Sport Supplements and High School Athletes: A Study of Use and Motivations

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SPORT SUPPLEMENTS AND HIGH SCHOOL ATHLETES: 
A STUDY OF USE AND MOTIVATIONS

by

Bethany Coovert

A Thesis 
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Faculty of The Graduate College 
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I would like to take this opportunity to thank my parents for all of their support throughout my education. The examples you have set for me have instilled the work ethic and drive that has allowed me to succeed in life and in my education.

I would also like to thank my thesis committee, Dr. Mike Miller, Dr, Robert Baker, and Gayle Thompson. Your guidance and patience throughout the process has been an incredible help to me. I appreciate every time you were willing to take a few moments out of your busy days to answer my questions.

Bethany Coover
The use of sports supplements is prevalent among American society, including high school athletes. The purpose of this study was to determine what sports supplements high school athletes are consuming, what are the motivations behind the athletes use, where do the athletes obtain the supplements, where do the athletes acquire information regarding sports supplements and who encourages and/or discourages the athletes supplement use. A questionnaire was distributed to high school athletes in the greater Kalamazoo, Michigan area, with a seven percent response rate.

The study found that 34% of the high school athletes surveyed reported to use sports supplements. The most commonly used supplements were multivitamins, caffeine, and ephedrine. The most frequently reported motivations for sports supplement use were, improved performance, stay healthy, and increase endurance. The majority of the students obtained sports supplements and received information regarding sports supplements from a friend and/or teammate. Adolescents also reported friends and/or teammates to encourage and parents to discourage sports supplement use. The information this study provides can be utilized to educate adults and adolescents in hopes to deter future supplement use.
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CHAPTER ONE
INTRODUCTION

Exercise performance has become an extremely profitable market targeted at individuals looking for quick results to improving appearance and athletic performance. Magazines and health food stores are now full of products claiming that they can fix body flaws or double strength in a week. Some of which claims may be true, such as ephedrine and phenylpropanolamine products, which are known to be effective for increasing alertness and decreasing the appetite, yet the adverse effects are potentially fatal (Jenkins, 1996). Prospective Olympic athletes were asked in a survey, if they were given the opportunity to take a pill that guaranteed them to win an Olympic gold metal, yet would kill them in a year, would they choose to do so? More than half of these elite athletes replied yes, they would consume the deadly substance (Ungerleider, 2001).

In 1999 and 2001, BlueCross BlueShield Healthy Competition Foundation performed a National Performance-Enhancing Drug Survey by phone to learn of the sports supplement and performance-enhancing drug use of American adolescents, adults' perceptions of these substances, as well as behaviors and awareness surrounding the products used. The survey estimated approximately one million young people, between the ages of twelve to seventeen, reported taking a sports supplement, or performance-enhancing drug. One in five adolescents reported that they personally knew someone who consumed sports supplements. The ratio of people known to
be consuming sports supplements increased to one in three for individuals between the ages of fifteen and seventeen.

The motivations behind the increase in sports supplement use seem to follow a common trend of improving one’s appearance, specifically size, shape, and definition, as well as increase muscle strength and improve athletic performance (Sobal & Marquart, 1994). Many young males acknowledge that they resort to alternate methods because they become impatient with their muscular development and would like to enhance their masculinity (Pedersen & Wichstrom, 2001). Body image issues had formerly been considered a women’s problem linked with eating disorders, yet recently has broken societal norms since muscle dysmorphia has been defined as a gender indifferent disorder. This preoccupation with body image has theoretically stemmed from the increased standard of unrealistic body expectations in Western society due to the media and the evolution of children’s toys (Kanayama, Gruber, Pope, Borowiecki & Hudson, 2001). This phenomenon of muscle dysmorphia has reached young athletes as well. Adolescent athletes admit to being so concerned with their body’s appearance and athletic performance they chose to use supplements regardless of the adverse effects (Ungerleider, 2001).

Adolescents are using sports supplements whether or not they are aware of the potential risks. Ninety-six percent of adolescents surveyed by BlueCross BlueShield (2001) acknowledge that they were aware of the potential health risks associated with sports supplements. When comparing both years surveyed, fewer adolescents considered the products to cause
serious damage or risk in 2001, compared to moderate damage or risk in 1999 (BlueCross BlueShield, 2001). If adolescents were aware that their athletic trainers, parents, doctors, and coaches were well-informed of the potential risks of sports supplements, these adults may have a greater impact on the decision-making of the young athletes and their supplement use. Sobal & Marquart (1994) performed a study concerning the use of supplements and athletes and found that parents, doctors, and coaches had the greatest influences on athletes concerning supplement use. To provide the best information possible, athletic trainers, parents, and coaches need to educate themselves on sports supplement use by high school athletes.

**Purpose of the Study**

The purpose of this study is to determine: 1) prevalence supplements high school athletes are using; 2) The motivational factors behind supplement use; 3) Who and/or where are the athletes receiving information on supplements; 4) Who and/or where are the athletes obtaining supplements; 5) Who is encouraging and/or discouraging the athletes use of supplements.

**Hypothesis**

1) The most commonly used supplements will be ephedra, androstenedione, and creatine. 2) The motivations for their use will follow the consistent trends of using supplements to improve appearance, more specifically, weight gain, weight loss, decrease fat, or to improve athletic
performance, such as, increase strength and increase endurance. 3) High school athletes are most likely to receive information from friends, magazines, and the Internet. 4) High school athletes obtain the supplements from health food stores, friends, and the Internet.

**Definition of Terms**

1) Dietary Supplement Health and Education Act of 1994 (DSHEA) – An act designed by the Food and Drug Administration (FDA), was passed in October of 1994. The DSHEA states that there is no proof of efficacy and safety and no standards for quality control for products labeled as dietary supplements. The DSHEA also states that these products may not place specific cures on labels, they may only claim an effect. The labels must also state that the FDA has not reviewed the product and its claims. Due to this act, if concerns of a certain supplement are brought to the FDA, it is the FDA’s responsibility to prove the product unsafe, rather than the manufacturer proving its safe (Winslow & Kroll, 1998).

2) Dietary supplement – This definition was written by the FDA for the DSHEA, included the following bulleted criteria:

- “A product (other than tobacco) that is intended to supplement the diet that bears or contains one or more of the following dietary ingredients: a vitamin, a mineral, an herb or other botanical, an amino acid, a dietary substance for use by man to supplement the diet by increasing the total daily intake, or a concentrate, metabolite,
constituent, extract, or combination of these ingredients;
(Lewis, 1999, p 16)"

3) Sports supplement - A product used to supplement the diet with the intentions to aid or improve physical work capacity, athletic performance, and responsiveness to exercise training.

4) Muscle dysmorphia - A condition that can be a disabling preoccupation with an individual's muscularity (Kanayama, Gruber, Pope, Borowiecki & Hudson, 2001).

Limitations

1) The most significant limitation to this study is the lack of number of completed surveys.

2) The data was self-reported by adolescent athletes.

3) The data was collected from high schools in the greater Kalamazoo, Michigan area only.

4) The data collection was limited to athletes who were participating in school-sponsored sports at the time of the distribution of the questionnaire.

Delimitations

1) The high schools that were eligible to participate in the study must have a Western Michigan University (WMU) graduate assistant
athletic trainer assigned to their high school.

2) Of the four separate classes of high schools in the state of Michigan, A through D, determined by school population, only schools in class B and C opted to participated in this study, based on first delimitation.
A study performed by Mason and colleagues (2001) of high school volleyball and football players reported that 8% of males and 2% of females were using a variety of performance-enhancing supplements. The BlueCross BlueShield Healthy Competition (2001) survey reported 5% of adolescents stated they had consumed a sports supplement, although the number of adolescents reporting they know of people who consume supplements suggests the prevalence of use could be much higher. O'Dea (2003) found in a study of adolescent supplement use that the majority of the students were consuming a supplement of some kind, from multivitamins, caffeine and ephedrine products to creatine. There are so many different sport supplements on the market that it is hard to maintain up-to-date knowledge of every possible supplement athletes may be using. Maintaining current knowledge maybe the key to decreasing the prevalence of supplement use amongst young athletes. It has been shown that knowledge of supplements is a deterrent for adolescent supplement use (Massad, 1995).

Influence on Adolescents

Athletic trainers have more influence than coaches and parents on the adolescents’ attitudes regarding supplements and their intentions of use. Dunn and colleagues (2001) found that athletic trainers, such as those
employed full-time at a high school, having regular contact with a specific
group of athletes, will have the most influence and are better predictors of
intention of use than coaches and parents, respectively. A previous study
found that coaches had the greatest influence regarding supplements, yet the
majority of them acknowledged they had not received formal nutrition
education, claiming they had obtained their information from health and
fitness magazines (Sobal, & Marquart, 1994). The BlueCross BlueShield (2001)
Healthy Competition survey reported that very few athletes stated that their
coaches were encouraging them to use sport supplements. Sobal and
Marquart (1994) reported younger adolescents reported they were more
influenced by television/radio than by doctors. The same study also
suggested that those whom have influence on adolescents may be gender
specific, finding that parents have greater influence with young girls, boys
reported that friends and coaches have greater influence on them.

