INJURIES AMONG FAST-PITCH TRAVEL SOFTBALL ATHLETES AS THEY RELATE TO FREQUENCY OF PARTICIPATION

By

Ashley D. Watkins

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Honors Student Ashley D. Watkins Date 3/24/14

Thesis Director _____ Date 3/24/14

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Abstract

Female participation in sport has increased dramatically in the last decade, and, consequently, the number of sport-related injuries has increased (Knop et al., 1996). Fastpitch travel softball has emerged as one of the most popular sports among young women; however, the effects of this sport in terms of injuries sustained have not been explored extensively. The purpose of this study was to determine the extent to which frequency of participation in fastpitch travel softball contributes to injury. The researcher surveyed 120 female athletes between the ages of ten and seventeen, and collected 116 responses. Analysis of the survey responses indicated that most athletes participate in fastpitch travel softball for ten or more months out of the year with no true "off-season". Statistical analysis showed a relationship between months of participation and number of sport-related injuries that approached significance. This suggests that the number of injuries sustained could be reduced if frequency of participation was reduced, thus emphasizing the necessity of seasonal play in order to reduce injuries (Prentice, 2013; Veroni & Brazier, 2006).

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Review of Literature

Participation in sport has become a popular leisure-time activity among youths (Knop, Engström, & Skirstad, 1996). A study conducted by Ewing and Seefeldt (1996) estimated that there were 20-35 million 5-18 year-old participants in non-school sports, while another study conducted by Seefeldt, Ewing, and Walk (1992) estimated that there were 10 million 14-18 year-old participants in school sports (as cited in Weiss & Hayashi, 1996). This research is concerned with the sport of softball which has experienced increases in participation in concurrence with the overall increase in sport participation; "it has been estimated that up to 40 million men and women participate [in softball] annually" (Loosli, Requa, Garrick, & Hanley, 1992, p.35). According to the American Academy of Pediatrics, approximately 4.8 million children ages 5-14 participate in baseball or softball (2001).

Trends in sport and sport participation include, but are not limited to, a decrease in the age at which individuals begin to play sports, earlier sport specialization, an increased number of opportunities to be involved in sport, and an increase in female participation in sports (Knop et al., 1996). Consequently, the number of sport-related injuries has increased. Emery (2003) reported that the National Health Interview Survey estimates indicate roughly seven million sport-related injuries require medical attention annually (as cited in Pollack, Canham-Chervak, Gazal-Carvalho, Jones, & Baker, 2005). The Amateur Softball Association of America (ASA) registers approximately 83,000 youth girl's fastpitch softball teams on an annual basis which accounts for more than 1.2 million female athletes (Krajnik, Fogarty, Yard, & Comstock, 2010).

Softball, the primary sport of interest for this research, has several versions: slow-pitch, modified fastpitch, and windmill fastpitch. It is played at many different organizational levels:

recreation, school, travel, collegiate, and Olympic. Several studies regarding injuries in the various versions of softball at the recreational, high-school, collegiate, and Olympic levels have been conducted (American Academy of Pediatrics, 2001; Aragon, Oyama, Oliaro, Padua, &Myers, 2012; Axe, Windley, & Snyder-Mackler, 2002; Bonza, Fields, Yard, & Comstock, 2009; Janda, Wojtys, Hankin, Benedict, & Hesinger, 1990; Krajnik et al., 2010; Loosli et al., 1992; Marshall, Hamstra-Wright, Dick, Grove, & Agel, 2007; Rauh, Macera, Ji, & Wiksten, 2007; Rechel, Yard, & Comstock, 2008; Shanley, Rauh, Michener, & Ellenbecker, 2011; Stovak, Parikh, & Harvey, 2012; Werner, Jones, Guido, & Brunet, 2006); however there are few publications regarding the topic. Travel softball has become popular across the United States and is commonly thought of as the next step up from recreational leagues due to its highly competitive nature.

This review of literature has been organized in such a way that it provides a historical background of information regarding female participation in sport, a description of the game of softball and its different subsets, and insight into softball-related injuries as well as previously researched prevention strategies.

