2012

Training, nutrition, injury and lifestyle characteristics of shorter distance triathletes

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TRAINING, NUTRITION, INJURY AND LIFESTYLE CHARACTERISTICS OF SHORTER DISTANCE TRIATHLETES

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Master of Science

in

The Department of Kinesiology

by
Loren Johnson
B.S., Louisiana State University, 2010
August 2012

ACKNOWLEDGMENTS

I would first and foremost like to thank my mentor, Dr. Laura Stewart, for her time and dedication in helping me finish my project. I also want to thank my committee members – Dr. Arnold Nelson and Dr. Russell Carson- for their many hours they have put into reading my documents and helping me become a better student.

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ABSTRACT

Triathlon is an increasingly popular sport in which an athlete competes in swimming, biking and running in a single competitive bout. Today there are more than 140,000 members in the sanctioning body for triathlon. However, there is little descriptive data about this group of athletes. **PURPOSE:** The primary purpose of this exploratory study was to describe the demographics, training habits, nutritional practices, injury occurrence and overall health status of triathletes and identify any differences between two studies that collected this information. The secondary purpose was to examine any significant correlations among the major outcome variables in the LSU study. **METHODS:** Three hundred and eighty male and female triathletes were recruited for this study. Participants were recruited at race expos the day prior to the event. Subjects completed a 30-question survey examining triathlete characteristics. The Purdue study surveyed 514 athletes competing in triathlons during the 1999 season. Independent t-tests were conducted to compare variables between studies and genders. Pearson's correlations were run to examine relationships between outcome variables. **RESULTS:** In the LSU study 248 male and 131 female were recruited, while 367 males and 147 females were recruited in the Purdue study. Mean age of the LSU study participants was 38.5 ± 10.0 years (mean ± SD), while mean age of the Purdue study participants was 33.2 ± 8.9 years. Triathletes in the LSU study report participating in 5.34 ± .3.8 months of competition in the past year, while triathletes in the Purdue study report participating 3.4 ± 2.7 months of competition. Athletes in the LSU study did not meet daily recommendations for carbohydrates, with only 12.6% of triathletes in the LSU study meeting requirements. The most common injury suffered, at the knee, occurred in 34% of

triathletes surveyed in the LSU study and 46.1% of the Purdue athletes. **CONCLUSION:** The LSU study participants were older than the Purdue study participants. The triathletes from the LSU study report a longer competitive season when compared with the Purdue study. LSU study participants consumed fewer carbohydrates than the Purdue study participants and most triathletes from both studies suffered injuries at the knee.

CHAPTER 1 - INTRODUCTION

Triathlon is an individual endurance sport in which an athlete competes in consecutive events, specifically swimming, biking and running. These events vary in length ranging from a short sprint distance triathlon, to longer events like the Ironman. Sprint distance triathlons include a .75 km swim, a 20 km bike and a 5 km run. Olympic distance triathlons include a 1.5 km swim, a 40 km bike and a 10 km run. Half Ironman distance triathlons include a 1.9 km swim, a 90 km bike and a 21.1 km run. Ironman distance triathlons include a 3.8 km swim, a 180 km bike and a 42.2 km run (Strock, Cottrell, & Lohman, 2006).

The sport of triathlon was developed in San Diego, CA in the early 1970s. Since then, the sport has become increasingly popular and debuted as an Olympic sport in Sydney, Australia in 2000. This increase in sport participation can also be observed when viewing USAT (USA Triathlon) membership. This organization is the official governing body of triathlon in the United States. In 1999 USA Triathlon was comprised of 19,060 annual members and by 2002, membership had more than doubled to 40,299. In the next 4 years (2006), membership doubled again to 84,787 active athletes. Today there are more than 140,000 annual members (Scott, 2012).

In 1999, an exploratory study was conducted at Purdue University with the goal of understanding the demographics, training habits, nutritional practices, injury occurrence and overall health status of the multisport athlete. This 1999 survey referred to as the Purdue study, examined triathletes in the Eastern and Midwestern regions of the United States. Five hundred fourteen (367 male and 147 female) triathletes were surveyed the day before competition. Participants answered questions concerning

demographics, training practices, nutritional practices, injury occurrence, and overall health status. This exploratory study also examined gender differences in each category listed above.

In the Purdue study age ranged from 18-68 years. In-season training averaged 3.5 hours/week swimming, 6.6 hours/week cycling, 4.7 hours/week running with 94% of athletes taking 1-2 days rest/week vs. 2.2 hours/week swimming, 3.4 hours/week cycling, 3.7 hours running with 55% of athletes taking 2-4 days rest/week in the off season. Overall servings of grains (4.3), fruits (3.0), and vegetables (3.0) were low compared to the food guide pyramid recommendations. Popular supplements used included liquids (92.3%), bars (90.4%), and vitamin and minerals (78.2%). Knee (46.1%), foot (32.2%), and back (28.1%) injuries were the most common. Significant gender differences were noted among physical characteristics (p = .01), experience (p = .001), nutrition (p = .003), and supplementation categories (p = .01).

Given the rapid increase in event participation and the development of triathlon specific training and nutrition programs, it is possible that the characteristics of the athletes participating today are different from those 12 years ago. Accordingly:

1. The primary purpose of this exploratory study was to describe the demographics, training habits, nutritional practices, injury occurrence and overall health status of triathletes and identify any differences between the LSU and Purdue studies or gender of the individual.
2. The secondary purpose was to determine whether there were any significant correlations among the major outcome variables.

We hypothesized:

1. That triathletes competing in 2011 would train for an equivalent amount of time per week, but would include more cross training (strength training) in their regimens. However, they would suffer similar injuries while maintaining similar overall health when compared to their counterparts from 1999.
2. That there would be a positive relationship between the number of hours per week of training and typical race performance, nutritional status, supplement use, injury rate, and health status.

Significance

This study will provide much needed information about the athletes that are participating in this rapidly growing sport. This information will allow clinicians, researchers and coaches to better prepare individuals for a triathlon. As a result, we hope that this study will allow individuals to enjoy the sport of triathlon for a longer period of time and triathlon involvement becomes a lifelong habit for a larger proportion of the US and world populations.

CHAPTER 2 – REVIEW OF LITERATURE

Training Habits

Training for a triathlon is dependent on race distance, and the current level of fitness and goals of the athlete. Dolan and colleagues surveyed 401 triathletes and found that the sprint distance triathlon was the most commonly raced distance.(Dolan, Houston, & Martin, 2011). The Purdue study previously found that of 514 participants surveyed, 70% had competed in an Olympic distance race while 65.3% had competed in a sprint distance race, 35.4% had done a half ironman and 11% had completed an ironman in the last 12 months (Stewart, 2000).

Triathlon, like other endurance sports, requires some sort of periodization of training to provide stimulus to both the physiological and psychological aspects of the competition. Athletes participating in periodization undergo a series of systemic variations in training specificity, intensity and volume organized in cycles within an overall program (Wathen, Baechle, & Earle, 2008). Traditionally, a training program is partitioned in to several periods, the largest being a macrocycle that usually constitutes an entire year of training. The macrocycle is further divided into mesocycles that are then divided into microcycles (Wathen et al., 2008). A typical undulating training situation involves two to three weeks (microcyles) of increased volume or intensity followed by a week of reduced training loads. In preparation for the competitive season, triathletes will begin in a mesocycle with a focus of base training, which involves low-intensity workouts where the goal is to acquire aerobic fitness and proper technique. When nearing

the goal race or races, a triathlete will focus on shorter duration, but higher intensity training to increase speed (Strock et al., 2006).

Dolan et al. also noted that most triathletes set goals for both training and competition with the most frequent training goal centered on completing a set number of hours of training per week and the most frequent competition goal of finishing in a personal best time. For example, the Purdue study found that triathletes spent the most time biking when in season (6.5 ± 4.3 hours per week) and the most time running in the off-season (3.7 ± 2.7 hours per week) (Stewart, 2000). Most of the triathletes in the Purdue study were average competitors with 37.2% finishing in the upper 50% of their age group by gender. The majority of the athletes were competing in Olympic distance events (57%) (Stewart, 2000).

Most triathletes will also participate in an off-season. A typical off-season begins when competitions start to dwindle; this usually occurs in late fall, but is dependent on the region (Strock et al., 2006). In more northern climates, this period will begin in September and last until the early spring. The off-season can be characterized by lower intensity and duration training and includes more cross-training and rest days (Dowdeswell, 2012). Preliminary data from the Purdue study found that athletes took an average of 1.3 ± .76 days off when in-season and 2.02 ±1.1 days off in the off-season (Stewart, 2000).

Exercise performance data indicate an increase in running and cycling endurance capacity when strength training is added to an aerobic exercise program in both sedentary and trained individuals; strength training had no effect on swimming performance (Tanaka & Swensen, 1998). Resistance training with heavier loads or explosive

movements improves muscle power and overall efficiency during endurance exercise (Young, 2010). Accordingly triathletes often add weight training to their exercise program. One of the best strength training programs available to triathletes online includes short but intense workouts lasting 15-40 minutes 1-3 times per week (Young, 2010). These recommendations can easily be met by the triathletes from the Purdue study that included, on average, 1.5 ± 1.8 hours per week of weight training when in season and 2.3 ± 2.1 hours in the off-season (Stewart, 2000).

Many triathletes include overreaching, which includes a high intensity exercise bout, but is followed by a fast recovery, which allows for positive physiological adaptations to take place (Ackel-D'Elia, Vancini, Castelo, Nouailhetas, & Silva, 2010). When an overreaching period is extended and adequate recovery is not incorporated into the training plan, the athletes may become overtrained (Main, Landers, Grove, Dawson, & Goodman, 2010). Overtraining syndrome is characterized by decreased athletic performance and usually persists for more than 6 weeks (Ackel-D'Elia et al., 2010). Main et al. studied the training patterns of triathletes and the negative results associated with them. Data showed that the total number of training sessions, specifically running sessions, had the greatest effect on overtraining symptoms in triathletes (Main et al., 2010). This same lab also examined the effects of these training factors on athlete burnout. Athlete burnout is defined as a withdrawal from a sport, often noted by resentment of the sport, physical and psychological exhaustion and a reduced sense of accomplishment. Main and colleagues found that training factors as well as psychological stressors might affect burnout (Main et al., 2010).

The potential for burnout and injury can be high in athletes that spend so much time training and racing. As a result, triathletes may seek training related information from a variety of sources. In one study surveying 401 triathletes, 56% of respondents indicated that they received training consultation from a coach. The most frequently used training devices were training logs and GPS devices (Dolan et al., 2011). Companies like Garmin produce fully water resistant GPS watches fashioned specifically for multisport athletes.

Nutritional Practices

An understanding of the importance of a proper nutrition strategy in triathlon is essential. The age of the competitor, duration and intensity of the event as well as the environment in which the event takes place are just a few of the factors that may influence an athlete's training and race day nutritional plans. The Purdue study found that 32% of triathletes were getting ≥ 6 servings of carbohydrates per day (Stewart, 2000). This is a low percentage given that it is well established that triathletes participating in Olympic distance or longer triathlons will benefit from carbohydrate loading (Strock et al., 2006). There are several studies examining nutritional information and supplementation in multisport athletes. Interestingly, Cox et al. found triathletes met the recommendation for pre-race carbohydrate loading; however, they failed to meet the recommendations for carbohydrate replenishing during competition (Cox, Snow, & Burke, 2010). Cox et al. also noted that the athletes took in carbohydrates mostly via gels and sports drinks during competition while S. H. Dolan et al. found that triathletes most frequently consumed water, energy gels and jellies as well as sports drinks fortified with carbohydrates and electrolytes (Dolan et al., 2011) (Cox et al., 2010). The Purdue study

found that triathletes were more likely to use liquids (92.4%) than gels (73.1%) during training and competition (Stewart, 2000).