An additional concern of adolescents consuming supplements is where
athletes are obtaining sports supplements. Mason and colleagues (2001)
surveyed high school football and volleyball athletes to determine what
supplements they were using and where they were obtaining them. The
majority reported purchasing supplements from General Nutrition Centers
(GNC) or a discount store, athletic clubs/fitness centers, or their parents.
Another survey reported similar results stating the majority of sports
supplements were purchased at discount stores, one in ten from friends, and
an additional few that reported receiving sports supplements from a coach
(BlueCross BlueShield, 2001).
During the Healthy Competition surveys by BlueCross BlueShield (2001), when asked questions regarding where they are obtaining their information concerning supplements, 30% reported they received information from friends, and 24% from advertising. Eighty percent of children reported they had not had a discussion concerning supplements with their parents. One third of parents questioned about their involvement in their children's knowledge of supplements, reported they had a discussion with their children. Forty-five percent of those parents who had not spoken with their children about supplements stated they had not done so because they were not informed enough to provide them with information. Only half of the adults surveyed reported that they could identify any side effects of common supplements (BlueCross BlueShield, 2001).

**Sports Supplements**

The sports supplements specifically chosen to be listed on this study's questionnaire were done so because adolescents had reported them as being used by themselves or their peers in previous research surveys (BlueCross BlueShield, 2001; Mason, Giza, Clayton, Lonning & Wilkerson, 2001). All of the sports supplements listed on this study's questionnaire are easily obtainable, over-the-counter products, and have no age restrictions for individuals purchasing these sports supplements. Due to the variety of supplements available for purchase by young people and the knowledge that athletic trainers, coaches and parents have influence on supplement use by
high school athletes, they should attempt to educate themselves to help athletes make informed decisions regarding sport supplements. Those adolescents that have the opportunity to make informed decisions report less use by Massad and colleagues (1995).

Androstenedione

Manufacturers claim that androstenedione, commonly known as "andro", is safe for supplemental ingestion because it occurs naturally in the human body. Andro manufacturers maintain that it will provide results similar to banned anabolic-androgenic steroids, without the adverse side effects (Herbet, 1995). Andro became more recognized when professional baseball player, Mark McGwire, credited androstenedione for allowing him to train harder and recover quicker during his record-breaking season in 1998. The use of androstenedione has increased five-fold since McGwire admitted to using the supplement (Herbert, 1995).

The East Germans first manufactured andro as a nasal spray that was administered to athletes competing in the Olympic games in the 1970's. Androstenedione was introduced in pill form in the 1990's to athletes of all levels in the United States (Harvard's Men's Health Watch, 2000). It is argued that androstenedione is actually a drug or pharmaceutical rather than a dietary supplement, because it is not a constituent of a regular daily diet (Stigler, Potteiger, Schmidt, & Chetlin, 2000). Androstenedione is a metabolic precursor to testosterone produced in the adrenal cortex and gonads. When
androstenedione is ingested, it is converted into testosterone by the liver, thus resulting in an anabolic effect on skeletal muscle (Stigler, Potteiger, Schmidt, & Chetlin, 2000).

In 1999, King and colleagues performed the first study investigating androstenedione supplementation, using twenty men between the ages of 19-29 years of age with normal testosterone levels, and no history of androgenic aid use or resistance training regimen. Half the subjects were given 300 milligrams per day for eight weeks, the other half were given placebo. Neither muscle strength or serum testosterone levels were affected by supplementation. A similar study by Leder and colleagues (2000) investigated hormonal levels reported testosterone levels increased by 34% and estrogen levels by 196% after seven weeks of 300 milligrams of androstenedione supplementation once a day. A significant amount of the androstenedione was actually converted into biologically active estrogens in the subjects during King and colleagues 1999 study. The hormonal evidence provided by these studies suggests that the increased estrogen levels seem to counteract the anabolic effect on skeletal muscle adaptations to resistance training.

Although the anabolic effects on skeletal muscle seem to be negated, the side effects appear to resemble those of anabolic-androgenic steroids. Studies have yet to follow long-term effects of androstenedione supplementation. The adverse effects most commonly reported from blood analysis confirmed that androstenedione supplementation reduced the amount of circulating levels of high-density lipoprotein cholesterol, thus
increasing the risk of atherosclerosis and stroke (King, Sharp, & Vukovich, 1999). Additionally, androstenedione tends to mimic testosterone within the nervous system, which emphasizes that andro is a steroidal hormone and the possible side effects should reflect those of anabolic-androgenic steroids.

Table 1 (Kersey, 2001 and Rogol, 2000). The increased level of testosterone in adolescents from steroids has shown to cause premature closing of the growth plates in bone, resulting in decrease adult height (The Medicine Letter, 1998).

### Table 1

<table>
<thead>
<tr>
<th>Side-Effects of Anabolic-Androgenic Steroidal Hormones</th>
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<tbody>
<tr>
<td>Virilization in women and children</td>
</tr>
<tr>
<td>Acne</td>
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<tr>
<td>Premature epiphyseal closure</td>
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<tr>
<td>Gynecomastia</td>
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<td>Decreased testicular volume</td>
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<tr>
<td>Infertility</td>
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<tr>
<td>Acute myocardial infarction</td>
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<td>Cerebrovascular accident</td>
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<tr>
<td>Cardiomyopathy</td>
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<td>Dysphoria and rage</td>
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A concern with androstenedione use is that the research provided was studied at 300mg each day for seven weeks. Often manufacturers and advertisers recommend individuals use 500-1,200mg/day (Kersey, 2001). In
addition, there is no current research regarding the adverse effects of androstenedione use by adolescents, yet about 1% of high school football players were using the supplement in a 2001 study (Mason, Giza, Clayton, Lonning, & Wilkerson, 2001). Many athletic organizations have already recognized the potential dangers in andro use. The International Olympic Committee, National Collegiate Athletic Association, the National Football League and National Basketball Association, have banned androstenedione (Congeni & Miller, 2002).

**Dehydroepiandrosterone (DHEA)**

Similar to androstenedione, dehydroepiandrosterone, commonly referred to as DHEA, is a circulating steroid hormone that is a precursor to androgens and estrogens. The levels of circulating DHEA seem to peak in young adults and then decline linearly throughout adulthood. In 1996, the Federal Drug Administration banned the use of DHEA, yet is able to be sold as a nutritional supplement (Rogol, 2000). DHEA is produced naturally in the adrenal glands, brain and the testes, but is also found in wild yams, which allows it to be considered a dietary supplement. Whether ingested or naturally produced, DHEA is converted into testosterone, estrogen, and cortisone (Clarkson & Rawson, 1999).

Due to the known decline of DHEA levels that occurs with aging, the majority of studies performed regarding DHEA use a subject group of older men and women. Welle and colleagues (1990) studied a sample of male
subjects with a mean age of 26 years, who ingested 1600 milligrams per day of DHEA for four weeks. After four weeks, a nine-fold increase was reported in the plasma DHEA levels, yet the increase resulted in no significant change in body weight or lean body mass in the young men. The researchers concluded that DHEA was not a key regulator of energy or protein metabolism in human males.

Another study administered 40 milligrams of DHEA twice a day for eight weeks to extremely obese individuals ranging in ages from 13 to 26 years old. Results showed that there were no positive effects on body weight, body composition, serum lipids, or insulin sensitivity in obese individuals (Vogiatzi, Vlachopadopoulou, El-Rashid, & New, 1996).

Mason and colleagues’ (2001) study of high school football players reported 1 of 495 males admitted to using DHEA, yet little is know about its effect on an adolescent’s maturing body. The adverse effects of DHEA have not been well reported, but it is recognized that some individuals ingesting DHEA experience water retention and weight gain (Hendrickson & Burton, 2000). Due to the similarity of DHEA to androstenedione and other anabolic agents, the International Olympic Committee (Substitutes, 2003) and National Collegiate Athletic Association added DHEA to their lists of banned substances (NCAA, 2002).

**Creatine Monohydrate**

Creatine monohydrate, also known as phosphocreatine, is a naturally
occurring amino acid, synthesized by the liver, kidneys, and pancreas, and most commonly stored in skeletal muscle. The total daily requirement for creatine is two grams per day, half of which is produced in vivo (Metzl, Small, Levinel & Gershel, 2001), the other gram is typically provided by a dietary intake of red meat, fish, and animal products (Kreider, 1998).

Creatine also is found in lingon berries, of which the dietary supplement creatine monohydrate is produced. Health food stores carry creatine in powder and time-released capsules, available for purchase by minors (Hendrickson & Burton, 2000).

British sprinters and hurdlers introduced creatine monohydrate to sport in the 1992 Olympics (Eichner, 1997). Studies reported claims that creatine supplementation can increase power, strength, and reduce fatigue, thus resulting in over $400 million in annual sales during 1999 alone (Metzl, Small, Levinel & Gershel, 2001). Creatine functions as a substrate for the hydrogen ion, and therefore facilitates the production of adenosine triphosphate (ATP) from adenosine diphosphate (ADP) (Metzl, Small, Levinel & Gershel, 2001). Due to this function of creatine, supplementation is used to increase levels of creatine concentrations stored in skeletal muscle. The increased phosphocreatine concentrations allow for a greater extent of ATP concentrations to be maintained during maximal muscular effect, more specifically noted in maximal effort sprinting. Creatine supplementation has also shown to augment the rate of ATP and phosphocreatine resynthesis following high intensity, short duration exercise (Kreider, 1998).

Multiple studies investigating short and long duration creatine
supplementation resulted in an increased strength, sprinting performance, power, and/or increased work performance during multiple sets of maximal effort muscular contractions (Kreider et al., 1998; and Harris et al., 1993; Volek et al., 1997). Volek et al. (1997) administered 25 gram per day supplementation for seven days, resulting in increased amount of work performed during multiple sets of bench press and jump squats. Kreider et al. (1998) administered 15.75 grams per day for 28 days that resulted in increased repetitive sprint performance and isotonic lifting volume from maximal effort repetition on bench press, squat, and power clean. Increased sprint performance was also reported by Harris et al. (1993) with administration of 30 grams per day supplementation for six days.