Title IX

As reported by the United States Department of Labor, Title IX states that "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance" (2010). This federal legislation has been critical in providing increased opportunities for women in sport as well as careers, and is crucial to the argument of equality between the genders (Lumpkin, 2011). Compliance with the new statute must be

demonstrated in one of three ways; this is known as the three pronged test (Lumpkin, 2011). The components of the three pronged test as stated by Angela Lumpkin, 2011, in *Introduction to Physical Education, Exercise Science, and Sport Studies* are as follows:

> Participation opportunities are substantially proportionate to the full-time undergraduate enrollment of males and females. When members of one sex have historically been underrepresented among intercollegiate athletes, there must have been a history and continuing practice of program expansion in response to developing interests and abilities of the underrepresented sex. In the absence of a continuing practice of program expansion, an institution must show that the interests and abilities of the underrepresented sex have been fully and effectively accommodated. (p. 346)

Female participation in sport. Title IX has paved the way for equality, regardless of gender, in schools and colleges across the nation (Lumpkin, 2011). Female participation in sports prior to Title IX was limited, and it was estimated in 1971 that fewer than 300,000 high school girls across the nation participated in interscholastic athletics (Brake, 2010). "Today that number exceeds 3 million," reports Deborah L. Brake in her novel, *Getting in the Game* (p.67). The ratio of females participating in high school sports has transitioned from a rarity, with only one in twenty seven girls playing a sport, to a common occurrence, with one out of every two girls participating in high school athletics (Brake, 2010).

Emergence of softball as a girl's sport. In response to Title IX, in order to be in compliance with the law, schools made efforts to add a proportionate but separate number of female teams that corresponded to the male teams (Brake, 2010). For example, a school that

included baseball, soccer, and basketball teams for males would add softball, girls soccer, and girls basketball teams as well. However, many women contend that baseball and softball are not equitable sports, while men contend that baseball is too strenuous for women (Brake, 2010). Nevertheless softball became known as the feminine version of baseball, and still exists today as a predominantly female endeavor (Brake, 2010).

What Is Softball?

According to the Amateur Softball Association of America, the national governing body for softball in the United States, the game of softball began inside the Farragut Boat Club in November, 1887, in Chicago, Illinois. A reporter, George Hancock, observed a Yale fan throwing an old boxing glove at a Harvard fan, who attempted to hit it back with a stick. He tied the laces of the glove to make a ball and marked the field on the ground with chalk. The Yale and Harvard alumni split into two teams and played make-shift baseball, later known as softball. Little did Hancock know that the game he had created would grow to become the most popular team sport in the United States (2013). The game Hancock invented was officially recognized as "softball" in the late 1930s and transitioned to an outdoor sport (Flyger, Button, & Rishiraj, 2006).

Since then the sport has increased in popularity worldwide, and "the International Softball Federation currently lists 122 national federations as members" (Flyger et al., 2006, p. 798). During the 2010-2011 school year, the National Federation of State High School Associations reported that 389,455 girls competed in fastpitch and slow-pitch softball, and the game is traditionally played between two teams of at least 9 players, on a field similar to the diamond-shaped baseball field, with the goal of the game being outscoring the opponent in

number of runs. The game is played in innings; one inning consists of both teams having the opportunity to play both defense and offense until 3 outs are made by each team. Teams alternate between batting (offense) and fielding (defense), and runs can only be scored while batting. Softball has two distinct variations depending on the style and delivery of the pitch: slow-pitch and fast-pitch. In slow pitch, the pitcher lobs the ball underhanded so that the arc of the ball as it travels to the batter is between 1.83 and 3.66m. There are two variations of fast-pitch softball: windmill, where the pitcher's arm makes an entire revolution before releasing the ball underhanded, and modified, where the pitcher's arm swings backward then forward to release the ball underhanded. Windmill-style, fast-pitch softball is regarded as the higher-performance discipline (Flyger et al., 2006).

Tournament rules of fast-pitch softball

Travel softball leagues. Weiss & Hayashi (1996) broke down community-based sport programs into four categories: agency-sponsored programs, national youth service organizations, club sports, and recreation programs. Travel softball falls into the "club sports" category, and its structure is very different from high-school softball and recreational softball. It is called "travel softball" because teams go to different athletic complexes, in different parts of the state, or in some cases other states in order to compete in tournaments, as opposed to a single constant location where teams typically play a single game.

According to the United States Specialty Sports Association (USSSA), travel softball is organized into tournaments in which teams compete against other teams in a series of several games in order to win prizes such as trophies, qualification for larger tournaments such as the

World Series, or monetary rewards. Organization and tournament structure make travel softball more competitive than recreational or school softball (USSSA, 2013).