A supplement as defined in the Dietary Supplement Health and Education Act, is a product that is intended to supplement the diet; contains one or more dietary ingredients (including vitamins; minerals; herbs or other botanicals, amino acids and other substances) or their constituents; is intended to be taken by mouth as a pill, capsule, tablet, or liquid; and is labeled on the front panel as being a dietary supplement ("Dietary Supplement Health and Education Act of 1994," 1994). S. H. Dolan et al. also found that of the 401 respondents, 53.6% used some form of dietary supplements (Dolan et al., 2011). The Purdue study found that triathletes most commonly used liquids (92.3%), bars (90.4%), vitamin/mineral supplements (78.2%), and gels (73.4%) to supplement their nutrition (Stewart, 2000). Some have suggested that multisport athletes may benefit from nutritional supplementation. Desbrow and coworkers surveyed 140 triathletes and found that 73% indicated a positive effect of caffeine on Ironman distance performance (Desbrow & Leveritt, 2006). It is important to note that the data presented from Desbrow and colleagues was self-reported and that the survey was comprised of several open-ended questions, which are difficult to quantify (Desbrow & Leveritt, 2006). In another study Bassit and colleagues administered creatine supplementation twice daily, five days prior to a half-Ironman competition and found significantly lower levels of pro-inflammatory cytokines with supplementation when compared with the carbohydrate controls 24 and 48 hours post competition (Bassit, Curi, & Costa Rosa, 2008). Bassit and colleagues cite a decrease in muscle damage and inflammatory responses due to creatine's ability to maintain muscle cell integrity during strenuous exercise (Bassit et al.,

2008). Interestingly, the Purdue study conducted in 1999 found that only 13.1% of triathletes surveyed supplemented with creatine (Stewart, 2000).

Dehydration has been cited as a cause of early fatigue in endurance athletes. Body mass loss of greater than 2% during competition or training significantly decreases performance (Coyle, 2004). Thus, although it is debated today, proper hydration techniques are necessary for optimal performance for all endurance athletes, triathletes included. McMurray and colleagues studied the influence of fluid ingestion times during cycling on running performance in a simulated Olympic distance triathlon. They found that earlier ingestion of the fluids at 8, 16, 24 and 32 kilometers versus at 10, 20, 30 and 40 kilometers, improved running performance (McMurray, Williams, & Battaglini, 2006). Another emerging health issue in the sport of triathlon is centered on hyponatremia. Exercise induced hyponatremia, which is defined as a post-exercise serum sodium level below 135 mEq/L, has been observed in long course triathletes competing for longer than 8 hours (O'Connor, 2006). Symptoms of hyponatremia, weakness, fainting and confusion, are similar to those of dehydration (Hiller, 1989).

While there are many issues related to the development of GI stress in triathletes, some of the most common are linked to high osmolalities in sports drinks and low blood flow to the gut during exercise (Rehrer, van Kemenade, Meester, Brouns, & Saris, 1992) (Jeukendrup, Jentjens, & Moseley, 2005). Jeukendrup and colleagues found that 93% of the highly trained triathletes tested reported some symptom of GI distress (Jeukendrup et al., 2000). McMurray also found that the athletes had fewer gastrointestinal (GI) problems when ingesting fluids earlier in the cycling portion of the triathlon vs. later in

the event (McMurray et al., 2006). It has also been found that GI problems occur most frequently on the run portion of the triathlon.

Injury Occurrence

Multisport athletes are often plagued by injuries; usually caused by overuse and other inappropriate training practices. It has been noted that multisport athletes more commonly incur overuse injuries, which include shin splints, blisters, tendonitis, iliotibial band syndrome, patellofemoral syndrome, plantar fasciitis, and compartment syndrome, than single-sport athletes (Strock et al., 2006; Tuite, 2010). In one study, even though the authors noted that triathlete might suffer an acute injury, such as a rotator cuff tear or sprain, up to 80% of triathlon related injuries are considered overuse injuries (Tuite, 2010). Several publications indicate injury rates and locations of injuries in the multisport athlete (Clements, Yates, & Curran, 1999) (Gosling, Forbes, McGivern, & Gabbe, 2010) (Shaw, Howat, Trainor, & Maycock, 2004) (Tuite, 2010) (Villavicencio, Burneikiene, Hernandez, & Thramann, 2006) (Villavicencio, Hernandez, Burneikiene, & Thramann, 2007) (Stewart, 2000). The Purdue study found that 76% of triathletes experienced injuries in a 12-month period (Stewart, 2000). Villavicencio et al. completed a cross sectional evaluation of neck pain in the multisport athlete and found that 47.6% of those surveyed suffered from neck pain and 64.1% of those indicating the neck pain believed it to be sports related, specifically due to cycling. Clements et al. found 22% of those triathletes surveyed suffered a knee injury due to cycling while 65% indicated an injury due to running (Clements et al., 1999). Concurrently, the Purdue study found knee injury to be the most prevalent (46.1%), followed by foot (32.2%) and back (28.1%) injuries (Stewart, 2000).

It has been hypothesized that time training causes a dose response in injury rates in endurance athletes. In a cross sectional study T. Shaw et al. (2004) found that athletes training 8-10 hours per week were the least likely to sustain injuries, while those training 7 or fewer hours and those training more than 15 hours were twice as likely to become injured. Clements' results also indicate that the longer one has competed in triathlon, the more likely he/she will suffer a knee injury (Clements et al., 1999). It has been consistently shown that multisport athletes incur more injuries due to running than cycling or swimming (Burns, Keenan, & Redmond, 2003) (Gosling et al., 2010) (Shaw et al., 2004). T. Shaw et al. also found that swimming did not have an effect on injury rate.

Overall Health Status

Most triathletes in the Purdue study indicated having a good to excellent quality of life (86%), while 92.5% rated their health as being very good to excellent (Stewart, 2000). Zeller et al. reported that well trained athletes, (runners, cyclists and triathletes) reported being highly satisfied with their quality of life. These same athletes reported maximal scores for physical and emotional functioning on the Medical Outcome Study Short Form 36 physical and health scales (Zeller, Abu-Shakra, Weitzman, & Buskila, 2011). However, Dolan and colleagues found that of 401 triathletes surveyed females were more likely to feel anxious and nervous prior to competition (Dolan et al., 2011).

CHAPTER 3 - METHODS

Study Subjects and Procedures

Three hundred and eighty male and female athletes were recruited for this study. All individuals were over the age of 18 and competed in a sprint, Olympic or half ironman distance triathlon during the 2011 triathlon season. Races included the AVIA Austin Triathlon, an Olympic distance triathlon in Austin, Tx on September 5, 2011, the 5150 Galveston, an Olympic distance triathlon and the Lonestar sprint triathlon in Galveston, TX on October 23, 2011, and the Oil Man Texas Triathlon, a half ironman distance race in Conroe, TX on November 6, 2011. Subjects were recruited at race sites and expos the day prior to the event. A table, chairs and signage highlighting the study were set up in each race's expo area. Research assistants of both sexes participated in the data collection at each race site. Subjects who volunteered to participate received a packet including a letter of introduction and informed consent document and the survey, as described above to complete and return prior to exiting the packet pick-up site. The subjects were able to withdraw from the study at any point without penalty.

Instrument

Subjects completed a 30-question survey examining demographics, training habits, nutritional practices, injury occurrence and overall health status. This survey was developed and piloted initially in 1999 and data was collected using it as part of an IRB approved study at Purdue University. Twelve participants completed and commented on the survey at the Terre Haute Triathlon on May 15, 1999. It took an average of 7-10 minutes for the athletes to complete the survey. The pilot study successfully identified several suggested editorial changes that were incorporated into the final version.

The survey included multiple items within each category mentioned below. A copy of the full survey can be found in Appendix 1.

<u>Demographics:</u>

Subjects answered questions regarding gender, age, height, weight, and body fat percent. Subjects entered data for all variables listed, except for sex in which they chose from the two options male or female.

<u>Training Habits:</u>

Subjects were asked to enter the average number of hours spent training per week in each discipline. Subjects also entered the number of rest days taken per week and the number of races completed in the last 12 months. Subjects reported on their primary resource for information regarding their training habits by selecting from a list of 5 resources.

<u>Nutritional Practices:</u>

Subjects indicated how often they used various supplements listed, rating as having never used the supplement to using the supplement on a daily basis. Subjects also indicated the number of servings consumed for all of the major macronutrients by selecting a serving number from 0 to ≥ 6. Subjects also indicated their vegetarian status by choosing from listed options.

<u>Injury Occurrence:</u>

Subjects indicated personal injury patterns for all regions of the body. Subjects indicated the severity of the injury ranging from no injury to injuries that were serious enough to cause the athlete to completely stop training for at least four days.

Overall Health Status:

Subjects indicated their health status on a scale ranging from excellent to poor. Subjects also indicated their level of difficulty of performing moderate activities and climbing several flights of stairs. Subjects answered questions regarding problems with work or other regular daily activities with the regards to physical and emotional problems. Finally, subjects were asked to report their quality of life ranging from excellent to poor.

Statistical Analysis

Percentages, means and frequencies are used to describe the response patterns of each survey item as deemed appropriate. All data are reported as a mean ± standard deviation. Independent t-tests are used to examine differences between the continuous variables (ex. height, weight, mean training times) assessed in both the Purdue study and the LSU study. Significance was defined as $p \leq 0.05$. Pearson's correlation is used to determine the relationship between the major outcome variables of interest.

CHAPTER 4 - RESULTS

The primary purpose of this study was to describe the demographics, training habits, nutritional practices, injury occurrence and overall health status of triathletes and identify any differences that may be related to the time of data collection or gender of the individual. The secondary purpose was to determine whether there were any significant correlations among all major outcome variables. The results are presented in the following sections:

a. general demographics and descriptions of training habits, nutritional practices, injury occurrence and overall health status of triathletes from both Purdue and LSU studies
b. significant correlations between the major outcome variables in the LSU study.

In the LSU study three hundred and eighty surveys were completed at three race expos that were held in east Texas between September and November 2011. Triathletes reported on their demographics, training habits, nutritional practices, injury occurrence and health status. Each question may or may not have been answered by every participant, which resulted in the varied number of responses for each item.

The Purdue study previously described the demographics, training habits, nutritional practices, injury occurrence and health status of triathletes (*N*=514) in the Midwestern and Eastern regions of the U.S. between June and August 1999. The data for each outcome variable is presented from the LSU Study, followed by data reported from the Purdue Study. A description of each race and number of study participants are presented in Tables 1 and 2.