A few studies reported little to no performance enhancing effects when the supplementation administered is lower than 20 grams per day for five days (Barnett, Hinds, & Jenkins, 1996; Odland, MacDougall, Tarnopolsky, Elorraige, Borgmann, & Atkinson, 1994; Ruden, Parcell, Ray, Moss, Selmer, & Sharp, 1996), or there when a higher loading period precedes a low dose period of two to three grams per day (Goldberg, & Betchel, 1997; Thompson, Kemp, Sanderson, Dixon, Styles, & Taylor, 1996). Additional studies that resulted in reduced effectiveness seemed to relate to the work to rest ratio performed or when prolonged recovery periods, ranging from 5 to 25 minutes, were provided during sprinting trials (Burke, Pyne, & Telford, 1996; Cooke, Grandjean, & Barnes, 1995; Redondo, Dowling, Graham, Almada, & Williams, 1996).

Due to the short period of time that creatine has been on the market,
very little is known about the long term side effects that it will have on supplementing individuals. One adverse effect that has been shown consistently throughout creatine investigations is weight gain (Kreider, 1998). Anecdotal reports repeatedly claim that individuals participating in creatine supplementation experience muscle cramping, increased thirst, and stomach cramps (Ray, Eck, Covington, Murphy, Williams, & Knudtson, 2001).

There is continued debate as to the physiological reasons for the increase in body mass. Some researchers have attributed the gains to both water retention and protein synthesis when administering short-term supplementation (Kreider, 1998). Investigations of supplementation, those lasting seven weeks or longer, have consistently resulted in increased total body mass and increased lean body mass, with no reported change in total body water percentages (Kreider, 1998). Additional beneficial effects from creatine supplementation were reported by Earnest and colleagues (1995) noting significant improvements of lipid profiles in trained male athletes and middle-aged men and women.

Supplementation of creatine monohydrate is not recommended for individuals under the age of eighteen by the American College of Sports Medicine (Congeni & Miller, 2002). This is due to the unknown effects that creatine supplementation may have on maturing individuals. Ray and colleagues (2001) surveyed creatine use by nearly 700 adolescent athletes, ages thirteen through nineteen, reporting that 23% of male and 2% of females have used creatine. Of the sixteen percent of adolescents reporting to use creatine, 70% of them were ingesting incorrect dosages, nearly all of which
ingesting more than recommended dosages. The participating adolescents reported that they received the information concerning creatine supplementation most often from friends (43%), the media (22%), and coaches (19%).

Metzl and colleagues (2001) performed a similar study, surveying 1103 athletes ages ten through eighteen. Nearly six percent of the 1103 participants reported using creatine, 8.8% of those using creatine were male, compared to 1.8% were females. The prevalence of reported users increased with age, which peaked with 44% of twelfth graders whom supplemented creatine at one point in time. The most common sports that reported use were athletes participating in football, wrestling, ice hockey, gymnastics, and lacrosse. The reasons for using creatine were the same amongst the wide variety of sports, to enhance performance (74.2%) and to improve appearance (61.3%). Mason and colleagues (2001) study of 495 male and 407 female athletes concluded that 6% of the males reported using creatine only one female volleyball player reported using creatine supplementation for performance enhancement.

Caffeine

Caffeine is a plant alkaloid extracted from coffee arabica and cola acuminata that acts as a central nervous system stimulant when ingested. More specifically it is a sympathomimetic amine, which imitates the actions of the sympathetic nervous system, creating the same reactions as the fight or
flight response. Caffeine is used as an erogenic aid for many different reasons in sports, which include increased work efficiency, alertness, energy, and power (Hendrickson & Burton, 2000), as well as an appetite suppressant (Jenkins, 1996).

The most well studied reason for caffeine use in sport is that caffeine is thought to be effective in improving performance in endurance exercise. This is thought to be due to an increase in mobilization of certain free fatty acids and an increased rate of lipid metabolism (Hendrickson & Burton, 2000) along with increased rate of ventilation and decreased perceived effort with the same workload. Anderson et al. (2000) studied the effects of caffeine ingestion on women's 2000 meter simulated rowing performance. The study reported that there was a dose-dependant improvement on performance in well-trained female oarswomen. Those who ingested the high dose of caffeine increased their average power output by 2.7% and a 1.3% reduction in time. The women who ingested the moderate dose reported an increase in average power output by 1.4% and a 0.7% reduction in time performance. Anderson et al. (2000) noted that there was a large range in responses per individual, some of the women had no response to certain doses, and then others had twice the dose response. The variety of dose responses among individuals is especially of concern when the side effects of caffeine can vary greatly as well.

Some researchers feel that the adverse effects that possibly occur with caffeine may negate the performance-enhancing qualities it may provide (Jenkins, 1996). Prolonged caffeine use can result in physical tolerance that
will result in withdrawal symptoms upon cessation of use. Those individuals will experience depression, irritability, flu-like symptom, nausea, decreased alertness, and headaches as withdrawal symptoms, that will diminish over a period seven days (Jenkins, 1996). There are other side effects associated with caffeine, such as anxiety, alertness, disorientation, muscle tension, tremors, tachycardia, elevated heart rate, dehydration, increased blood glucose (Jenkins, 1996), insomnia, increased gastric acid secretions, and increased blood pressure (Hendrickson & Burton, 2000), all of which may occur under acceptable doses (Jenkins, 1996). Doses exceeding 500 milligrams per day, equivalent to more than five cups of coffee, can result in paranoia, muscle spasms, psychotic disorders, convulsions, extreme anxiety, respiratory collapse, heart palpitations, and possibly death. Previously, the IOC allowed maximal levels of caffeine urinary concentrations of 12 micrograms per milliliter, as of January 2004, caffeine will be removed as a banned substance (Substitutes, 2003). The NCAA allows for slightly greater concentrations at 15 micrograms per milliliter than those designated for Olympic level athletes (Hendrickson & Burton, 2000). Twelve micrograms per milliliter of caffeine would be equivalent to six to eight cups of coffee in a two-hour period. Only one cup of guarana tea, which contains as much as six percent caffeine, could cause illegal levels by IOC or NCAA standards (Jenkins, 1996).

Symptoms, such as inability to concentrate, dehydration, loss of muscle coordination, and anxiety are indicative of excessive caffeine ingestion. Adolescents are thought to be more susceptible to overdosing on caffeine products because they will think along the lines of, 'if one works,
then ten will be better’ (Jenkins, 1996). In addition to overuse of a single product, the synergistic effects of combining caffeine with products such as ephedra, could be fatal (Jenkins, 1996).

Caffeine supplementation seems to be common amongst adolescent athletes. Forty-two percent of the adolescent students reported using energy drinks and an additional five students reported taking guarana, specifically (O’Dea, 2003). Some of the individuals consuming the energy drink reported “they make me alert” and “other guys on the team are drinking them (p.102)” (O’Dea, 2003).

**Ephedra/Ephedrine/Ma Huang**

The genus *Ephedra* is comprised of approximately forty different species of herbs containing varying amounts of ephedrine alkaloid in quantity and quality (Samenuk, Link, Homund, Contreras, Theohardes, Wang & Estes, 2002). Ephedra is also used as a collective term for ephedrine-type alkaloids found in ma huang, including ephedrine, pseudophedrine, norephedrine, methylphedrine, and norpseudoephedrine (Wynn, 2002). Ma Huang has been used in Chinese herbal medicine for centuries, as a bronchodilator, for conditions such as bronchitis and broncospasms. In modern society, ma huang is most commonly used as an appetite suppressant, decongestant for treating allergies and sinusitis, and also for energy enhancement.

Physiologically, ma huang increases the availability of catecholamine
at synaptic areas in the brain and heart, resulting in increased blood pressure, heart rate, cardiac output, and peripheral resistance. Ephedra’s half-life is reported ranging from 2.7 to 3.6 hours (Samenuk et al., 2002) to three to six hours (Powers, 2001). The half-life length attributes to easy buildup of toxic levels of ephedra, resulting in severe vasoconstriction of both the cerebral and coronary arteries, seen with both short and long term use. As a result, short-term use is associated with ischemic and hemorrhagic stroke. Long-term use has been linked with cardiomyopathy, fibrosis, and death, all of which are associated with catecholamine excess. Additional concerns arise when ephedra products are combined with other stimulants, such as caffeine, which may result in cardiac arrhythmias, and, as mentioned above, death (Samenuk et al., 2002). If ephedra is combined with monoamine oxidase inhibitors (MAOIs), life-threatening hypertension, hyperpyrexia, and/or coma could result (Wynn, 2002).

In 1999, an estimated twelve million Americans used products containing ma huang (Samenuk et al., 2002), yet there are no warnings on the labels that these products could have serious adverse effects for individuals with diabetes, hypertension, and heart disease (Blanck, Khan, & Serdula, 2001). A greater concern is posed to those that are aware they need to avoid ephedra alkaloids because content is not accurately reported on labels. The Food and Drug Administration (FDA) found that of twenty ephedra supplements tested, eleven labels failed to report the content of ephedra. In those labels that did list the ephedra content, there was a twenty percent or greater difference between the actual content and that, which was listed
(Blanck, Khan, & Serdula, 2001). A label inconsistency can occur even between two lots of the same product. Due to the concerns and inconsistencies, the FDA created the Adverse Reaction Monitoring System (ARMS) to track reported adverse reactions associated with supplement use. The 1994 Supplement Act stated that dietary supplement products must be proven unsafe before they will be removed from the market; ARMS monitors such concerns.

