)

1. Which Junior College sport do you participate in (Identify **main** sport)?

- | | |
|--|---------------------------------------|
| <input type="checkbox"/> Track and Field | <input type="checkbox"/> X-Country |
| <input type="checkbox"/> Football | <input type="checkbox"/> Softball |
| <input type="checkbox"/> Basketball | <input type="checkbox"/> Baseball |
| <input type="checkbox"/> Wrestling | <input type="checkbox"/> Soccer |
| <input type="checkbox"/> Volleyball | <input type="checkbox"/> Ice Hockey |
| <input type="checkbox"/> Swimming/Diving | <input type="checkbox"/> Water polo |
| <input type="checkbox"/> Golf | <input type="checkbox"/> Gymnastics |
| <input type="checkbox"/> Lacrosse | <input type="checkbox"/> Martial Arts |
| <input type="checkbox"/> Field Hockey | <input type="checkbox"/> Tennis |
| <input type="checkbox"/> Cheerleading | Other _____ |

2. Have you ever used dietary supplements **excluding** a Multi-vitamin. (If **YES** continue, if **NO**, skip to question 13).

- YES
 NO

3. Why do you use dietary supplements? (Mark **only most important**)

- For health reasons
 Prevent injury
 Injury or illness recovery
 Improve physical appearance
 Improve athletic performance (speed, strength, power)
 Weight gain
 Weight loss
Other _____

4. If you are using/have used any of the above dietary supplements, how long have you been using them?

- 0 – 6 months
 7 months – 1 year
 1 – 2 years
 Over 2 years

5. Which dietary supplements have you used or, are using? **(Mark all that apply)**

- Amino Acids**
(Tyrosine, Glutamine, Arginine, Acetyl L-Carnitine & Lysine)
- HMB** - (Hmb Fuel®, Advanced Steroidal complex™)
- Creatine**
(Creatine Monohydrate, creatine caps®, & Creatine liquid™)
- Thermogenics**
(Ultra slim tea®, Trim Maxx®, Herbal slim 450™, & Dexatrim Natural™)
- DHEA** - (Dhea 100®, Dhea Sublingual®, Dhea Fuel®, & spray®)
- Chromium**
(Chromium Picolinate, M2 Chromium™, & Mega Chromic Fuel®)
- Androstenedione**
(19-Nor 3-Andro®, Nor Andro fuel stack®, & Andro poppers®)
- Protein Products**
(Myoplex™, Nitro-Tech™, Protein bars, Shakes, & Meal replacements)
- Ephedrine, Caffeine, or Mu Hang**
(Hydroxycute®, Xenadrine®, & Ripped Fuel®)

Other _____

6. During the competitive season of your sport, do you use dietary supplements more or less than during the off-season?

- I don't use them during the competitive season
- Less during the competitive season
- More during the competitive season

7. Where do you usually buy your dietary supplements? **(Mark one)**

- | | |
|---|--|
| <input type="checkbox"/> Retail Store | <input type="checkbox"/> Family member |
| <input type="checkbox"/> Athletic Trainer | <input type="checkbox"/> Physician |
| <input type="checkbox"/> Nutritionist/dietician | <input type="checkbox"/> Teammate |
| <input type="checkbox"/> Pro scout or agent | <input type="checkbox"/> Website |
| <input type="checkbox"/> Coach | Other _____ |

8. When did you start using dietary supplements? **(Mark one)**

- Junior high or before
- High School
- Freshman year in college
- After freshman year in college

9. Who first introduced you to dietary supplements? **(Mark one)**

- | | |
|---|--|
| <input type="checkbox"/> Coach | <input type="checkbox"/> Family member |
| <input type="checkbox"/> Athletic Trainer | <input type="checkbox"/> News reports |
| <input type="checkbox"/> Physician | <input type="checkbox"/> Nutritionist |
| <input type="checkbox"/> Strength Coach | <input type="checkbox"/> Website |
| <input type="checkbox"/> Teammate | <input type="checkbox"/> Retail Store |
| <input type="checkbox"/> Friend | Other _____ |

10. What are your sources of information on dietary supplements? **(Mark all that apply)**

- | | |
|---|---|
| <input type="checkbox"/> Coach | <input type="checkbox"/> Family member |
| <input type="checkbox"/> Athletic Trainer | <input type="checkbox"/> Academic Journal |
| <input type="checkbox"/> Nutritionist/dietician | <input type="checkbox"/> Physician |
| <input type="checkbox"/> Strength Coach | <input type="checkbox"/> Website |
| <input type="checkbox"/> Teammate | <input type="checkbox"/> Retail Store |
| Magazine _____ | Other _____ |

11. I will continue to use dietary supplements until? **(Check one)**

- I receive counseling
- I compete at a higher level (ex. NCAA®)
- I don't get the desired effects
- I experience side effects (ex. Muscle & intestinal cramps, bloating, faster heart rate, hair loss, acne)
- I see no need to stop
- Other _____

12. The National Junior College Athletic Association (NJCAA) **does not** have a "banned list" policy for drugs and dietary supplements. Does this affect your consumption of dietary supplements?