Table 1. LSU Study: Race Locations, Dates and Descriptions

Race	Date	Distances	Study Participants (N = 380)
AVIA Austin Triathlon Olympic Austin, TX	September 5, 2011	1.5 km Swim, 40 km Bike, 10 km Run	109
AVIA Austin Triathlon Sprint Austin, TX	September 5, 2011	.75 km Swim, 20 km Bike, 5 km Run	17
Galveston 5150 Olympic Galveston, TX	October 23, 2011	1.5 km Swim, 40 km Bike, 10 km Run	100
Galveston 5150 Sprint Galveston, TX	October 23, 2011	.75 km Swim, 20 km Bike, 5 km Run	47
Oilman Half Ironman Conroe, TX	November 6, 2011	1.9 km Swim, 90 km Bike 21.1 km Run	107

Table 2. Purdue Study: Race Locations, Dates and Descriptions

Race	Date	Distances	Study Participants (N = 514)
Blackwater Eagleman Cambridge, MD	June 5, 1999	2 km Swim, 40 km Bike, 21 km Run	203
Indianapolis Triathlon Indianapolis, IN	July 16, 1999	1.5 km Swim, 40 km Bike, 10 km Run	114
Mrs. T's Chicago Triathlon Chicago, IL	August 29, 1999	International: 1.5 km Swim, 40 km Bike, 10 km Run	180
		Sprint: .5 km Swim, 22 km Bike, 5 km Run	17

Demographics

LSU vs. Purdue Study

In the LSU study, triathletes ranged in age from 18 to 66 years with a mean of 38.5 ± 10.0 years. Ninety nine percent of the athletes identified their gender. Sixty five percent were male (248) and 34% were female (131). The average height and weight reported was 179.07 ± 8.38 centimeters and 78.43 ± 11.36 kilograms for males and 168.71 ± 9.43 centimeters and 65.96 ± 12.65 kilograms for females. Body fat percentages reported averaged 13.97 ± 6.27% for males and 19.18 ± 5.97% for females.

In the Purdue study Stewart et al. surveyed 514 triathletes and found that they ranged in age from 18 to 68 years with a mean of 33.2 ± 8.9 years. Males averaged 179.8 ± 7.6 centimeters and 77.3 ± 9.3 kilograms, while females averaged 166.9 ± 6.9 centimeters and 59.9 ± 7.5 kilograms (Stewart, 2000). Height values were consistent with values previously reported in the Purdue study. Body fat percentages were higher in both men and women in the LSU study, 13.966 ± 6.27% in males and 19.17 ± 5.96 in females, than those previously reported in the Purdue study 10.7 ± 10.5% in males and 16.0 ± 6.9% in females.

Age values were significantly higher in the LSU study when compared to the values previously reported from the Purdue study (age p = .0001). Weight values were significantly higher in the LSU study for females, but not for males (weight males p = 0.1769, weight females p = .0001). The most frequently reported high school/college sport was cross-country or track in both studies presented. Basketball was the second most frequently indicated sport in the LSU study, while swimming was the second most frequently indicated sport in the Purdue study (Tables 3 and 4).

Gender Comparison

The LSU study found that thirty four percent of the athletes surveyed were female (131) and 65% (248) were male. The mean age of triathlete males (39.12 ± 10.0 years) was not significantly higher than the mean age of triathlete females (37.14 ± 9.8 years) in the LSU study. Males were heavier and taller on average than females. Mean self reported body fat percentage was higher in females (19.2 ± 6.0%) when compared to males (14.0 ± 6.3%). The Purdue study reports a gender difference in age, height, weight and body fat percent. (Table 6) (Stewart, 2000).

Both studies surveyed a high percentage of age group athletes of average ability. In the LSU study, almost 98% of men did not possess a pro card, while 96.2% of women were also considered amateur. Fourteen percent of male triathletes reported receiving a national age group ranking. Similarly 13% of female triathletes also received national age group rankings. Of the triathletes surveyed in the Purdue study, 34% of the 490 athletes reported receiving national age group rankings (Stewart, 2000).

Table 3. LSU Study: High School/College Sport Participation (N = 380)

Sport	**Frequency (% of Total)**
Basketball	77 (20.2%)
Football	70 (18.4%)
Track/Cross Country	119 (31.3%)
Soccer	64 (16.8%)
Swimming	67 (17.6%)
Volleyball	45 (11.8%)
Other	126 (33.2%)

Table 4. Purdue Study: High School/College Sport Participation

Sport	Frequency (% of Total)
Basketball (N = 494)	89 (18.0%)
Football (N = 494)	93 (18.8%)
Track/Cross Country (N = 495)	182 (36.8%)
Soccer (N = 495)	76 (15.4%)
Swimming (N = 494)	140 (28.3%)

Table 4 continued.

Volleyball (N = 48)	48 (9.7%)
Other (N = 201)	201 (40.6%)

Table 5. LSU Study: Gender Comparisons of Age, Height, Weight, and Education Level Mean, SD

Variable	Mean	SD	P
Age (yrs.) (N = 377)			
Male (N = 247)	39.12	10.0	
Female (N =130)	37.14	9.76	.066
Height (cm) (N = 376)			
Male (N = 246)	179.07	8.38	
Female (N = 130)	168.71	9.42	.000
Weight (lb) (N = 374)			
Male (N = 245)	172.90	25.03	
Female (N = 129)	145.41	27.88	.000
% Body Fat (N = 143)			
Male (N = 106)	13.97	6.27	
Female (N = 37)	19.18	5.97	.000

Table 6. Purdue Study: Gender Comparisons of Age, Height, Weight and Education Level (Mean, SD)

Variable	Mean	SD	P
Age (yrs.) (N = 512)			
Male	34.04	9.36	.001
Female	31.18	7.14	
Height (cm) (N = 512)			
Male	170.82	3.01	.0001
Female	165.84	2.68	
Weight (lb) (N = 506)			
Male	170.36	20.26	.0001
Female	132.94	16.54	
% Body Fat (N = 226)			
Male	10.72	10.51	.001
Female	16.02	6.87	

Training Habits

LSU vs. Purdue Study

The triathletes in the LSU study had participated in triathlon ranging from 1-30 years with an average of 4.0 ± 4.6 years of participation. In the past year, triathletes were active in triathlon competition an average of 5.3 ± 3.8 months. Athletes reported the number and types of races they had participated in the last 12 months (Table 7).

Triathletes from the Purdue study reported activity in the sport ranging from less than 1 year to 20 years with an average of 4.2 ± 4.3 years of participation. These athletes were competitive in organized triathlon an average of 3.4 ± 2.7 months that year. The number and types of races these athletes had participated in the last 12 months are found in Table 8 (Stewart, 2000).

The athletes reported the hours they spent swimming, biking, running, and weight lifting in an average week of training both in and off season. While triathletes spent the most time biking and the least time swimming both in and off season, mean training times varied for each discipline in the LSU study (Table 9). For instance athletes took an average of 1.40 ± 1.72 days off per week when in season and 2.07 ± 1.65 days off in the off season. Athletes reported similarly in the Purdue study (1.3 ± .76 days off in season, 2.02 ± 1.1 days off in the off season, $p = .2413$) (Stewart, 2000). Times spent biking and running were significantly higher in the LSU study group when compared to the Purdue study group, while it appears that more time was spent weight training by athletes from the Purdue study (Tables 9, 10 and 11).

Athletes were asked to describe their typical race place in the last 12 months. In the LSU study, nine percent reported being in the top 10% overall and 38.6% reported

placing in the upper 50% for their age group by gender. The Purdue study reports similar findings with 19% reported being in the top 10% overall and 37.2% reported placing in the upper 50% for their age group by gender (Stewart, 2000).

Triathletes were asked to report their primary resource used to determine their training practices for the past 12 months. Many participants indicated more than one response, with most triathletes indicating utilizing a coach (Table 12). A higher percentage of triathletes used a coach to determine their training practices in the LSU study than those in the Purdue study. Fewer triathletes relied on friends or magazine articles for help with training practices in the LSU study than in the Purdue study; however, currently triathletes are more likely to use a computer software program to determine their training practices.

Table 7. LSU Study: Ironman, Half Ironman, Olympic/International, Sprint Race Participation in the Past 12 Months (Frequency)(% of Total N)

Number of Races	**0**	**1**	**2**	**3**	**4-6**	**> 6**
Ironman (N = 377)	319 (83.9)	49 (12.9)	7 (1.8)	2 (.5)	0 (0)	2 (.5)
Half Ironman (N = 375)	215 (56.6)	99 (26.1)	37 (9.7)	17 (4.5)	7 (1.9)	4 (1.1)
Olympic/ International (N = 373)	166 (43.7)	88 (23.2)	52 (13.7)	33 (8.7)	32 (8.5)	7 (1.9)
Sprint (N = 374)	66 (17.4)	81 (21.3)	76 (20)	50 (13.2)	79 (20.8)	26 (6.3)

Table 8. Purdue Study: Ironman, Half Ironman, Olympic/International, Sprint Race Participation in the Past 12 months (Frequency)(% of Total N)

Number of Races	**0**	**1**	**2**	**3**	**4-6**	**> 6**
Ironman (N = 497)	441 (88.7)	43 (8.7)	10 (2.0)	2 (0.4)	1 (0.2)	0 (0)
Half Ironman (N = 497)	309 (60.1)	106 (20.6)	48 (9.3)	22 (4.3)	12 (2.4)	0 (0)

Table 8 continued.

Olympic/ International (N = 497)	149 (30.0)	123 (24.7)	108 (21.7)	50 (10.1)	52 (10.4)	24 (4.8)
Sprint (N = 497)	172 (34.7)	130 (26.3)	67 (13.5)	41 (8.3)	65 (13.1)	22 (4.4)

Gender Comparison

In the LSU study male triathletes, on average, took off more days than female triathletes in the off season (2.26 ± 1.90, 1.70 ± .96, $p = .002$). There was no significant difference in days off when in season (males 1.47 ± 2.05, females 1.27 ± .79, $p = .271$). An independent T-test indicates a significant gender difference in the total number of years active in triathlon with males ($N = 246$) averaging more years of participation than women ($N = 130$) (4.31 ± 5.09, and 3.41 ± 3.34). There was no significant gender difference in competitive season length.

Oppositely the Purdue study found a significant gender difference in competitive season length with males averaging more active months per year when compared to females (3.64 ± 2.80, and 2.70 ± 2.40, p = 0.0001). The Purdue study also notes a significant gender difference in the total number of years active in triathlon with males ($N = 365$) averaging more years than females ($N = 146$) (4.59 ± 4.49, and 3.23 ± 3.75, $p = 0.001$) (Stewart, 2000).