Between 1995 and 1997, there were 926 reported adverse reactions connected to ma huang, including eleven sudden deaths, sixteen strokes, and ten myocardial infarctions. These cases occurred to apparently healthy individuals, mean age of forty-three plus or minus thirteen years, with no history of smoking or other risk factors, including hypertension and diabetes, or family history of cardiovascular disease. Thirty-six of the 37 individuals in this report used the products within the manufacturers recommendations (Samenuk et al., 2002).

It is apparent that all persons consuming ephedra seem to be at risk of severe adverse reactions, but the most publicized deaths are those of athletes and adolescents. The speculation behind this link is that the combination of ephedra and caffeine is already known to be dangerous, but adding the additional variable of vigorous exercise may be increasing blood pressure to fatal levels. A sixteen-year-old high school athlete was ingesting an ephedrine-based diuretic when she collapsed during a sporting event from heart palpitations. Due to the damage from the diuretic she continues to receive treatments for irregular heartbeat years following the incident
A seventeen-year-old football player died of a heart attack, which was attributed to ephedrine toxicity in the autopsy report. The young athlete’s ephedrine use never exceeded the manufacturer’s recommended dosage (Sardina, 1999/2000). Many people use ephedra products for an energy boost, for example, a nineteen-year-old purchased four caplets of an ephedrine product from a gas station to stay awake. He ingested all 4 caplets over a period of twenty-four hours. The autopsy revealed that he died of a heart attack that was triggered by ephedrine toxicity (Sardina, 1999/2000).

High profile sport governing bodies have recognized the danger of ingesting ephedra products and have officially banned them. The IOC limits ephedrine levels in urinary concentrations to 10 micrograms per milliliter (Substitutes, 2003). The NCAA has not specified any acceptable levels of ephedra detected in urinary analysis (NCAA, 2002). The National Football League’s ban of ephedra was the first professional league to take action against ephedra in 2001 (Sports Medicine Digest, 2001). Since the FDA has yet to ban the sale of over-the-counter ephedra products, states have taken the responsibility themselves. In 2000, fourteen states made restrictions on the sale of ephedra products. Ohio classified ephedra as a “Schedule IV” controlled substance, which is defined as: “any material, compound, mixture, or preparation that contains any quantity of the “substance [...] having a stimulant effect on the central nervous system”. Florida banned the sale of non-prescription ephedra completely, and persons “trafficking” ephedra products can be charged with a first-degree felony. Illinois has designed a
ban focused on adolescents. An adolescent in Illinois found possessing ephedra on school property is grounds for expulsion (Sardina, 1999/2000).

**Phenylpropanolamine (PPA)**

Phenylpropanolamine (PPA) is a sympathomimetic amine, similar to caffeine and ephedra, which was the main ingredient in many over the counter decongestants and appetite suppressants. PPA works as an appetite suppressant by repressing the hypothalamus, the body's appetite control center (Mersfelder, 2001). PPA was introduced to the American public in 1930, and was present in over 130 medications during the 1980's (Lake et al., 1988), ranking as the fifth most frequently used drug in America in 1984 (Marshall & Douglas, 1994). A five state survey estimated that five million Americans used a product containing PPA between 1996 and 1998 (Blanck, Khan, & Serdula, 2001).

Concerns began to arise regarding the safety of PPA and its correlation to increased risk of stroke in young women. Due to these concerns the FDA and manufacturers formed the Hemorrhagic Stroke Project to assess the risk of hemorrhagic stroke associated with PPA use. The correlation arose only in the case of women using diet aids, yet the numbers were not statistically significant. Although statistically insignificant, the results from the Hemorrhagic Stroke Project motivated the FDA on October 6, 2000, to recommend to manufacturers to voluntarily remove products containing PPA from the market and prescription drugs containing PPA for weight loss and
decongestants should be avoided (Mersfelder, 2001).

Lake and colleagues (1998) studied the effects of PPA on the sympathetic nervous system in apparently healthy, young, normotensive individuals. The study found that systolic blood pressure measurements were significantly elevated while ingesting PPA, yet those levels did not increase enough to be considered hypertensive. Measurements for plasma catecholamine also stayed within normal limits. The concern intensifies when those increases in numbers are applied to a hypertensive or obese population, where the increase in systolic blood pressure may enter dangerous levels.

In addition to the fatal adverse effects of PPA, it is also known to cause nervousness, restlessness, insomnia, headache, nausea, elevated blood sugar, and elevated blood pressure, similar to caffeine and ephedra (Jenkins, 1996). Not only has the FDA recognized the dangers in PPA, the IOC banned the use of these products up to 25 micrograms per milliliter of urinary concentrations (Substitutes, 2003), and the NCAA’s ban on PPA became effective August of 2003 (NCAA, 2002).

**Beta-Hydroxy-Beta-Methylbutyrate (HMB)**

Beta-hydroxy-beta-methylbutyrate (HMB) is a metabolite of alpha-ketoisocaproate (KIC) and the amino acid leucine. HMB acts as a precursor to cellular cholesterol synthesis by maintaining levels of HMG-CoA, which may become insufficient during periods of stress or damage in muscle cells to support cholesterol synthesis (Gallagher, Carrithers, Godard, Schulze &
Trappe, 2000). Small amounts of HMB can be ingested from grapefruit and catfish, but cannot be considered as a sufficient supplemental HMB source (Clarkson & Rawson, 1999).

HMB supplementation is theoretically used to attenuate muscle protein breakdown after resistance training. Originally, HMB was used to increase muscle mass and decrease subcutaneous fat in livestock. The success with livestock lead to its use in humans to increase lean muscle mass and strength when combined with resistance training (Paddon-Jones, Keech & Jenkins, 2001). The recommended dosage is about three grams per day, but many of the studies performed used dosages according to an individual's weight (Gallagher, Carrithers, Godard, Schulze & Trappe, 2000). Slater and colleagues (2001) administered 1.5 and 3.0 grams per day, Nissen and colleagues (2000) used 3 grams per day in a series of nine experiments, Paddon-Jones and colleagues (2001) experimented with 3.4 grams per day, and Gallagher and colleagues (2000) administered 38 and 76 milligrams per kilogram per day.

A number of studies have shown an increase in muscle mass with moderate (3 grams per day and 38 milligrams per kilogram per day) HMB supplementation during both three week (Nissen, Sharp, Ray, Rathmacher, Rice, Fuller, Connelly & Abumrad, 1996) and eight week long studies (Gallagher, Carrithers, Godard, Schulze & Trappe, 2000). Yet, both Slater et al. (2001) and Nissen et al. (1996) reported there were no differences in fat mass among the participants in both the control and supplemented groups. Gallagher and colleagues (2000) also reported an increase in both concentric
and eccentric peak torque during the eight-week study. Nissen et al. (1996) reported improvement with abdominal exercises and maximum weight lifted with one repetition (1RM) of lower body exercises with three grams per day of HMB for three weeks, but no significant differences in 1RM upper body exercises.

Additional studies found a decrease in the metabolic indicators of protein breakdown, creatine phosphokinase (CPK) and lactate dehydrogenase (LDH) enzymes, released into the blood stream suggesting a decrease in muscle damage occurring after intense endurance exercise and resistance training or a quicker recovery time (Knitter, Panton, Rathmacher, Petersen, & Sharp, 2000; Nissen et al., 1996). Paddon-Jones and colleagues (2001) specifically studied the effects of HMB supplementation on delayed-onset muscle soreness (DOMS) and found no differences reported in the severity of soreness between the supplemented and control groups. However, Paddon-Jones' study did not use blood samples, instead participants reported responses ranging from no soreness to extreme soreness twenty-four hours post exercise.

Further benefits seen with HMB supplementation and exercise were found during Nissen and colleagues' series of nine experiments in 2000. Across all nine experiments total cholesterol decreased by 3.7 percent and low-density lipoprotein (LDL) cholesterol decreased by 5.7 percent. In individuals who began the experiments with a total cholesterol above 200 milligrams per deciliter, the combination of HMB supplementation and exercise decreased total cholesterol and LDL cholesterol levels by 5.8 percent.
and 7.8 percent, respectively (Nissen, Sharp, Panton, Vukovich, & Fuller, 2000).

Consistently, no adverse effects to HMB supplementation have been reported among the studies. Gallagher and colleagues (2000) specifically studied the effects of HMB on hematology, hepatic function, and renal function. The study reported there were no changes in blood enzyme activity, leukocyte levels, blood lipid profile, or blood chemistry. They also reported no change in urine analysis, hepatic or renal function (Gallagher, Carrithers, Godard, Schulze & Trappe, 2000). During Nissen and colleagues' (2000) series of nine experiments, participants were instructed to report adverse events and emotional profiles through weekly questionnaires, none of which revealed a trend in adverse reactions or emotional events.
CHAPTER THREE

METHODOLOGY

Subjects

The subjects for this study were high school students participating in at least one school-sponsored sport. Seven high schools in the greater Kalamazoo, Michigan area with a Western Michigan University (WMU) graduate assistant athletic trainer working on campus were eligible to participate in the study.

Instrumentation

A nine-question questionnaire was created to examine the research questions (Appendix D), the lists were influenced by a questionnaire developed by Reeder and colleagues (2003) and supplements listed by Mason and colleagues (2001). The initial portion of the questionnaire consisted of demographic information concerning age, grade, gender, and school-sponsored sports participation. The second portion of the questionnaire examined supplements high school athletes consumed, motivations for use, how high school athletes obtained the supplements, and who provided the athletes with information about supplements. The final question of the questionnaire consisted of two parts; part one determined those who...
encouraged sports supplement use and part two determined those who discouraged sports supplement use.