- YES
- NO

13. If you have never used or have stopped using dietary supplements, **check the main reason, why?**

- | | |
|--|---|
| <input type="checkbox"/> Coach's rule | <input type="checkbox"/> It costs too much |
| <input type="checkbox"/> I plan to compete at the NCAA® level | <input type="checkbox"/> I didn't get the desired effects |
| <input type="checkbox"/> Others would disapprove | <input type="checkbox"/> It's against my beliefs |
| <input type="checkbox"/> Concerned about what it might do to my health | <input type="checkbox"/> No desire to experience the effects |
| <input type="checkbox"/> It hurts my athletic performance | <input type="checkbox"/> I had a bad experience with it (side effect) |
| <input type="checkbox"/> I have recovered from injury or illness | <input type="checkbox"/> I was afraid of the consequences of being caught |
| <input type="checkbox"/> Does not apply | Other _____ |

Demographics

14. How old are you? _____ Years

15. What is your gender?

- Female
 Male

16. How do you describe yourself?

- White
 Black or African American
 American Indian and Alaska Native
 Asian (Asian Indian, Chinese, Filipino, Japanese)
 Native Hawaiian and other Pacific Islander
 Hispanic or Latino
 Other _____

APPENDIX C
FOLLOW UP LETTER

Date:

Dear College Athletic Official:

Approximately about two weeks ago I attained permission to administer a survey to your Junior College Student-Athletes on the use of dietary supplements. The results of this study will provide invaluable information to athletic trainers, exercise physiologists, strength coaches, physical educators, doctors, nutritionists, dietitians, and personal trainers regarding the consumption of dietary supplements by junior college athletes. This information will help the medical field the determinants of consumption and whether education at a younger age will prevent the use of dietary supplements. Dietary supplements in question are androstenedione, amino acids, creatine, chromium, DHEA, caffeine, ephedrine, mu huang, and protein, which have been predominantly used by athletes in various athletic levels. Once again I appreciate your approval to conduct this survey on your student-athletes and that the participation of the athletes is voluntary and choosing to/not to participate in the study will not affect your relations with San Jose State University (and, or other participating institutions).

If you have any questions about this study, or need another survey, I can be reached at (408) 206-4597. If you have any questions, or complaints about research subjects' rights, please notify Leamor Kahanov, ED.d ATC, Graduate Athletic Training Director, or Eileen M. Fortin, Institutional Review Board Coordinator for Graduate Studies and Reseach, at (408) 924-2479.

Thank you for your time,

Eliseo R. Munoz, ATC

APPENDIX D
EXPERT EVALUATION
COVER LETTER

Date:

Dear _____,

I am writing my graduate thesis on the consumption of dietary supplements by CA junior college student-athletes at San Jose State University for my Masters Degree in Athletic Training. I am seeking your expertise in refining my current research project

As a professional in the medical field, your feedback is essential for the validity and reliability of the survey. Please critique the format, content, expression, and the importance of the items. I appreciate your time and help.

I would also appreciate your return of your evaluation within the next two weeks. I hope to propose my thesis to my committee at the end of the month. Your prompt response will ensure that I make the best proposal possible.

Thank you again for all your help,

Eliseo R. Munoz, ATC

APPENDIX E

EXPERT VALIDATION QUESTIONNAIRE

EXPERT VALIDATION QUESTIONNAIRE

Hello,

I am seeking your expertise in refining my current research project. I am working on my thesis and would like your professional opinion on a survey to Junior College Athletes regarding supplement use. As professionals in the medical field, your feedback is essential for the validity and reliability of the survey. Please answer the following three questions and critique the format, content, expression, and the importance of the items. I appreciate your time and help.

1. Are the questions valid and reliable to research this topic?

2. What items would you add or delete?

3. Any other comments?

Job Title: _____

Education: _____

Thank you,

Eliseo R. Munoz, ATC