Table 9. LSU Study: Mean Training Times (hrs.) (Mean + SD) (N = athletes that responded

Activity	In Season (hrs.)	Off Season (hrs.)
Swimming	3.2 ± 3.2 (N =376)	1.9 ± 3.1 (N = 356)
Biking	6.5 ± 6.5 (N = 376)	4.2 ± 5.2 (N = 356)
Running	5.1 ± 6.1 (N = 374)	4.5 ± 7.8(N = 355)
Weight Training	1.3 ± 1.6 (N = 371)	1.8 ± 2.2 (N = 354)

Table 10. Purdue Study: Mean Training Times (hrs.) for Activities in the Last 12 Months (Mean ± SD) (N = athletes that responded)

Activity	In Season (hrs.)	Off Season (hrs.)
Swimming (N = 506)	3.3 ± 2.5	2.2 ± 2.5
Biking (N = 509)	6.5 ± 4.3	3.4 ± 3.4
Running (N = 507)	4.6 ± 3.1	3.7 ± 2.7
Weight Training (N = 484)	1.5 ± 1.8	2.3 ± 2.1

Table 11. Study Comparisons in LSU and Purdue Studies of Mean Training Times for Activities in the Last 12 Months

Activity	P In Season	P Off Season
Swimming	.60	.12
Biking	1.00	.006
Running	.113	.033
Weight Training	.092	.0009

Table 12. LSU Study: Primary Resource Used to Determine Training Practices (Frequency) (%) (N = 380)

A Friend	A Coach	A Magazine Article	An Advertisement	Computer Software Program	Other
106 (27.9%)	120 (31.6%)	54 (14.2%)	2 (.5%)	32 (8.4%)	120 (31.6%)

Table 13. Purdue Study: Primary Resource Used to Determine Training Practices (Frequency) (N = 419)

A Friend	A Coach	A Magazine Article	An Advertisement	Computer Software Program	Other
134 (32.0%)	61 (14.6%)	89 (21.2%)	0 (0%)	4 (1.0%)	131 (31.3%)

Table 14. LSU Study: Gender Comparison of Training Days and Triathlon Participation

Variable	Mean	SD	P
Years Participating (N = 376)			
Males	4.31	5.09	
Females	3.41	3.34	.069

Table 14 continued.

Season Length (months) (N = 374)			
Males	5.50	4.08	
Females	5.06	3.17	.291

Table 15. Purdue Study: Gender Comparison of Training Days and Triathlon Participation

Variable	Mean	SD	P
Years Participating			
Males (N =365)	4.59	4.49	.001
Females (N = 146)	3.23	3.75	
Season Length (months)			
Males (N = 365)	3.64	2.80	.0001
Females (N = 146)	2.70	2.40	

Nutritional Practices

LSU vs. Purdue Study

The triathletes reported their dietary intake patterns for the past 12 months. Consistent with findings from the Purdue study, 30% of triathletes reported practicing some form of vegetarianism (Tables 16 and 17). Many triathletes fell short of the daily recommendations for fruit and vegetable consumption. Fifty three percent of triathletes in the LSU study were meeting the daily recommendations for dairy in their diets (2-3 servings). Similar rates were found in the Purdue study with 54.8% meeting the dairy recommendations. Fifty percent of triathletes in both studies reported consuming adequate servings of protein rich foods (2-3 servings). Fifty nine percent of triathletes reported adequate vegetable consumption (3-5 servings) in the LSU study, while 55.8% of triathletes in the Purdue study also met the recommendations. Seventy percent of triathletes in the LSU study and 70.9% of triathletes in the Purdue study reported meeting

the daily recommendations for fruit consumption (2-4 servings). Only 12.6% of triathletes reported meeting the daily recommendations for carbohydrates (6-11 servings) in the LSU study, while 32.4% of triathletes met the daily carbohydrate recommendations in the Purdue study (Stewart, 2000).

Gender Comparison

Triathletes were asked to describe their eating patterns. Examination of the results revealed no significant difference in the dietary intake of males and females in the LSU study. Furthermore, thirty one percent of females count calories, while only 19.4% of males count calories. Conversely, the Purdue study reported equal rates of calorie counting behavior between males and females (6%). In the current study, males and females equally classified themselves as practicing some form of vegetarianism (~30%), while the Purdue study found that females were more likely to practice some form of vegetarianism (Stewart, 2000).

Macronutrient consumption comparison based on gender from the current study can be seen in Table 20. Results from the Purdue study indicate a gender difference in vegetable consumption, with females consuming more vegetables than males ($p = .02$) (Stewart, 2000).

Table 16. LSU Study: Dietary Patterns in the Past 12 Months (N = 375)

Dietary Pattern	Percent	Frequency
Non-Vegetarian	70.8	269
Vegan	.3	1
Lacto Vegetarian	.5	2
Lacto Ovo Vegetarian	2.6	10
Lacto Ovo Povo Vegetarian	24.5	93

Table 17. Purdue Study: Dietary Patterns in the Past 12 Months (N = 503)

Dietary Pattern	Percent	Frequency
Non-Vegetarian	69.6	350

Table 17 continued.

Vegan	1.0	5
Lacto Vegetarian	2.8	14
Lacto Ovo Vegetarian	3.4	17
Lacto Ovo Povo Vegetarian	23.3	117

Table 18. LSU Study: Servings of Food Guide Pyramid Food Groups Ingested Daily by Triathletes in the Last 12 Months, % of Total N.

Servings	**0**	**1**	**2**	**3**	**4**	**5**	**>6**
Carbohydrate (N = 378)	.5	8.4	16.6	22.9	23.5	15.0	12.6
Protein (N = 377)	1.1	8.9	22.1	28.4	21.6	12.6	4.5
Fat (N = 378)	3.9	26.8	31.3	24.2	8.2	3.4	1.6
Fruits (N = 378)	.8	12.9	25.3	27.6	17.1	9.8	6.1
Vegetables (N = 377)	1.6	8.7	23.9	28.7	20.3	10.0	6.1
Dairy (N = 378)	5.0	23.9	32.1	20.8	12.4	2.9	2.4

Table19. Purdue Study: Servings of Food Guide Pyramid Food Groups Ingested Daily by Triathletes in the Last 12 Months, % of Total N.

Servings	**0**	**1**	**2**	**3**	**4**	**5**	**>6**
Carbohydrate (N = 509)	.8	3.1	8.6	18.3	20.8	15.9	32.4
Protein (N = 510)	2.2	21.4	25.9	24.5	13.9	6.5	5.7
Fat (N = 508)	7.9	33.5	30.9	16.9	6.3	2.2	2.4
Fruits (N = 510)	.6	12	25.1	27.8	18.0	8.8	7.6
Vegetables (N = 510)	.8	13.3	25.5	32	16.5	7.3	4.7
Dairy (N = 510)	2.0	20.8	27.3	27.5	12.5	5.7	4.5

Table 20. LSU Study: Servings of Food Guide Pyramid Food Groups Ingested Daily by Triathletes in the Last 12 Months, % of Total N

Servings	0	1	2	3	4	5	≥6
Carbohydrate							
Males (N = 246)	.4	8.5	16.9	22.6	23.0	15.7	12.1
Females (N = 131)	.9	8.4	16.0	23.7	24.5	13.7	13.0
Protein							
Males (N = 246)	.8	8.5	20.2	25.8	23.4	15.3	5.2
Females (N = 131)	1.5	9.9	26.0	33.6	18.3	7.6	3.1
Fat							
Males (N = 246)	4.0	24.2	30.2	26.2	8.5	3.6	2.4
Females (N = 131)	3.8	32.1	33.6	20.6	7.6	2.3	0
Fruits							
Males (N = 246)	1.2	14.5	29.0	24.2	15.3	9.3	5.6
Females (N = 131)	0	9.9	18.3	34.4	20.6	10.7	6.1
Vegetables							
Males (N = 246)	2.0	11.3	26.6	27.0	19.4	9.3	3.6
Females (N = 130)	.8	3.8	19.1	32.1	22.1	11.5	9.9
Dairy							
Males (N = 246)	5.2	23.0	31.0	21.4	12.9	2.8	2.8
Females (N = 131)	4.6	26.0	34.4	19.8	11.5	3.1	.8

Table 21. LSU Study: Gender Comparison of Dietary Intake in the Last 12 Months (Frequency)(% of Total N)

Diet Type	Total N (%) (N = 375)	Male N (%) (N = 246)	Female N (%) (N = 129)
Non Vegetarian	269(70.8%)	178(71.8%)	91(69.5%)
Lacto Ovo Povo Vegetarian	93(24.5%)	64(25.8%)	29(22.1%)
Lacto Ovo Vegetarian	10(2.6%)	3(1.2%)	7(5.3%)
Lacto Vegetarian	2(.5%)	0(0%)	2(1.5%)
Vegan	1(.3%)	1(.4%)	0(0%)

Table 22. Purdue Study: Gender Comparison of Dietary Intake in the Last 12 Months (Frequency)(% of Total N)

Diet Type	Total N (%) (N = 503)	Male N (%) (N = 357)	Female N (%) (N = 146)
Non Vegetarian	350(69.6)	262(73)	88(60)
Lacto Ovo Povo Vegetarian	117(23.3)	77(22)	40(27)
Lacto Ovo Vegetarian	17(3.4)	6(2)	11(8)

Table 22 continued.

Lacto Vegetarian	14(2.8)	8(2)	6(4)
Vegan	5(1.0)	4(1)	1(1)

Supplement Use

LSU vs. Purdue Study

Athletes reported on their frequency of use of vitamin/minerals, liquids, bars, gels, carbohydrate powders, protein powders, and creatine powder in the last 12 months. Frequency ranged from never to daily use. Table 23 depicts the supplement use patterns reported by triathletes in the past 12 months. Liquids (92.5%), bars (90.1%), vitamins/mineral supplements (84.4%) and gels (83.9%) were the most commonly used, while creatine (14.2%), carbohydrate powders (51.3%) and protein powders (64.5%) were the least commonly used.

The Purdue study found similar trends with the athletes most commonly using liquids (92.3%), bars (90.4%), vitamin/mineral supplements (78.2%) and gels (73.4%), while creatine (13.1%), protein powders (34.3%) and carbohydrate powders (41.8%) were less common. Conversely, protein powders seem to be utilized more now when compared to 12 years ago (Tables 23 and 24) (Stewart, 2000).

Gender Comparison

In the LSU study male triathletes report using all supplements listed more often than female triathletes (Table 25). The Purdue study similarly found that supplement use was higher in male triathletes than female triathletes for all items listed (Stewart, 2000).

Table 23. LSU Study: Percentage of Athletes Ingesting Supplements (% of Total N)

Supplement	Never	Occasionally	Often	Daily
Vitamins (N = 379)	15.3	23.4	12.6	48.4

Table 23 continued.

Bars (N = 380)	10	36.1	36.3	17.7
Gels (N = 380)	16.1	36.3	40.8	6.8
Liquids (N = 379)	7.1	18.9	44.7	28.9
Carbohydrate Powders (N = 379)	48.4	28.2	16.8	6.3
Protein Powders (N = 380)	35.5	28.7	22.4	13.4
Creatine (N = 379)	85.5	10.8	2.1	1.3

Table 24. Purdue Study: Percentage of Athletes Ingesting Supplements (% of Total N)

Supplement	Never	Occasionally	Often	Daily
Vitamins (N = 514)	21.8	21.4	10.4	46.5
Bars (N = 509)	9.6	34.2	38.7	17.5
Gels (N = 514)	26.9	38.2	32.0	2.9
Liquids (N = 514)	7.7	21.4	46.6	24.4
Carbohydrate Powders (N = 514)	58.2	18.4	18.6	4.8
Protein Powders (N = 514)	65.7	15.9	11.8	6.5
Creatine (N = 514)	86.9	8.4	2.0	2.8

Table 25. Percentage of Athletes Ingesting Supplements (% of Total N) (Males and Females)

Supplement	Never	Occasionally	Often	Daily
Vitamins				
Males (N = 247)	14.5	25.0	11.7	48.4
Females (N = 131)	16.8	20.6	14.5	48.1

Table 25 continued.