Procedures

Those high schools with Western Michigan University (WMU) certified athletic trainers (ATC) at high schools in the greater Kalamazoo, Michigan area were invited to participate as collaborating investigators for this study. Letters were sent to the principals of the high schools eligible to participate in the study to request approval for the use of the high school as a site for research activity. The letters requesting approval were sent to each principal with a stamped return address envelope, to be signed and returned within two weeks of receipt. A follow-up phone call to the principal and a verbal reminder to the ATCs were completed after one week, if approval for site of research form (Appendix A) had yet to be received.

Prior to distribution, each questionnaire and parental consent form was coded on the upper right hand corner. This process removed any additional possibilities of identifying athletes to their completed questionnaires. Packets were provided to each collaborating investigator which contained, instructions to address students, one large manila envelope marked "Parental Consent Forms", another marked "Completed Questionnaires", and stapled packets, each containing a parental consent form (Appendix B), a student-athlete assent form (Appendix C), a questionnaire and a blank white envelope.
When the principal granted signed permission, the ATC could proceed with administration of the questionnaires. The collaborating investigators were instructed to approach coaches and request time to speak with the athletes before or after practice, during which the coach was not to be present. During this time the collaborating investigator read aloud the student-athlete assent form. Each athlete invited to participate received a parental consent form, a student-athlete assent form, and a questionnaire. The athletes were instructed to return the signed parental consent form and the completed questionnaire within two weeks after the receipt of the packet. If the parents and athletes chose to participate, then the parental consent forms were to be returned to the athletic training room and placed in specified collection envelope. If the athlete chose to participate, the completion of the questionnaire provided their assent, as stated in the student-athlete assent form. Each athlete was instructed to complete the questionnaire in privacy and seal it in the envelope provided to ensure his or her confidentiality.

After one week, the ATCs were instructed, to orally remind all athletes that if they wished to participate they needed to return the forms by the designated date written on the collection envelopes in the athletic training room. Once the athlete completed the questionnaire it was then sealed in an unmarked envelope and returned to the athletic training room and placed in the specified collection envelope at each site. After the two weeks, the ATC then sealed both of the collection envelopes and placed them in the principal investigators mailbox in the WMU Health, Physical Education, and Recreation department office, which were then given to the student
investigator. The detached coded corners of the parental consent forms were then matched to the coded corners of the completed questionnaires. If a questionnaire had been returned without having a match to the coded corners of the parental consent form, the questionnaire was not used in data analysis.

**Data Processing and Analysis**

Descriptive and frequency statistics were calculated for demographic variables. Chi-square analysis was conducted to compare supplement use, motivation for use, where to obtain supplements, where athletes receive information, the encouragement and discouragement of supplement use. The level of significance was set a-priori at .05 for all procedures. All data was analyzed using SPSS version 11.5 (Chicago, IL).
CHAPTER FOUR

RESULTS

This chapter will discuss the results of the study, which identified supplement use and motivational factors by high school athletes. Additionally, demographic information and motivational factors, data regarding resources of information, resources of products used, and persons providing encouragement and discouragement of supplement use will be identified. Relationships amongst specific supplements and motivations for use, as well as gender and different aspects of sports supplement use will be addressed.

Demographic Data

Sixty-seven completed questionnaires of 965 administered were returned to the student investigator by the two-week deadline, resulting in a 7% response rate. Four schools chose to participate and return completed surveys. Three of the participating schools were class B schools with populations ranging from 497 to 1041 students, and the fourth participating school was a class C school with a population ranging from 233 to 496 students. The sample population consisted of 78% (n=52) student-athletes attending a class B high school, 22% (n=15) attended a class C high school. Of the athletes that attended Class B and Class C high schools, 91% (n=21) and
9% (n=2) consumed supplements, respectively. Thirty-four percent (n=23) of the athletes reported consuming sports supplements.

Table 2

<table>
<thead>
<tr>
<th>Years old</th>
<th>Percent Respondents</th>
<th>Percent Supplements Users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total sample size (n=67)</td>
<td>Total supplement users (n=23)</td>
</tr>
<tr>
<td>14</td>
<td>10 (n=7)</td>
<td>4 (n=1)</td>
</tr>
<tr>
<td>15</td>
<td>27 (n=18)</td>
<td>22 (n=5)</td>
</tr>
<tr>
<td>16</td>
<td>28 (n=19)</td>
<td>43 (n=10)</td>
</tr>
<tr>
<td>17</td>
<td>28 (n=19)</td>
<td>26 (n=6)</td>
</tr>
<tr>
<td>18</td>
<td>6 (n=4)</td>
<td>4 (n=1)</td>
</tr>
</tbody>
</table>

The gender of the participating athletes was nearly proportionate with 52% (n=35) female, and 48% (n=32) male. The gender of the athletes that reported consuming sport supplements was not as evenly split with 70% (n=16) of males and 30% (n=7) females using supplements (Table 4).
Table 3

Gender of Respondents and Sports Supplement Users

<table>
<thead>
<tr>
<th>Gender</th>
<th>Percent Respondents</th>
<th>Percent Supplements Users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total sample size (n=67)</td>
<td>Total supplement users (n=23)</td>
</tr>
<tr>
<td>Male</td>
<td>47.8 (n=32)</td>
<td>70 (n=16)</td>
</tr>
<tr>
<td>Female</td>
<td>52.2 (n=35)</td>
<td>30 (n=7)</td>
</tr>
</tbody>
</table>

Table 4

Grade of Respondents and Sports Supplement Users

<table>
<thead>
<tr>
<th>Grade in school</th>
<th>Percent Respondents</th>
<th>Percent Supplements Users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total sample size (n=67)</td>
<td>Total supplement users (n=23)</td>
</tr>
<tr>
<td>9</td>
<td>19.4 (n=13)</td>
<td>9 (n=2)</td>
</tr>
<tr>
<td>10</td>
<td>25.4 (n=17)</td>
<td>26 (n=6)</td>
</tr>
<tr>
<td>11</td>
<td>34.3 (n=23)</td>
<td>48 (n=11)</td>
</tr>
<tr>
<td>12</td>
<td>20.9 (n=14)</td>
<td>17 (n=4)</td>
</tr>
</tbody>
</table>
The school-sponsored sports most commonly reported were basketball (n=41, 61%), volleyball (n=26, 39%), track and field (n=21, 31%), football (n=20, 30%), and baseball (n=18, 27%), (Table 5). Those school-sponsored sports with athletes using sports supplements most frequently were basketball (n=15, 65%), football (n=10, 43%), track and field (n=9, 39%), and baseball (n=7, 30%), (Table 5).

**Sports Supplements**

The most frequently reported supplement used was multivitamins (n=18, 18%), followed by caffeine (n=7, 10%), ephedrine (n=5, 8%), and creatine (n=2, 3%). The remaining supplements, androstenedione, glucosamine, weight gainer, and whey protein, were each used by one student, the latter three were enter by individuals in the “other” option of the questionnaire (see Table 6).
Table 5

Percentage of School-Sponsored Sports Participated In

<table>
<thead>
<tr>
<th>Sport</th>
<th>Percent Respondents</th>
<th>Percent Supplements Users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total sample size (n=67)</td>
<td>Total supplement users (n=23)</td>
</tr>
<tr>
<td>Football</td>
<td>30 (n=20)</td>
<td>43 (n=10)</td>
</tr>
<tr>
<td>Basketball</td>
<td>61 (n=41)</td>
<td>65 (n=15)</td>
</tr>
<tr>
<td>Soccer</td>
<td>13 (n=9)</td>
<td>9 (n=2)</td>
</tr>
<tr>
<td>Wrestling</td>
<td>0 (n=0)</td>
<td></td>
</tr>
<tr>
<td>Volleyball</td>
<td>39 (n=26)</td>
<td>13 (n=3)</td>
</tr>
<tr>
<td>Baseball</td>
<td>27 (n=18)</td>
<td>30 (n=7)</td>
</tr>
<tr>
<td>Softball</td>
<td>16 (n=11)</td>
<td>17 (n=4)</td>
</tr>
<tr>
<td>Tennis</td>
<td>2 (n=1)</td>
<td>4 (n=1)</td>
</tr>
<tr>
<td>Track &amp; Field</td>
<td>31 (n=21)</td>
<td>39 (n=9)</td>
</tr>
<tr>
<td>Cross Country</td>
<td>12 (n=8)</td>
<td>4 (n=1)</td>
</tr>
<tr>
<td>Swimming</td>
<td>0 (n=0)</td>
<td></td>
</tr>
<tr>
<td>Weightlifting</td>
<td>15 (n=10)</td>
<td>22 (n=5)</td>
</tr>
<tr>
<td>Dance/ballet</td>
<td>0 (n=0)</td>
<td></td>
</tr>
<tr>
<td>Cheerleading</td>
<td>10 (n=7)</td>
<td>13 (n=3)</td>
</tr>
<tr>
<td>Ice Hockey</td>
<td>0 (n=0)</td>
<td></td>
</tr>
</tbody>
</table>
Table 5 cont’d

<table>
<thead>
<tr>
<th>Sport</th>
<th>Number of Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Hockey</td>
<td>0 (n=0)</td>
</tr>
<tr>
<td>Golf</td>
<td>5 (n=3)</td>
</tr>
</tbody>
</table>

Table 6

Frequency of Sports Supplement Use

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Number of Users</th>
<th>Percent of Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Androstenedione</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>Caffeine</td>
<td>7</td>
<td>10%</td>
</tr>
<tr>
<td>Creatine</td>
<td>2</td>
<td>3%</td>
</tr>
<tr>
<td>Ephedrine</td>
<td>5</td>
<td>8%</td>
</tr>
<tr>
<td>Glucosamine</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>Multivitamin</td>
<td>18</td>
<td>18%</td>
</tr>
<tr>
<td>Weight Gainer</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>Whey Protein</td>
<td>1</td>
<td>2%</td>
</tr>
</tbody>
</table>
Motivations, Obtaining, Information, and Influence Regarding Supplements

Table 7 refers to the most commonly reported responses to motivations of athletes' use of sports supplements, where athletes obtain the supplements, where athletes received information regarding supplements, and who encouraged and discouraged the athletes' supplement use. The most frequently reported motivations for use by high school athletes were to improved performance (n=12, 18%), stay healthy (n=10, 15%), and increased endurance (n=6, 9%). The most frequently reported response for where adolescents obtain supplements was from a friend or teammate, 15% (n=10). Friends and/or teammates (n=12, 18%) were reported most often as the athletes' source of information regarding supplements and. Athletes reported the individual that encourage them to use supplements was a friend and/or teammate (n=11, 16%), followed by health food store (n=8, 12%), and doctor (n=6, 9%). The individuals reported to discourage supplement use to the most athletes was a parent (n=8, 12%), coach, and athletic trainer (n=7, 10% each), followed by doctors and TV (n=6, 9% each).
Table 7

Most Frequently Reported Responses

<table>
<thead>
<tr>
<th>Survey Question</th>
<th>#1 Response (n, %)</th>
<th>#2 Response (n, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Reasons for use.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved performance</td>
<td>(12, 18)</td>
<td>Stay healthy (10, 15)</td>
</tr>
<tr>
<td>Stay healthy</td>
<td>(10, 15)</td>
<td></td>
</tr>
<tr>
<td>7. Obtained from.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friend/teammate</td>
<td>(10, 15)</td>
<td>Parent/Health food store (7, 10)</td>
</tr>
<tr>
<td>Parent/Health food store</td>
<td>(7, 10)</td>
<td></td>
</tr>
<tr>
<td>8. Information from.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friend/teammate</td>
<td>(12, 18)</td>
<td>Parent (9, 13)</td>
</tr>
<tr>
<td>Parent</td>
<td>(9, 13)</td>
<td></td>
</tr>
<tr>
<td>9a. Encouraged by.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friend/teammate</td>
<td>(11, 16)</td>
<td>Health food store (8, 12)</td>
</tr>
<tr>
<td>Health food store</td>
<td>(8, 12)</td>
<td></td>
</tr>
<tr>
<td>9b. Discouraged by.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent (8, 12)</td>
<td>Athletic trainer/Coach (7, 10)</td>
<td></td>
</tr>
</tbody>
</table>

Several statistically significant relationships were found between supplements and the motivations for use. Creatine was linked to improve appearance ($\chi^2=7.119$, $P=.008$), increase strength ($\chi^2=5.402$, $P=.020$), and improve athletic performance ($\chi^2=9.449$, $P=.020$). Caffeine was statistically significant with increase endurance ($\chi^2=11.019$, $P=.001$), increase energy ($\chi^2=9.701$, $P=.003$), and improve athletic performance ($\chi^2=8.183$, $P=.004$).
Ephedrine was statistically significant with improve athletic performance ($\chi^2=14.168$, $P=.000$), improve appearance ($\chi^2=11.146$, $P=.001$), weight loss ($\chi^2=5.402$, both $P=.020$), and decrease fat ($\chi^2=5.402$, both $P=.020$). Multivitamin was statistically significant with staying healthy ($\chi^2=53.874$, $P=.000$), weight gain ($\chi^2=5.078$, $P=.024$), and improve athletic performance ($\chi^2=5.611$, $P=.031$).

There was also a statistically significant relationship among males and friend and/or teammate response for where they obtained sports supplements ($\chi^2=8.045$, $P=.004$), where they are receive information regarding supplements ($\chi^2=7.414$, $P=.006$), and who is encouraging their sports supplement use ($\chi^2=6.118$, $P=.013$).
Table 8

Statistically Significant ($P > .05$) Motivations for Specific Sports Supplement Use

<table>
<thead>
<tr>
<th>Motivations</th>
<th>Andro</th>
<th>Creatine</th>
<th>Caffeine</th>
<th>Ephedrine</th>
<th>Multivitamin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight gain</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
<td>.024</td>
</tr>
<tr>
<td>Weight loss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.020</td>
</tr>
<tr>
<td>Decrease fat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.020</td>
</tr>
<tr>
<td>Increase strength</td>
<td>.000</td>
<td>.020</td>
<td>.025</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase endurance</td>
<td>.001</td>
<td></td>
<td></td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>Improve appearance</td>
<td>.000</td>
<td>.008</td>
<td></td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>Improve ath perform.</td>
<td>.031</td>
<td>.002</td>
<td>.004</td>
<td>.000</td>
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CHAPTER FIVE
DISCUSSION

Prevalence of Supplement Use

Thirty-four percent of the high school athletes surveyed reported using sports supplements in the greater Kalamazoo, Michigan area. These findings show considerably higher prevalence of use compared to the reported 5% of adolescent athletes surveyed by Mason and colleagues in 2001. Caffeine and ephedrine were specifically listed on this study’s questionnaire; neither was specified listed on Mason and colleagues’ questionnaire. Specific mention of the two supplements may have attributed to the increased prevalence of supplement use because they were both a large portion of the supplements used amongst the subject sample compared to Mason and colleagues (2001). This study’s prevalence was also higher than other studies, despite the low number of subjects from high supplement use populations such as wrestlers and gymnasts (Sobal & Marquart, 1994).

Demographics of Sample

The gender of those athletes who returned questionnaires was nearly proportionate. There was slightly greater number of female respondents than males, yet over two-thirds of the respondents using sports supplements were
male. Out of the total respondents surveyed, 50% of the males, and 2% of females reported supplement use. The trend of increased prevalence of supplements use by males supports the results of the other studies addressing gender and sports supplement use. Massad and colleagues (1995) acknowledged a significant increase of general supplement use by males versus females. Ray and colleagues (2001) reported 23% of male adolescents used creatine, compared to 2% of females. Mason and colleagues (2001) reported 8% of the male and 2% of female respondents reported using a sport supplement. This data supports other study findings that males use supplements significantly more than females.

When considering what the commonly used sports supplements are and the motivations for use, males are understandably the more prevalent population. Many sports supplements are targeted towards males to attain physical changes that many male athletes attempt to attain or improve upon. Muscle dysmorphia may also be a contributing factor to the higher incidence of use among male athletes. The preoccupation with musculature may drive more males impatient with their developing bodies to resort to sports supplements which may enhance or accelerate natural development.

The grades of athletes who returned questionnaires were evenly distributed throughout. Grades ten and eleven, providing a slightly greater number of completed questionnaires. Athletes in grade 11 reported an increased prevalence of use compared to the other grades. The results found in this study regarding supplement use among grades did not support other researchers findings. Metzl and colleagues (2001) reported supplement use
significantly higher among athletes in grades 11 and 12. Massad and colleagues (1995) found no significant difference for supplement use by year in school. The differences in findings may be attributed to the lower number of questionnaires returned by athletes in grade 12 (20.9%) (Massad, Shier, Koceja & Ellis, 1995). It was expected that grades 11 and 12 would have a higher prevalence of use rather than a younger group because they would be competing at a varsity level and possibly be training to compete at a collegiate level. The decreased use amongst 12th graders may also be attributed to an increased knowledge of sports supplements and the associated risks. Increased use among tenth graders may be a result of training to compete at the next level, preparing for a position on a varsity team. Peer pressure may also be a contributing factor to increased use by younger athletes.

Sports Supplements and Motivations for Use

The most frequently reported supplement used by 18% of athletes surveyed was multivitamins. The prevalence of use was similar to Sobal & Marquet's findings in 1994 of reported daily use (19%) and higher than the 8% reported in Mason and colleagues' (2001) study. Although this study's incidence of multivitamin use was notably lower than the 48.7% reported by O'Dea (2003) and 41.7% reported by Massad and colleagues' (1995). It is not surprising the multivitamin is the most commonly reported supplement used among adolescents. Considering the developmental stage of life adolescents
are in, it would be expected that parents and doctors would encourage multivitamin use to enhance a typically poor-balanced diet for many adolescents.

The most common motivations reported in this study concerning multivitamin supplementation, were to stay healthy, gain weight, and improve athletic performance. This information supports the adolescents in Sobal and Marquart’s study (1994), which reported that the most frequent response for motivations to consume multivitamins were healthy growth, treating illness, and sports performance. O’Dea’s study (2003) asked adolescents to provide reasons why they consume multivitamins, some of which were health, prevention of illness, parental control and poor diet.

Multivitamins, although not proven to enhance sports performance, are encouraged to be ingested to satisfy any deficiencies in diet. Weight gain may be a commonly reported motivation for multivitamin use for this same reason. Doctors, parents, athletic trainers, and coaches may endorse multivitamins to those athletes that may appear to have an eating disorder or food issues. Adults are attempting to maintain vitamin and mineral levels in the body by promoting multivitamin products while the athlete has altered their nutrient-dense food intake. It is very encouraging to find that multivitamins are the most commonly used supplement they are used to improve overall health.