Bars **Males** **(N = 248)** **Females** **(N = 131)**	7.7 14.5	37.1 34.4	35.5 38.2	19.8 13.0
Gels **Males** **(N = 248)** **Females** **(N = 131)**	14.1 19.8	39.1 31.3	39.1 44.3	7.7 4.6
Liquids **Males** **(N = 247)** **Females** **(N = 131)**	5.6 9.9	15.7 25.2	46.0 42.7	32.3 22.1
Carbohydrate Powders **Males** **(N = 248)** **Females** **(N = 131)**	44.0 57.3	29.8 25.2	19.4 12.2	6.9 5.3
Protein Powders **Males** **(N = 248)** **Females** **(N = 131)**	35.5 35.9	27.0 31.3	21.8 23.7	15.7 9.2
Creatine **Males** **(N = 247)** **Females** **(N = 131)**	81.9 92.4	12.9 6.9	3.2 0	1.6 .8

Table 26. Purdue Study: Percentage of Athletes Ingesting Supplements (% of Total N) (Males and Females)

Supplement	Never	Occasionally	Often	Daily
Vitamins **Males** **(N = 363)** **Females** **(N = 147)**	22.3 20.4	20.1 24.5	10.7 9.5	46.8 45.6

Table 26 continued.

Bars				
Males (N = 364)	8.8	34.1	37.6	19.5
Females (N = 145)	11.7	34.5	41.4	12.4
Gels				
Males (N = 365)	23.0	41.6	32.3	3.0
Females (N = 145)	36.6	29.7	31.0	2.8
Liquids				
Males (N = 363)	5.2	19.0	49.9	25.9
Females (N = 146)	13.7	27.4	38.4	20.5
Carbohydrate Powders				
Males (N = 360)	53.3	20.3	21.4	5.0
Females (N = 145)	70.3	13.8	11.7	4.1
Protein Powders				
Males (N = 362)	63.3	16.3	13.8	6.6
Females (N = 146)	71.9	15.1	6.8	6.2
Creatine				
Males (N = 360)	83.9	9.7	2.8	3.6
Females (N = 142)	94.4	4.9	0.0	0.7

Injury Occurrence

LSU vs. Purdue Study

Triathletes reported personal injury occurrence ranging from those that caused a change in activity to those that caused the athlete to completely stop training for 4 or more days. Triathletes reportedly sustain injuries to all areas described in Table 27, but

most commonly suffer from injuries of the knee (34%), foot (31.6%), back (20.3%) and shoulder (20.3%). The quadriceps (6.6%), shin (9.5) and neck (10.3) are the least commonly affected.

The most common injuries cited in the Purdue study were the knee (46.1%), foot (32.2%) and back (28.1%). The quadriceps (9.6%), neck (12.1) and shin (16.1%) were the least commonly affected areas (Stewart, 2000).

Gender Comparison

Athletes commented on the location and severity of their injuries in the last 12 months. The severity of the injury was determined using a 0-3 value with 0 representing no injury and 3 representing injuries requiring more than four days of rest. All injuries were summed and the totals represented total injury value. The groin was the only location to reveal a significant difference in injury rate. Females (3.8%) experienced injury to the groin that was not serious, while males presented a slightly higher percentage of injury (9.7%) with almost 25% of those with the injury requiring cessation of training. These findings differ from those reported in the Purdue study, where no gender differences were found in the injury severity or location of injury (Stewart, 2000).

Table 27. LSU Study: Location and Seriousness of Injuries Experienced by Triathletes in the Last 12 Months, % of N (N = 379)

Injury Site	No Injury	No Training Restriction	Training Restriction	Stopped Training for at Least 4 Days
Achilles	87.9	5.8	4.7	1.3
Ankle	83.9	8.9	5.0	1.8
Back	79.5	13.7	3.7	2.9
Foot	68.2	18.2	8.7	4.7
Groin	91.8	6.1	1.1	.8
Hamstring	82.1	11.1	5.3	1.3
Hip	86.1	8.4	2.6	2.6
Knee	65.8	21.1	7.6	5.3
Neck	89.5	8.4	1.6	.3

Table 27 continued.

Other	93.4	1.6	2.6	2.1
Quad	93.2	5.5	.8	.3
Shoulder	79.5	13.7	5.0	1.6
Shin	90.3	5.5	3.2	.8

Table 28. Purdue Study: Location and Seriousness of Injuries Experienced by Triathletes in the Last 12 Months, % of N

Injury Site	No Injury	No Training Restriction	Training Restriction	Stopped Training for at Least 4 Days
Achilles	83.4	10.5	3.7	2.4
Ankle	79.1	11.4	4.1	5.4
Back	71.5	19.2	5.7	3.7
Foot	67.7	19.7	6.6	5.9
Groin	92	5.5	2.0	.4
Hamstring	76.3	17.4	3.9	2.4
Hip	82.6	10.0	4.1	3.3
Knee	53.9	24.5	13.1	8.5
Neck	87.9	8.8	3.1	.2
Other	91.6	3.1	1.7	3.7
Quad	90.3	6.6	2.6	.4
Shoulder	73.5	16.3	6.5	3.7
Shin	83.8	8.8	5.8	1.5

Overall Health Status

LSU vs. Purdue Study

The SF-12 (Ware, 2000) was used to determine the perceived health status and quality of life in triathletes. Eighty six percent of the athletes reported that their quality of life was very good to excellent and 88.7% of triathletes rated their health as being very good to excellent in the LSU study. The Purdue study reported similar findings of 86.4% of athletes reporting that their quality of life was very good to excellent and 92.5% reporting very good to excellent health (Stewart, 2000).

Gender Comparison

Health status and quality of life were determined using a 0-4 value with 0 representing excellent health/quality of life and 4 representing poor health/quality of life.

Examination of independent T-tests noted no significant gender difference in quality of life or health status in either study (Tables 31, 32).

Table 29. LSU Study: Perceived Quality of Life and Health Status During the Last 12 Months, % of total

Scale	Excellent	Very Good	Good	Fair	Poor
Quality of Life (N = 379)	36.6	49.5	11.6	1.6	.5
Health Status (N = 377)	40	48.7	9.7	.8	0

Table 30. Purdue Study: Perceived Quality of Life and Health Status During the Last 12 Months, % of total

Scale	Excellent	Very Good	Good	Fair	Poor
Quality of Life (N = 509)	42.2	44.2	12.6	1.0	0
Health Status (N = 508)	53.3	39.2	6.9	.4	.2

Table 31. LSU Study: Gender Comparison of Health Status and Quality of Life

Gender	N	Mean	P
Health Status			
Males	246	.69	
Females	130	.76	.306
Quality of Life			
Males	247	.79	
Females	131	.79	.927

Table 32. Purdue Study: Gender Comparison of Health Status and Quality of Life

Gender	N	Mean	P
Health Status			
Males	365	1.55	.936
Females	143	1.54	
Quality of Life			
Males	363	1.75	.242
Females	146	1.66	

Correlations

Pearson's correlation tests were used to identify any significant relationships between outcome variables in the LSU study only. The complete SPSS output is available in pdf format. Several of the most interesting correlations are enumerated here.

As expected, height and weight were strongly correlated (p = .000, r = .706, N = 374). Weight was also positively correlated with age (p = .024, r = .117, N = 374) and body fat percent (p = .007, r = .223, N = 143). The number of years active in the sport is significantly correlated with the number of races participated in the past 12 months at all race distances (ironman races p = .000, r = .227, N = 374; half ironman p = .001, r = .166, N = 372; Olympic p = .006, r = .144, N = 370; sprint p = .008, r = .137, N = 371). Interestingly, the correlation between the race distance and the number of active years in the sport increased along with increases in the race distance.

It is important to note that performance was self-reported on a scale enumerated 0-5, with 0 representing Top 10 overall and 5 representing Lower 50% of age group by gender; thus negative correlations represent a higher performance. Performance was negatively correlated with experience level (years active)(p = .000, r = -0.197, N = 359) while positively correlated with age (p = .017, r = .126, N = 358). Better performance ratings were found with increased gel (p = .044, r = -0.106, N = 359) and carbohydrate use (p = .000, r = -0.214, N = 358).

As far as dietary relationships are concerned, triathletes who used protein powders were also more likely to consume more protein rich foods (p = .000, r = .193, N = 377). However, there were no significant relationships between macronutrients practices and any of the other outcome variables in the study.

It appears that the longer race distances require the use of more supplements. Race distance was correlated with supplement use. As race distance increased gel usage also increased (p = .000, R = .211, N = 380). Similar results were found for liquids (p = .017, R = .123, N = 379) and carbohydrate powders (p = .000, R = .233, N = 379).

Injury rates were correlated with several variables including age, days off in the off season and in season, and training times on the bike and weight lifting. A significant correlation was found between groin injury rate and age (p = .044, r = .104, N = 378). Age was also correlated with neck injuries (p = .005, r = .144, N = 378). Knee injury was correlated with days off in the off season (p = .011, r = .133, N = 365) and days off when in season (p = .005, r = .145, N = 379). Quadriceps injury rate was positively correlated with several variables including time spent weight training both in season (p = .002, r = .160, N = 372) and in the off season (p = .007, r = .142, N = 355), as well as time spent biking both in season (p = .012, r = .130, N = 377) and in the off season (p = .007, r = .141, N = 357). Interestingly, back injury was negatively correlated with race distance (p = .020, r = -0.119, N = 379). Foot injury was the only injury correlated with the number of races having competed in the last 12 months (Olympic p = .014, r = .127, N = 372; sprint p = .012, r = .130, N = 373). Unexpectedly, no correlations were found between running training times and injury rate.

Several questions regarding athlete health status were correlated with other outcome variables. Athletes who competed in more sprint distance triathlons had more difficulty climbing stairs (p = .009, r = -.137, N = 369) and doing moderate activities (p = .002, r = -.163, N = 370). Surprisingly an increased number of days off in the off season was negatively correlated with both difficulty climbing stairs (p = .000, r = -.215, N =

362) and difficulty performing moderate activities (*p* = .000, *r* = -.211, *N* = 362). Days off when in season was negatively correlated with several variables including difficulty climbing stairs (*p* = .000, *r* = -.271, *N* = 375), difficulty performing moderate activities (*p* = .000, *r* = -.274, *N* = 375), athletes accomplishing less than they would like due to physical health (*p* = .000, *r* = -.203, *N* = 377) and athletes limited in the kind of work due to their physical health (*p* =-.264, *r* = -.264, *N* = 377). Time spent running when in season was also negatively correlated with difficulty climbing stairs (*p* = .012, *r* = -.130, *N* = 371), difficulty performing moderate activities (*p* = .015, *r* = -.126, *N* = 372), accomplishing less due to physical health (*p* = .000, *r* = -.197, *N* = 373) and accomplishing less due to emotional health (*p* = .008, *r* = -.137, *N* = 373) as well as being limited in the kind of work due to physical health (*p* = .000 *r* = -.294, *N* = 373).

CHAPTER 5 - DISCUSSION

The primary purpose of this study was to describe the demographics, training habits, nutritional practices, injury occurrence and overall health status of triathletes and identify any differences that may be related to the time of data collection or gender of the individual. The secondary purpose was to determine whether there were any significant correlations among major outcome variables in the LSU study. Discussion of the findings is divided into the following sections:

1. Demographics
2. Training Habits
3. Nutritional Practices
    a. Supplement Use
4. Injury Occurrence
5. Overall Health Status
6. Practical Training Recommendations

Demographics

Age, weight and body fat percentage were higher in the LSU study when compared to the Purdue study. The LSU study females were heavier and both males and females reported significantly higher body fat percentages when compared with their Purdue counterparts (Stewart, 2000). While these findings are interesting given the current obesity epidemic, it is important to note that body fat percentages were still well within the healthy range (11.3-15.8% for males aged 30-39, 15.5-19.9% for females aged 30-39) according to the American College of Sports Medicine Standard (Esmat, 2012).

Because age was correlated with weight and body fat percentage, it could be true that the athletes in the LSU study are heavier than those in the Purdue study due to the increased age of the participants in the LSU study.

In both the LSU study and the Purdue study, cross-country or track was the most commonly reported high school or college sporting background. The data obtained are similar to the findings from an article by Dolan et al. (2011), which reported that most triathletes (58%) came from a competitive running background. Basketball was the second most common background sport in the LSU study while swimming was the second most common sport in the Purdue study (Stewart, 2000). These findings are similar to another study by Collins et al. which sent questionnaires to 257 male and female triathletes finishing an Olympic distance triathlon. Results revealed that running (53%) was the most popular prior sport, followed by swimming (33%), other sports (7.7%) and cycling (6.2%) (Collins, Wagner, Peterson, & Storey, 1989). This difference may be related to the difference in the popularity of basketball in 1999 vs. 2011 or may be attributed to regional differences.

As expected, males in the LSU study were significantly taller and heavier and had a higher body fat percentage when compared to females. No gender differences were noted in age, years of triathlon experience, and months of triathlon participation. These findings differ from those presented in the Purdue study, which show significant gender differences in age, years of triathlon experience and months of triathlon participation.

The young age of female triathletes in the Purdue study may reflect the slower integration of females into the relatively new sport of triathlon. Now, more than ten years

later, there is no gender difference in age, which may indicate the steady increase in female participation in the sport.

<u>Training Habits</u>

The majority of the athletes surveyed in the LSU study were relatively new to the sport with the average triathlete competing for about 4 years. This finding supports the national trend of increasing interest in triathlon. For example, as reported earlier, triathlon interest, as measured by USAT membership, has increased 734% since 1999. These results are further supported by Dolan et al. who also report low experience levels, citing an average of 3 years of participation in the sport (Dolan et al., 2011). Given the fact that the LSU study failed to show that athletes had been participating in triathlon for a longer time, it is possible that individuals may not spend a long time (in terms of years) dedicated to the sport. In the LSU study, 15.7% of athletes had competed in at least one ironman in the last 12 months, this percentage, though lower than any other race distance is greater than that found in the Purdue study. This may be an influence of the popularity of the distance, with the large increase in the number of ironman races conducted around the world today. Additionally, there has been an increase in media coverage in the sport of triathlon with most of the featured races being of half-ironman or ironman distance. However, other results from the LSU study only suggest an opposite trend. In current athletes, it was noted that as the race distance decreases, event participation increases. This participation pattern describes a group that focuses on the shorter distance triathlons. The shorter distance triathlons are not only less intimidating, but also require less time consuming training and fewer months of preparation. Additionally, the 29-year range of sport participation suggests that all ages of triathletes feel welcome in the sport.

Triathletes surveyed in the LSU study reported significantly longer competitive seasons than those surveyed in the Purdue study. This finding may be due to differences in the regional climates of the athletes. The Purdue study surveyed athletes from the cooler Midwestern and Eastern regions, while the LSU study surveyed athletes from East Texas which has milder springs, falls and winters therefore allowing for longer competitive seasons.

In the LSU study, experience levels of men were not significantly different when compared to women. Conversely, Dolan et al. found that a greater percentage of males had more than 7 years of experience when compared to females (x^2 = 25.06, 9, p = .01) (Dolan et al., 2011). Males and females do not differ in competitive season length in the LSU study. The Purdue study found that males' competitive seasons lasted longer and that males had participated in the sport for a longer time period (years) than females.

The results of the LSU study indicate that triathletes were swimming an average of 3.2 ± 3.2 hours a week, biking an average of 6.5 ± 6.5 hours a week and running an average of 5.1 ± 6.1 hours per week. The data are consistent with those found in the Purdue study, indicating no difference in average hours spent training per week. Resistance training has been shown to benefit the endurance athlete (Tanaka & Swensen, 1998). While there has been more emphasis on the addition of weight training to endurance training regimes, there has been no significant change in the amount of time triathletes spend lifting since 1999. Most athletes in the LSU study reported regular weight training, spending 1.3 ± 1.6 hours in the gym per week. These results are similar to those found in the Purdue study (1.5 ± 1.8 hours per week) and by Dolan et al. who reports that 61.4% of those surveyed participated in a minimum of 1 hour of resistance

training per week (Dolan et al., 2011). This may be due to athletes' busy schedules and lack of time available for training, or may be attributed to a lack of emphasis in the benefits of weight training to endurance performance.

The triathletes spent more time biking and running when compared to swimming in both studies. This finding could indicate a discipline preference against swimming. Because most triathletes come from a cross-country/track background, it is possible that they prefer running to swimming. Furthermore, it generally requires longer training times to evidence physiological adaptations on the bike than when running, which could explain the increased time spent cycling over running (O'Toole & Douglas, 1995).

In the LSU study 32% of triathletes surveyed report relying on a coach to help determine their training practices, while only 14.6% of triathletes in the Purdue study answered similarly. The increase in the percentage of triathletes relying on coaches may be due to the increased availability of USAT certified coaches and the popularity of using coaches in this sport. Also, it is possible that the overall low percentage of athletes utilizing a coach could be due to the low experience levels of the groups surveyed. Dolan et al. notes that athletes with moderate or most years of triathlon experience reported consulting with a triathlon coach more frequently than those with the least years of experience ($x^2 = 17.98$, 9, $p < .05$) (Dolan et al., 2011).

There were no significant gender differences in hours per week spent training in the LSU study. This data is supported by Dolan et al. who also found no differences in time spent training between genders; but conflicts with data obtained in the Purdue study, which stated that males spent more hours per week training than females (Dolan et al.,

2011). The increase in females' training volumes may be caused by the increased participation of females since the Purdue study.

Nutritional Practices

Surprisingly, both the LSU and Purdue studies reported that 30% of athletes were practicing some sort of vegetarianism. In the LSU study vegetarian rates did not differ by gender, however the Purdue study reported a significant gender difference with more females than males reporting vegetarian eating patterns. Most triathletes met the daily recommendations for all macronutrients listed except for carbohydrates. In the LSU study, only 12.6% of triathletes surveyed reported meeting the recommended daily intake of carbohydrates, while 32.4% of triathletes from the Purdue study reported consuming the recommended daily servings of carbohydrates. These findings were supported by Nogueira et al. who also found that athletes intake of carbohydrates was insufficient (Nogueira & Da Costa, 2004). This decrease may be due to the increase in the number and popularity of low carbohydrate diets like the Atkins diet. Current nutritional guidelines given by the American Dietetic Association recommend training and competing under conditions of high carbohydrate availability (Rodriguez, DiMarco, & Langley, 2009). Also, only 10% of triathletes surveyed reported low protein intake in the current study, while 23.6% of athletes were getting inadequate protein in the Purdue study. This is not surprising given the current popularity of higher protein diets (Friedman et al., 2012).

Intake of fat, dairy, fruits and vegetables did not appear to differ among the studies. In the LSU study, females were more likely to consume the recommended daily servings of protein, fruits, vegetables and dairy products. Males were likely to consume

more than the recommended daily servings for all macronutrients except for carbohydrates, which may be a function of the difference of overall caloric intake between males and females. Interestingly, both genders failed to meet the daily recommendations for carbohydrate consumption.

Supplement Use

A supplement as defined in the Dietary Supplement Health and Education Act, is a product that is intended to supplement the diet; contains one or more dietary ingredients (including vitamins; minerals; herbs or other botanicals, amino acids and other substances) or their constituents; is intended to be taken by mouth as a pill, capsule, tablet, or liquid; and is labeled on the front panel as being a dietary supplement ("Dietary Supplement Health and Education Act of 1994," 1994). The triathletes in the LSU study used a variety of supplements, with liquids, bars and vitamins and minerals being the most popular supplements used. These findings are similar to those found in the Purdue study. Creatine use has increased in the LSU study when compared to the Purdue study, though it is not as commonly associated with endurance exercise performance. Some suggest that creatine may benefit the multisport athlete. A study by Nelson and colleagues has shown that creatine loading can increase cell volume and increase glycogen stores for use during endurance exercise (Nelson, Arnall, Kokkonen, Day, & Evans, 2001).

Protein powder use in the multisport population has also increased since the Purdue study. Protein powders are not necessary in a normal, non-vegetarian diet, however, some research has suggested that moderate intensity endurance activity impacts dietary protein requirements minimally, and advise no more than 1.6 g protein/kg/day for

endurance athletes. It has also been well established that athletes can get enough protein in their diets (Tarnopolsky, 2004). It is possible that the extensive marketing of the product has driven this increase in protein supplement use. For example, there are currently more than 1000 different brands of protein powders sold in common health food stores today ("GNC," 2012). The correlation between protein rich foods and protein powders indicates the possibility that the athletes who are supplementing with protein powders are also consuming more protein rich foods.

Supplements should not replace a healthy diet, but may be beneficial for individuals who are not on a balanced nutritional plan. An older study (1987) found that 39% of triathletes took a multivitamin-mineral supplement on a daily basis (Worme et al., 1990). The percentage of those using vitamins has increased over the years with 46.5% using them in 1999 (Purdue study) and 48% taking vitamins daily in the present study. The trend of increasing use of a multivitamin is interesting, especially since there have been recent reports that show multivitamin use may be harmful. For example, a 2011 study found that common dietary supplements like multivitamins, B6, folic acid, iron, magnesium, zinc and copper were associated with increased risk of death (Mursu, Robien, Harnack, Park, & Jacobs, 2011). Although more research is necessary to explain this phenomenon, these findings may be linked to the overall health of the participants in the study. Individuals who are ill, and are already at an increased risk for death, may be more likely to take these supplements in an effort to reduce disease risk. This behavior could account for the positive relationship between supplement use and mortality.

In the LSU study, men used liquids and carbohydrate powders and creatine significantly more than females. The Purdue group found that men used significantly

more of all supplements listed. Dolan et al. also reported that a greater percentage of males consume energy gels and bars than female triathletes (Dolan et al., 2011). This may be a result of higher energy demands in males than females. Supplement (gels, liquids and carbohydrate powders) use was significantly correlated with race performance, indicating a higher finishing placement with higher supplement use. Strock et al. who reported increased exercise performance with increased carbohydrate consumption support this finding (Strock et al., 2006) .

Injury Occurrence

The increased participation in triathlon has also lead to a higher incidence of overuse injuries (Shaw et al., 2004). In the LSU study, knee (34%), foot (31.6%), back (20.3%) and shoulder (20.3%) injuries are the most commonly reported by triathletes. Injuries to the knee and foot were commonly associated with the cessation of training for at least 4 days. The injury locations in the LSU study are similar to those found previously in the Purdue study which reported knee (46.1%), foot (32.2%) and back (28.1%) as the most common injury sites. These findings are similar to another study that reported that triathletes most commonly experienced injuries of the lower extremities with injury to the knee most common (32%, n=41) (Shaw et al., 2004). A study by Burns et al. supported these findings and revealed that 75% of triathlon related injuries occur in the lower extremities with 71% of injuries associated with the run component of the sport (Burns et al., 2003).