The second most frequently used supplement was caffeine. This is considerably lower than O’Dea’s (2003) results in which nearly 50% of her participants, in a study of similar sample size, reported using caffeine. The
results may appear to be lower than O’Dea’s (2003) study because caffeine and ephedrine products were classified under the bulk classification of “energy drinks”. Caffeine and ephedrine are contained in more products than just “energy drinks”. If the participants are given the impression that those are the products they are to report they may omit the use of caffeine and ephedrine in pill form.

The adolescents from O’Dea’s research (2003) reported to consume caffeine because of energy, sports performance and peer group pressure. Participants in this survey frequently reported using caffeine with the intentions to increase endurance, improve athletic performance, and to increase energy levels. These motivations, which were commonly reported with caffeine use, are proven effective with usage of the supplement (Anderson, Bruce, Fraser, Stepto, Klein, Hopkins & Hawley, 2000; Hendrickson & Burton, 2000). Caffeine may be frequently used among adolescents because it is so easy to attain, and it is assumed to be a safe performance-enhancer. Health fitness magazines report caffeine to effectively increase endurance, and improve performance, at certain doses. Young athletes may not take into consideration that there can be too much of a good thing and at certain levels the effects of caffeine are potentially detrimental to athletic performance. To adolescents, perhaps caffeine does not sound like a potentially harmful product because of its familiarity in today’s society.

The third most frequently used supplement was ephedrine. Eight percent of adolescents surveyed reported using an ephedrine product. Previously, researchers have surveyed very little regarding ephedrine-type
alkaloid use by adolescents. It previously may have been classified under a bulk category, such as energy drinks or not listed on questionnaires at all. The actual number of individuals consuming ephedrine-type alkaloids may be much higher than reported. Unfortunately, even if young athletes are aware of ephedrine’s potential dangers, there are several different names that may be listed on a label that they may not realize what they have ingested.

Significant findings amongst ephedrine use and motivations for its supplementation were to improve performance, improve appearance, weight loss, and decrease fat. Again, all of the reasons adolescents are reporting to use ephedrine are effective functions of the product (Jenkins, 1996).

Identifying ephedrine as frequently used amid adolescent athletes is very alarming considering the danger that it poses to adolescents’ health and the ease of accessibility of ephedrine-type alkaloids in some states. Athletes are often unaware that caffeine and ephedrine, the second and third most frequently used supplements in this study, a potentially lethal combination when combined. Athletes are using ephedrine for reasons that ephedrine-alkaloids have been proven effective. Those athletes that use ephedrine products to lose weight, decrease fat, and improve appearance may be doing so because of internal pressure or by individuals that expect them to attain optimal body physique for their sport.

The fourth most frequently reported sports supplement was creatine monohydrate, used among 3% of the adolescents all male, participating in this study. This was similar to other studies, one reported 3% overall use, 6% males and less than 1% females (1 in 28) (Mason, Giza, Clayton, Lonning,
Wilkerson, 2001), the other reported overall 5.6% prevalence, 8.8% males and 1.8% female (Metzl, Small, Levine & Gershel, 2001). One particular study found notably higher prevalence of creatine use among high school athletes, of 16%, and 23% among males (Ray, Eck, Covington, Murphy, Williams & Knudtson, 2001). The study, however, did not report demographic data regarding the sports the respondents participated; it is possible that this study had a larger number of athletes participating in sports such as football, weight lifting, and baseball, which this study did not have. Another possibility for the lower prevalence of creatine supplementation is that young athletes are becoming more informed of the unknown risks of creatine supplementation by adolescents, particularly the American College of Sports Medicine specifically advised against adolescent creatine use (Ray, Eck, Covington, Murphy, Williams & Knudtson, 2001).

Correlation was found among the motivations for supplement use and creatine monohydrate supplementation with improved appearance, increased strength, and improved athletic performance. The results reported in this study reflected those reported by Metzl and colleagues (2001), which stated nearly 75% of the adolescents reported to use creatine did so to enhance performance, over half to improve appearance, and slightly less than half to improve endurance. Twenty-two of the 28 athletes in Mason and colleagues (2001) study reported using creatine to improve performance as well. Athletes continue to choose the effective sports supplements to achieve their goals those of which are repeatedly similar among different studies as the main motivations reported of supplement use. Those athletes who have goals
to improve appearance by means of increasing body mass, or to improve athletic performance via increased strength and power, would find creatine to be effective. Creatine monohydrate particularly, may be a supplement that is commonly used among males that need to increase strength and body mass to continue to be competitive at levels where body mass can be imperative, such as football.

Of the additional supplements surveyed, one person each reported using androstenedione, glucosamine, whey protein, and weight gainer, the later three responses were added in the “other” response option. The lower frequency of androstenedione use was unexpected, considering the increased media coverage of androstenedione following Mark McGwire attributing androstenedione to his homerun record-breaking season in 1998. Although, the minute amount of adolescent athletes that reported androstenedione use in this study supports Mason and colleagues (2001) reported one percent prevalence androstenedione use among high school adolescents. The increased media coverage could also attribute to the low prevalence of androstenedione, bringing attention to young athletes the fact that the adverse effects may be similar to that of steroids, therefore increasing knowledge and deterring use.

None of the athletes surveyed reported consuming DHEA, HMB, or PPA. Mason and colleagues (2001) results supported this study, which reported a very small percentage of participants used HMB, represented less than 1% of respondents that used supplements, and no athletes reported use of DHEA or PPA in either study. These supplements are not as prevalent in
the media or in fitness magazines to gain the attention of a young public. HMB supplementation may be a commonly used sports supplement in the future among adolescents due to the studies recently reporting HMB supplementation to possibly decrease muscle damage after resistance training or facilitate quicker recovery (Knitter, Panton, Rathmacher, Petersen, & Sharp, 2000; Nissen et al., 1996) without evidence of adverse effects (Gallagher, Godard, Schulze, & Trappe, 2000). PPA use was expected to have a very low prevalence of use due to the highly publicized deaths of many individuals associated with PPA, and the removal of many products containing PPA from the market.

Receiving Information and Obtaining Sports Supplements

The majority of individuals received information regarding sports supplements from friends, teammates, parents, doctors and health food stores. None of the subjects in this survey reported school as a source of information, yet more than half of the adolescents surveyed in the BlueCross BlueShield (2001) survey stated that their school provided them with the most information regarding sports supplements. Additional participants from the BC/BS Healthy Competition (2001) survey reported receiving information from friends and one-quarter from advertising. Again both were more frequently reported in the Healthy Competition (2001) survey compared to this study. Those differences in sources of information may possibly be attributed to differences in schools the participants attended. Although
demographic information was not included in the Healthy Competition survey, it is possible that a large portion of the students may have attended larger schools or schools in urban areas, where the subject of sports supplements may be more frequently addressed.

Twenty-five percent of parents involved in the BC/BS survey admitted they felt they were not informed enough to feel comfortable providing information to their children concerning sports supplements, this evidence, although exceeding the results, supported the findings in this study. Expectedly, the majority of the athletes surveyed received information regarding supplements from friends, yet adults must assume adolescents typically acquire anecdotal information and not that which will aid them in making an informed decision. Parents should take initiative to inform themselves so that they are confident when discussing sports supplements with their children.

The sports supplements surveyed in this study are all available over-the-counter without age restrictions on purchases. The accessibility of these products are readily available at local discount stores and health food store chains such as GNC, some products are even available at gas stations and pharmacies. Most of the adolescents in this study obtained sports supplements from a friend and/or teammate (15%), followed by health food stores and parents (10% each), supporting the previous findings by Mason and colleagues’ study in 2001, of volleyball and football athletes. The difference amongst the three studies reporting where athletes obtained supplements was BlueCross BlueShield (2001), which stated a few of the
respondents reported coaches had provided them with sports supplements. Otherwise the majority of the BC/BS survey (2001) respondents followed the current trend of obtaining supplements from stores, friends, and parents.

Encouragement and Discouragement of Supplement Use

The influence individuals may have on adolescents can be very important. It has been proven that those who effectively influence adolescents regarding supplements use can decrease the prevalence of sports supplement use (Dunn, Eddy, Wang, & Nagy, 2001). In this study, participants reported that friends and/or teammates, health food stores and doctors most often encouraged sports supplement use. The most common responses for those that discouraged adolescent supplement use were parents, coaches, and athletic trainers, respectively. Unfortunately, information on those who discouraged supplement use was not collected from subjects who refrained from using sports supplements. Parents, coaches, and athletic trainers should make a greater effort to portray themselves as individuals that adolescents feel comfortable approaching with questions regarding sports supplement use. It is possible that the individuals, such as athletic trainers, parents, and coaches did not take the opportunity to provide their perceptions regarding supplements.
Conclusion

High school athletes are using a variety of sports supplements with the intentions to improve athletic performance, increase endurance, stay healthy and improve appearance. They are obtaining supplements and acquiring information regarding supplements from unreliable sources, such as friends and/or teammates. Friends and teammates seem to have a great deal of influence on their peers regarding encouraging sports supplement use, whereas the adults who typically have the most influence upon adolescents, are unsuccessfully discouraging supplementation. Education is the most effective deterrent for adolescent supplement use; the adults in their lives must seize the opportunity to provide them with the materials to make informed decisions in regard the athlete’s well-being.

Limitations

The sports supplement questionnaire for this study had a low return rate (7%), yet was similar to studies with similar age range concerning sports supplements listed on the survey (Mason, Giza, Clayton, Lonning & Wilkerson, 2001; O'Dea, 2003). The low response rate may have been attributed to the process of adolescents obtaining parental consent and then returning both the consent form and the questionnaire to the collaborating investigators. Many athletes reported to collaborating investigators that they
had misplaced the forms during this process.

There was also a notably disproportionate response rate amongst the Class A, B and C schools where the questionnaires were distributed. None of the surveys from the Class A schools were returned, the majority of the surveys received were received from Class B schools and less than one quarter of the questionnaires were returned from Class C schools.

An additional limitation to the study was that the data collection was limited to athletes who were participating in school-sponsored sports at the time of the distribution of the questionnaire. This narrowed the subject sample population by the number of available participating athletes and the range of sports surveyed.

Recommendations for Future Research

Recommendations for further research on the topic of sports supplement use by adolescent athletes would commence by instructing all respondents to fill out all sections of the questionnaire so that data can be collected on those who successfully discouraged athletes from sports supplement use. Also a more effective route for questionnaire distribution should also be considered. One option would be to include non-athletes in the study so the questionnaire could be distributed in a classroom setting. An additional option would be to distribute the questionnaire in conjunction with annual pre-participation exams (PPEs). This method ensures the parental consent forms would be sent out with the PPEs, which are required
to be returned with a parent’s signature. This would also provide the athletes
with an opportunity to complete the questionnaire without parents or
coaches, to maintain the athletes’ anonymity. Also, adjusting the time of year,
in which the distribution may result in an increase in numbers of completed
questionnaires, such as fall or spring sports seasons, when there are a greater
number of athletes participating in school-sponsored athletics. An additional
recommendation would be to research further into the duration of
supplement use as a variable. Differentiation between one-time users and
long-term users may reveal notable changes in the data reported.
APPENDIX A

LETTER TO THE PRINCIPAL FOR RESEARCH SITE APPROVAL
Dear ____________ High School Principal:

Your high school is invited to participate in a research study entitled “Prevalence of Sport Supplement Use Among High School Athletes,” being conducted by Bethany Coover, in fulfillment of the thesis research requirement for her Masters of Arts degree from Western Michigan University, Department of Health, Physical Education, and Recreation. The purpose of this study is to find what types of sports supplements high school athletes are using, the motivations behind their use, and the sources of purchasing, encouragement, discouragement and information of sports supplements for high school athletes. By allowing your student athletes to participate in this study the data collected may be used to better inform parents, athletic directors, and coaches as the products that athletes are using and those they may be tempted to use. Any of the information provided will not be directly identified to any participating individual or high school to ensure anonymity of the participants.

You may choose not to have your students participate in this survey, if so, simply discard this form and let your athletic trainer know of your wishes. If you choose to have your school participate in this research study and allow your school to be a site of research then sign this form provided and return it to your athletic trainer with in the next week. If you have any questions contact Bethany Coover, ATC at (269) 552-9235, Dr. Michael Miller at (269) 387-2728, the Chair, Human Subjects Institutional Review Board (269) 387-8293 or the Vice President of Research (269) 387-8298.

Thank you very much for your time and consideration.

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Subjects should not sign this document if the corner does not show a stamped date and signature.

Your signature below indicates that you, the principal, grant permission for your high school to be used as a site for the research project “Sport
Supplement Use Among High School Athletes” and for your student-athletes to participate in the survey.

Signature ___________________  Date ___________
APPENDIX B

PARENTAL CONSENT FORM
Western Michigan University  
Department of Health, Physical Education and Recreation  
Principal Investigator: Dr. Michael Miller  
Student Investigator: Bethany Coovert

Dear Parent or Guardian:

Your child has been invited to participate in a research study entitled “Sport Supplement Use Among High School Athletes”. The purpose of this study is to find what types of sports supplements high school athletes are using, the motivations behind their use, and the sources of purchasing, encouragement, discouragement and information of sports supplements. This project is being conducted by Bethany Coovert, ATC in fulfillment of the thesis research requirement for her Masters of Arts degree at Western Michigan University.

Your permission for your child to participate in this study means that your child can choose to fill out the survey attached about their use of supplements. Your child’s answers will be kept completely anonymous. Your child and his/her school will never be directly associated to the results of the study. Your child may choose not to participate, if so the survey may be discarded. The final results of this survey may help to better inform you, the parents, coaches and athletic trainers. Knowing which supplements the athletes are using, will help us to better educate ourselves and provide them with factual information about the products that they may be tempted to use. Please be aware that the final report will be available to you, but the specific information pertaining to your child and their school will not be attainable.

For your child’s information to be included in the study, please have him or her return this form to the athletic training room. If you have more than one child participating you must sign the parental permission form for each child. The corner of this form is coded so that once it is signed, the coded corner will be separated from the form. The form will be stored in a locked file in the principal investigator’s office for three years. Then the detached coded corner will be matched to your child’s completed survey. This process allows for your child’s information to be kept completely anonymous, yet still ensuring that a parent’s permission has been granted.

If you have any concerns or questions about this study please feel free to contact Bethany Coovert at (616) 552-9235 or Dr. Michael Miller at (616)387-2728. If you have any concerns you may also contact the Vice President of Research (616) 387-8298.

Thank you very much for your time and consideration.
This parental permission document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Subjects should not sign this document if the corner does not show a stamped date and signature.

Your signature below indicates that you, as parent or guardian, can and do give your permission for participation in the survey used in the study “Sport Supplement Use Among High School Athletes”.

Signature ___________________________ Date _________
APPENDIX C

STUDENT ASSENT FORM
You are invited to participate in a research study titled, “Sport Supplement Use Among High School Athletes”. The purpose of this study is to find what types of sport supplements high school athletes are using, the motivations behind their use, and the sources of purchasing, encouragement, discouragement and information of sport supplements. For the purposes of this study the definition of a sport (ergogenic) supplement is any over the counter item that may be used to enhance or alter performance. Please note that this definition does not include steroids, or street drugs. This study is being conducted by Bethany Coover, in fulfillment of the thesis requirement for her Masters of Arts degree at Western Michigan University.

The survey is comprised of nine questions regarding sport supplement use and should take less than five minutes to complete. In order to complete the survey, you must be a high-school athlete participating in a school-sponsored sport between grades nine through twelve. Please DO NOT add any person's name or additional markings to the survey. The data collected from the surveys will remain anonymous and will not be directly linked to any participating individual or high school. Additionally, any information provided will not effect your relationship or ability to play sports at your high school or at Western Michigan University.

If you choose to participate in the survey, please take home the parental permission form, the survey and this form. After your parents sign the permission form return the signed form to the appropriate envelope in the athletic training room. You may then complete the survey in the privacy of your own home to protect yourself from parents, coaches or teachers from seeing any confidential information. Once you have completed the survey, place it in the envelope provided and return that to the specified envelope in the Athletic Training room. By completing the survey, you will be giving your assent for the information you have provided to be used in the analyzed data for this study.

Please have all the necessary forms and surveys completed and returned to the Athletic Training room by the date posted on the return
envelopes. The envelopes will be sealed on the completion date. The sealed envelopes will then be delivered to the principal investigator by the certified athletic trainer from your high school, where they will be stored in a locked file for three years. If you choose to not participate in this study, then simply discard the survey.

If you have any questions, you can contact Bethany Co overt at (616) 552-9235, Dr. Michael Miller (616) 387-2728, the Chair, Human Subjects Review Institutional Review Board (616) 387-8293 or the Vice President of Research (616) 387-8298.
APPENDIX D

SUPPLEMENT USE QUESTIONNAIRE
1. Age

2. Grade
   (circle) 09 10 11 12

3. Gender
   (circle) Male Female

4. In my high school I participate in the following sports (check all that apply):
   - Football
   - Basketball
   - Soccer
   - Wrestling
   - Volleyball
   - Baseball
   - Softball
   - Tennis
   - Track/field
   - Cross Country
   - Swimming
   - Weight Lifting
   - Dance/ballet
   - Cheerleading
   - Ice Hockey
   - Field Hockey
   - Golf
   - Other (please specify):

5. For participation in sports I have tried the supplement (check all that apply):
   - Androstenedione (Andro)
   - Creatine
   - Caffeine (Guanara, No-Doz, Red Bull)
   - DHEA
   - Ephedra/Ephedrine (Metabolite, Mini-thins)
   - HMB
   - Multivitamin
   - Phenylpropanolamine (Dexatrim, Metabolift)
   - Other (please specify names, steroids or street drugs DO NOT apply.):

If you have not tried a supplement, stop here.
If you have tried a supplement, continue.
For the following questions, if you mark other, DO NOT write a person’s name.

6. I used the supplement for (check all that apply):
☐ Weight gain
☐ Weight loss
☐ Decrease fat
☐ Increase strength
☐ Increase endurance
☐ Stay healthy
☐ Improve appearance
☐ Improve athletic performance
☐ Other (please specify): 

7. I got the supplement from (check all that apply):
☐ Health food store
☐ Catalogue/Magazine
☐ Internet
☐ TV
☐ Parent
☐ Coach
☐ Athletic Trainer
☐ Doctor
☐ Friend/Teammate
☐ Local gym staff
☐ Other (please specify): 

8. I was given information about supplements by (check all that apply):
☐ Health food store
☐ Catalogue/Magazine
☐ Internet
☐ TV
☐ Parent
☐ Coach
☐ Athletic Trainer
☐ Doctor
☐ Friend/Teammate
☐ Local gym staff
☐ Other (please specify): 

9. I was encouraged or discouraged to use supplements by (check all that apply):
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<tr>
<td>Coach</td>
<td></td>
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<tr>
<td>Athletic Trainer</td>
<td></td>
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<tr>
<td>Doctor</td>
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<td>Friend/Teammate</td>
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<tr>
<td>Local gym staff</td>
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