It is important to note that while it is likely that the injuries sustained are caused by over use, these injuries may also be due to acute trauma during triathlon competition or training. It has been reported by Burns et al. that preseason injury is higher in those

who have more years of triathlon experience (Burns et al., 2003), which may support the earlier hypothesis, which stated that individuals did not compete in triathlons for a long period of time. We did not ask specifically about when the injuries took place, and therefore cannot make this distinction. In the LSU study, males indicated a significantly higher incidence of groin injuries with a quarter of those athletes restricting training due to the injury sustained. No other significant gender differences were discovered with respect to injury in the LSU study. Stewart et al. found no gender differences in injury reporting. Burns et al. also notes no gender differences in injury occurrence (Burns et al., 2003). Quadriceps injuries were positively correlated with both time spent biking and time spent weight training in the LSU study. This finding is unsurprising given that the major muscle group used during cycling is the quadriceps. Knee injuries were negatively correlated with days off both in season and in the off season. It could be that athletes are taking more days off because of a knee injury and not suffering knee injuries due to time off.

Overall Health Status

The triathletes surveyed in the LSU study reported a very high health status and quality of life. Eighty six percent of the athletes reported that their quality of life was very good to excellent and 88.7% of triathletes rated their health as being very good to excellent. Stewart et al. reported very similar results in 1999.

There were no gender differences noted in the health status or quality of life of the triathletes in the LSU study or the Purdue study. The high health and quality of life ratings could be a result of the excellent physical condition of both male and female

triathletes. Other factors that could play a role include the high education level reported as well as income, health motivation and other positive lifestyle choices.

Several questions regarding athlete burnout and overtraining were correlated with other outcome variables in the LSU study. Athletes who took fewer days off both in season and in the off season were more likely to report difficulty climbing stairs and performing moderate activities. It is important that triathletes experience at least one day off per week to avoid overtraining symptoms. Of the triathlon disciplines, running was the only activity that caused physical limitations to the athletes in all items presented.

Practical Training Recommendations

This study has provided valuable information for individuals new to the sport of triathlon. An athlete's optimal training regime will vary based on the race distance, difficulty of the course, and personal goals of the individual (Dolan et al., 2011). Age, motivation and genetic potential can also play key roles in establishing the best training practices for each triathlete (Stewart, 2000).

Although a cross training effect has been measured between swimming, biking and running, each sport must be practiced multiple times every week. Emphasis on a particular triathlon discipline will vary according to the athlete's physiological strengths and weaknesses and personal preferences. Weight training should be included in the training regime to aid in endurance performance and prevent injury (Tanaka & Swensen, 1998). Triathletes should incorporate at least one rest day per week to avoid overtraining and burnout symptoms.

While administering the study, a few limitations were noted. In both the LSU study and the Purdue study administered by our lab, data was self-reported the day before

the race. This method of surveying a population has been linked to a high percentage of individuals that may over/under report. This may have caused many competitive and experienced triathletes from taking the time to complete the survey. The surveys were administered at race expos, where there was little seating and space to take the survey. Administering the surveys in a more relaxed setting might have garnered different results. It should also be noted that a more accurate account of training times and intensities could be found by utilizing training diaries.

When reporting typical race place, athletes were asked to rate their average performance over the last 12 months. This item did not specify the competitive nature of the races completed, and therefore those who placed well in smaller races were not differentiated from those who had placed at more competitive races.

CHAPTER 6 – CONCLUSION

The primary purpose of this study was to describe the demographics, training habits, nutritional practices, injury occurrence and health status of triathletes and identify any differences that may be related to the time of data collection or gender of the individual. The secondary purpose of this study was to determine whether there were any significant correlations among all major outcome variables.

This study found that the average age of triathletes in the LSU study were older than those in the Purdue study. Both studies found that the triathletes were relatively new to triathlon and focused on the shorter distance races. Both studies indicated that 70% of triathletes surveyed were non-vegetarians. Nutritional practices were fairly similar with the exception of carbohydrate consumption with the participants in the LSU study consuming fewer servings of the macronutrient. Injury rates were similar between the two studies with most injuries occurring at the knee and foot. Males were more prevalent in both studies (LSU 65%, Purdue 71%). Other significant gender differences were noted among demographics, experience, nutrition and supplementation categories in both studies. Interesting correlations were found between performance and supplement use, injury occurrence and training practices, and health status markers and rest days.

This study provides athletes, as well as researchers and coaches and clinicians, with information on popular training and lifestyle practices indicating similarities and differences between decades and genders. The results of this study may benefit the growing number of amateur and professional triathletes, as well as those who coach and care for them.

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APPENDIX I

NOTE: If you have filled out this questionnaire once, please do not fill it out again.

Training Questionnaire

Race Participating in: ___________________________________

<u>General Training Habits</u>

1. Please enter the average number of hours you spend training per week in the following events:

	In Season	Off Season	24hr.Prior to race day
Number of Hours Spent Swimming	_______	_______	_______
Number of Hours Spent Biking	_______	_______	_______
Number of Hours Spent Running	_______	_______	_______
Number of Hours Spent Weight Lifting	_______	_______	_______
Number of Hours Spent Cross Training	_______	_______	_______

2. How many days off do you take per week (Please list 0-7 days)?
   _______ In Season
   _______ Off Season

3. In the past year, how many months have you participated in organized triathlon competitions?

   ________ months

4. Enter the number of races which you participated in for each group below during the past 12 months.

   _______Ironman Distance
   _______Half Ironman
   _______Olympic/International Distance
   _______Sprint Distance

PLEASE TURN OVER. Questions on Both Sides.

Specific Training Habits

Supplementation Practices

5. Please indicate with an "X" your consumption pattern **for each** of the following supplement groups during the past 12 months:
Please 'X' only one space for each supplement group.

	Never	Occasionally	Often	Daily
Vitamins/ Minerals (examples: Multivitamin, Iron or Calcium Supplement)	_______	_______	_______	_______
Bars (examples: Powerbar, ClifBar, Lunabar)	_______	_______	_______	_______
Gels (examples: PowerGel, GU, Clif Shot)	_______	_______	_______	_______
Liquids (examples: Gatorade, PowerAde)	_______	_______	_______	_______
Carbohydrate Powders (examples: Exceed, Cytomax)	_______	_______	_______	_______
Protein Powder (examples: Whey Protein)	_______	_______	_______	_______
Creatine (any form)	_______	_______	_______	_______

Nutritional Information

6. Please indicate with an ‘X’ the number of servings of the following food groups you consumed on an average day of training during the past **12 months**. Serving size examples are given. **Please ‘X’ only one space for each food group.**

	0	1	2	3	4	5	6+
Carbohydrates: Examples: 1 serving = 1 slice bread, 1 oz. cold Cereal, ½ cup cooked Cereal, rice or pasta	___	___	___	___	___	___	___
Fruits: Examples: 1 serving = 1 orange, ½ cup applesauce, ¾ cup orange juice	___	___	___	___	___	___	___
Vegetables: Examples: 1 serving = 1 medium salad bowl, 1 potato, 2/3 cup beans or yams, ½ cup cooked, or fresh green and dark yellow foods	___	___	___	___	___	___	___
Dairy Products: Examples: 1 serving = 1 cup milk, yogurt, or ice cream, 1 tablespoon butter, 1 oz. or 1 slice of cheese	___	___	___	___	___	___	___
Fat Rich Foods: Examples: 1 serving = ¼ avocado, 1 tablespoon peanut butter, margarine, shortening, or cream cheese	___	___	___	___	___	___	___
Protein Rich Foods: Examples: 1 serving = 3 oz. beef, fish or pork, 1 hamburger or 3 oz. soy product	___	___	___	___	___	___	___

PLEASE TURN OVER. Questions on Both Sides.

7. Which of the following best categorizes your dietary intake during the past 12 months?
   (Check One)

   _____**Non – Vegetarian** – diet includes animal derived products
   _____**Vegan** – no animal derived products in diet
   _____**Lacto Vegetarian** – milk and milk products included in diet
   _____**Lacto Ovo Vegetarian** – milk, milk products and eggs included in diet
   _____**Lacto Ovo Povo Vegetarian** – milk, milk products, eggs, and chicken or fish included in diet

8. Do you count the calories you consume in an average day of training during the past 12 months?

   Yes_______ (Go to Number 9)
   No_______ (Go to Number 10)

9. If you answered YES to question 8 please enter the number of calories consumed in an average day of training. If No, please skip to #10.

   ____________________**calories**

Lifestyle Information

10. Which **primary** resource have you used during the past 12 months to determine your training practices? (Check only one)

    _____ A Friend
    _____ A Coach
    _____ A Magazine Article
    _____ An Advertisement
    _____ Computer Software Coaching Program
    _____ Other (Please List) _________________________

11. Please indicate with an 'X' your injury pattern **for each** of the following areas of the body. Injuries include all those incurred while training for or racing in triathlons during the past 12 months. **Please 'X' one space for each area of the body.**

	No Injury	**Not Serious enough to restrict training**	**Serious enough to restrict**	**Serious enough to completely stop training for at least 4 days**
Foot	_______	_______	_______	_______
Ankle	_______	_______	_______	_______
Achilles	_______	_______	_______	_______
Shin	_______	_______	_______	_______
Knee	_______	_______	_______	_______
Hamstring	_______	_______	_______	_______
Quadriceps	_______	_______	_______	_______
Groin	_______	_______	_______	_______
Hip	_______	_______	_______	_______
Back	_______	_______	_______	_______
Shoulder	_______	_______	_______	_______
Neck	_______	_______	_______	_______
Other	_______	_______	_______	_______

Demographic Information

12. Are you: (Circle One)   Male   Female

13. Age ________ years

14. Height ______ft______inches

PLEASE TURN OVER. Questions on Both Sides

15. Weight ________ lbs

16. Body Fat Percentage ________ Don't know ________

17. What is your highest level of education? (Circle One)

High School	College	Grad School
1 2 3 4	1 2 3 4	1 2 3 4 5+

18. How many years have you been active in Triathlon?

_______________ years

19. Do you possess a professional or elite card? Yes ______ No_______

20. How would you describe how you typically placed in races during the past 12 months?

________ Top 10 overall
________ Top 10% overall
________ Top 10 of age group by gender
________ Top 10% of age group by gender
________ Upper 50% of age group by gender
________ Lower 50% of age group by gender

21. Did you receive a national age group ranking last year?

______ Yes ______ No

22. In what sports did you participate in high school/college? (Check all that apply)

_____ Basketball _____ Swimming _____ Football
_____ Volleyball _____ Soccer _____ Track/Cross Country
_____ Other (Please identify: _____________________________________)

This section of the survey will be used to compare the health status of triathletes to individuals in other populations. While some of the questions may not seem to apply to your lifestyle, please answer each item to the best of your ability.

23. In general, would you say your health is:

Excellent	**Very Good**	**Good**	**Fair**	**Poor**
_______	_______	_______	_______	_______

24. The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

	Yes, Limited A Lot Limited	**Yes,** Limited A Little	**No,** Not
a. **Moderate activities,** such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	_______	_______	_______
b. Climbing **several** flights of stairs	_______	_______	_______

25. During the **past 4 weeks,** have you had any of the following problems with your work or other regular daily activities <u>as a result of your physical health</u>?

	YES	**NO**
a. **Accomplished less** than you would like	______	______
b. Were limited in the **kind** of work or other activities	______	______

26. During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities <u>as a result of any emotional problems</u> (such as feeling depressed or anxious)?

	YES	**NO**
a. **Accomplished less** than you would like	______	______
b. Didn’t work on other activities as **carefully** as usual	______	______

PLEASE TURN OVER. Questions on Both Sides

27. During the **past 4 weeks**, how much did pain interfere with your normal work (including both work outside the home and housework)?

Extremely	Quite a bit	Moderately	A little bit	Not at all
_______	_______	_______	_______	_______

28. These questions are about how you feel and how things have been with you during **the past 4 weeks.** For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the **past 4 weeks…**

	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
a. Have you felt calm and peaceful?	_____	_____	_____	_____	_____	_____
b. Did you have a lot of energy?	_____	_____	_____	_____	_____	_____
c. Have you felt downhearted and blue?	_____	_____	_____	_____	_____	_____

29. During the **past 4 weeks**, how much of the time has <u>your physical health or emotional problems</u> interfered with your social activities (like visiting with friends, relatives, etc.)?

All of the of the time time	Most of the time	Some of the time	A little of the time	None
_______	_______	_______	_______	________

30. Rate your quality of life in the past 12 months

Excellent	Very Good	Good	Fair	Poor
______	______	______	______	______

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE! Please return the survey to one of the administrators or to the box at the specified location.

Dear Race Participant:

You are invited to complete this survey, which will be employed by researchers at Louisiana State University to further understand the increasingly popular sport of triathlon. Completion of this survey is voluntary and any information gathered will be treated as confidential and destroyed after the study is published.

Do not put your name on any part of the survey. There are no right or wrong answers. Please answer as honestly and accurately as possible, and return the survey to the administrator or to the box at the indicated location. If you do not understand any portion of the survey, please ask one of the researchers for clarification.

You will give your consent to participate by completing and returning the survey. Thank you for your participation and have an excellent racing season.

Sincerely,

Loren Johnson
Graduate Student
Louisiana State University

APPENDIX II

Institutional Review Board
Dr. Robert Mathews, Chair
131 David Boyd Hall
Baton Rouge, LA 70803
P: 225.578.8692
F: 225.578.6792
irb@lsu.edu | lsu.edu/irb

ACTION ON PROTOCOL APPROVAL REQUEST

TO: Laura Stewart
Kinesiology

FROM: Robert C. Mathews
Chair, Institutional Review Board

DATE: August 22, 2011
RE: **IRB#** 3203

TITLE: A Cross-Sectional Examination of the Training Habits and Lifestyle Characteristics of Triathletes

New Protocol/Modification/Continuation: New Protocol

Review type: Full ___ Expedited X **Review date:** 8/17/2011

Risk Factor: Minimal X Uncertain ______ Greater Than Minimal_______

Approved X **Disapproved**__________

Approval Date: 8/23/2011 **Approval Expiration Date:** 8/22/2012

Re-review frequency: (annual unless otherwise stated)

Number of subjects approved: 500

Protocol Matches Scope of Work in Grant proposal: (if applicable)______

By: Robert C. Mathews, Chairman [signature]

PRINCIPAL INVESTIGATOR: PLEASE READ THE FOLLOWING – Continuing approval is CONDITIONAL on:

1. Adherence to the approved protocol, familiarity with, and adherence to the ethical standards of the Belmont Report, and LSU's Assurance of Compliance with DHHS regulations for the protection of human subjects*
2. Prior approval of a change in protocol, including revision of the consent documents or an increase in the number of subjects over that approved.
3. Obtaining renewed approval (or submittal of a termination report), prior to the approval expiration date, upon request by the IRB office (irrespective of when the project actually begins); notification of project termination.
4. Retention of documentation of informed consent and study records for at least 3 years after the study ends.
5. Continuing attention to the physical and psychological well-being and informed consent of the individual participants including notification of new information that might affect consent.
6. A prompt report to the IRB of any adverse event affecting a participant potentially arising from the study.
7. Notification of the IRB of a serious compliance failure.
8. SPECIAL NOTE:

**All investigators and support staff have access to copies of the Belmont Report, LSU's Assurance with DHHS, DHHS (45 CFR 46) and FDA regulations governing use of human subjects, and other relevant documents in print in this office or on our World Wide Web site at http://www.lsu.edu/irb*

Application for Approval of Projects Which Use Human Subjects

This application is used for projects/studies that cannot be reviewed through the exemption process.

LSU

Institutional Review Board
Dr. Robert Mathews, Chair
131 David Boyd Hall
Baton Rouge, LA 70803
P: 225.578.8692
F: 225.578.6792
irb@lsu.edu
lsu.edu/irb

-- Applicant, Please fill out the application in its entirety and include two copies of the competed application as well as parts A-E, listed below. Once the application is completed, please submit to the IRB Office for review and please allow ample time for the application to be reviewed Expedited reviews usually takes 2 weeks. Carefully completed applications should be submitted 3 weeks before a meeting to ensure a prompt decision.

-- A Complete Application Includes All of the Following:
- **(A)** Two copies of this completed form and two copies of part B thru E.
- **(B)** A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts 1&2)
- **(C)** Copies of all instruments to be used.
  - *If this proposal is part of a grant proposal, include a copy of the proposal and all recruitment material.
- **(D)** The consent form that you will use in the study (see part 3 for more information.)
- **(E)** Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing or handling data, unless already on file with the IRB. Training link: (http://phrp.nihtaining.com/users/login.php.) on file
- **(F)** IRB Security of Data Agreement: (http://www.lsu.edu/irb/IRB%20Security%20of%20Data.pdf)

1) Principal Investigator*: Laura K. Stewart **Rank** Assistant Professor

*PI **must be** an LSU Faculty Member

Dept: Kinesiology **Ph:** 8-3549 **E-mail:** stewart6@lsu.edu

2) Co Investigator(s): please include department, rank, phone and e-mail for each

Loren Johnson, graduate student (MS), Kinesiology, 318.332.5614, ljohn81@tigers.lsu.edu

IRB# 3203 LSU Proposal #____

- ○ Full
- ⊗ Expedited
- ⊗ Human Subjects Training on file
- ⊗ Complete Application

3) Project Title: A Cross-Sectional Examiniation of the Training Habits and Lifestyle Characteristics of Triathletes.

4) Proposal Start Date: Sept. 1, 2011 **5) Proposed Duration Months:** 3 months

6) Number of Subjects Requested: 500 **7) LSU Proposal #:**

8) Funding Sought From: None

Study Approved By:
Dr. Robert C. Mathews, Chairman
Institutional Review Board
Louisiana State University
203 B-1 David Boyd Hall
225-578-8692 | www.lsu.edu/irb
Approval Expires: 8-22-2012

ASSURANCE OF PRINCIPAL INVESTIGATOR named above

I accept personal responsibility for the conduct of this study (including ensuring compliance of co-investigators/co-workers) in accordance with the documents submitted herewith and the following guidelines for human subject protection: The Belmont Report, LSU's Assurance (FWA00003892) with OHRP and 45 CFR 46 (available from http://www.lsu.edu/irb). I also understand that copies of all consent forms **must be maintained at LSU for three years after the completion of the project.** If I leave LSU before that time, the consent forms should be preserved in the Departmental Office.

Signature of PI ____________ Date 7/25/2011

ASSURANCE OF STUDENT/PROJECT COORDINATOR named above. If multiple Co-Investigators, please create a "signature page" for all Co-Investigators to sign. Attach the "signature page" to the application.

I agree to adhere to the terms of this document and am familiar with the documents referenced above.

Signature of Co-PI (s) ____________ Date 7-25-2011

Study Title: **A Cross Sectional Examination of the Training Habits and Lifestyle Characteristics of Triathletes**

1. Performance Site: **The AVIA Austin Triathlon, Austin, TX; E Si Ironman 70.3 in Augusta, GA; 5150 Galveston in Galveston, TX.**

2. Investigators: The following investigators are available for questions about this study M-F 8:30am-4:30pm.

Principal Investigator: Laura K. Stewart, Ph.D. 225.578.3549

Co-investigators: Loren E. Johnson, B.S. 318.332.5614

Russell Carson, Ph.D. 225.578.3923

3. Purpose of the Study:

The purpose of the study is to describe lifestyle and training characteristics of triathletes at various levels of involvement in the sport.

4. Subject Inclusion:

Participants must be 18 years of age or older and competing in a sprint, olympic or half ironman distance triathlon the following day.

5. Number of Subjects = 500 (both males and females)

6. Study Procedures:

Volunteer subjects will be given a packet which includes a letter of introduction, informed consent document and an 85-item survey to complete at packet pick-up/expo the day prior to the race. The subject must complete and return the survey before he/she exits the packet pick-up site.

7. Benefits:

While no guarantee of benefits can be made, subjects may gain further insight into their own training habits by completing the survey.

8. Risks/Discomforts:

As with any survey, you may experience some psychological discomfort when answering the survey questions. If at any point, you feel uncomfortable answering any of the questions, you can either skip the question or choose not to take the survey.

9. Injury/Illness: In the unlikely event of a problem resulting from taking the survey, contact **Laura Stewart, Ph.D., 225-578-3549**. You will be referred for treatment, but the expense of medical treatment will be your responsibility. No compensation is available in case of study-related illness or injury.

10. Right to Refuse: You may choose not to participate or to withdraw from the study at any time without penalty or loss of any benefit to which you might otherwise be entitled.

11. Privacy: You will not give any identification. Your answers are confidential and cannot be traced back to you.

12. Financial Information: There is no cost to you, nor is there any compensation for participating in the study.

13. Signatures: The study has been discussed with me and all my questions have been answered. I may direct additional questions regarding study specifics to the investigators. If I have any questions about subjects' rights or other concerns, I can contact Robert C. Matthews, Institutional Review Board at (225) 578-8692. I agree to participate in the study described above and acknowledge the investigator's obligation to provide me with a signed copy of this consent form.

______________________ ____________

Participant's Signature Date

The study subject has indicated that s/he is unable to read. I certify that I have read this consent form to the subject and explained that by completing the signature line above, the subject has agreed to participate.

______________________ ______________

Reader's Signature Date

VITA

Loren was born in April of 1988 in Shreveport, Louisiana. She was raised by her parents Suzanne and Dean, and has four younger sisters. Starting at an early age, she had a passion for physical activity – encouraged by her parents who were both physical education instructors and coaches. She graduated with honors from high school in 2006 and attended Louisiana State University, majoring in kinesiology. During this time, she invested many of her extracurricular hours working with athletes on the LSU Track & Field team and developing an interest in triathlon. Through her coursework and extracurricular activities, she was introduced to the field of exercise physiology, while being specifically intrigued with the athletic population.

In anticipation of earning her degree in the spring of 2010, Loren applied to the Kinesiology Department at Louisiana State University, under the mentorship of Dr. Laura Stewart. During her first year of graduate school, she completed many hours of exercise testing lab work in the LSU exercise-testing lab. With the help of Dr. Stewart, Loren began her thesis project in the fall of 2011. She will defend her thesis early in the summer of 2012 in order to be awarded a Master of Science in Kinesiology.

Loren's immediate future plans are uncertain, though she does plan to work with athletes, possibly through performance testing, coaching or both.