Organization. Travel softball teams are typically run by an organization composed of coaches, parents, and other volunteers (Weiss & Hayashi, 1996). The organization assembles a team based on age group, skill level, and gender. Some teams have official try-outs, and other teams are derived from local recreational teams. Once a team has been assembled, the coach, or another organizational administrator is typically required to register the team with travel fastpitch leagues such as the ASA or USSSA on a local level. The team must register within a certain age bracket, and all the members of the team (aside from coaching staff) must meet the age requirement. For example, in order for a team to play in the 12 and under age bracket with the USSSA, all players must be 12 years old or younger as of December 31st of the previous calendar year (United States Specialty Sports Association, 2013). Occasionally, a team may not have enough of its members present to participate in a tournament. In this case, coaches may ask players from other teams that are not participating in the tournament to play with his/her team temporarily. This is known as "guest-playing". All guest players must be on the rooster that the coach submits to the tournament director the day of the tournament, and they must meet the same eligibility requirements as all of the other regular members of the team.

Governing bodies, such as USSSA, host fastpitch softball tournaments on weekends (some begin as early as Friday), at various locations and athletic complexes across the United States throughout the year. Teams can choose which tournaments they wish to enter and pay the fee for those tournaments. An understood policy is that there is no limit to the amount of tournaments a single team can participate in over the course of a year; however, no team can compete in more than one tournament at the same time. In addition, teams may compete in

tournaments held anywhere in the United States: they are not required to play in the state that the team was registered in, nor are they forbidden from playing in tournaments in other states.

Tournament structure. The first level of tournament organization is the time frame in which the tournament will be held. Tournaments are typically either one-day, or two-day (Saturday and Sunday); however, some of the larger tournaments begin on Fridays, and even larger tournaments, such as the World Series, are held over the course of a week or more. The second level of organization is determined by the gender of the participants and age-brackets offered. Tournaments are designed for either male teams or female teams; however female fastpitch softball is much more popular than its male counterpart. Rarely, if ever, does one tournament host both male and female divisions at the same time. In addition, tournaments may host all age brackets, or a specific subset of age brackets. For example, a tournament may host 12 and under, 14 and under, and high school teams but not 8 and under or 10 and under teams.

Most tournaments are not able to include all age brackets due to limited field space at athletic complexes and time constraints; thus tournament directors choose a subset of age brackets that have similar rules and regulations. For example, the third level of tournament organization is the "game guarantee": the minimum number of games a team will play before being eliminated. Most two-day tournaments have a three-game-guarantee, meaning teams will get to play at least 3 games before they are eliminated. The game guarantee depends on two things: the number of "pool" games, and the number of "bracket games".

A "pool" game is typically shorter than a regulation softball game, and once time has expired the game is over regardless of the number of innings completed. The score and the result (win, loss, or tie) of a pool play game does not count towards the team's elimination status, but is

occasionally used to organize teams within the bracket in which case the team that won the pool play game would be ranked higher in the bracket. A "bracket" game is a regulation softball game that cannot end in a tie, and the result counts towards a team's elimination status. The number of bracket games played is the next level of organization. There are single-elimination (one loss), double elimination (two losses), and triple elimination (three losses) brackets. In a single-elimination bracket, a team is eliminated the first time they lose a game. Once a team is eliminated, they will not play any more games within that tournament. Another level of organization that can be employed is the division of teams into categories based on skill level. Some travel teams are much more skilled than others, so, in an attempt to promote the development of skills, confidence, and sportsmanship among players and teams, tournaments with many participating teams are often divided into two or more letter brackets (A, B, C, etc.). An example of a tournament schedule is displayed in Appendix A.

Injury and Prevention

This section introduces the definition of injury employed by this study as well as several other research studies, lists the injuries most common in softball, describes factors that influence softball injuries, describes literature that discusses softball-related injuries among specific populations, and addresses suggestions for preventing the injuries discussed in the previous research.

Injury defined. The National Collegiate Athletic Association Injury Surveillance System defines injury as one that "(1) occurred as a result of participation in an organized intercollegiate practice or competition *and* (2) required medical attention by a team certified athletic trainer or physician *and* (3) resulted in restriction of the student-athlete's participation or performance for

1 or more calendar days beyond the day of injury" (Dick, Agel, & Marshall, 2007, p. 174). Furthermore, injuries are classified as acute, having sudden onset and short duration, or chronic, having long onset and long duration. Types of acute injuries include: fractures, dislocations and subluxations, ligament sprains, contusions, muscle strains, muscle cramps, and nerve injuries (Prentice, 2013). Types of chronic injuries include: tendinosis, tendinitis, tenosynovitis, bursitis, osteoarthritis, and myofascial trigger points (Prentice, 2013).

Socialization to pain in softball. According to Hughes and Coakley (1991), tolerating pain is a key component of the social norms of athleticism; therefore, female softball athletes often continue to compete while injured in order to gain the respect of their teammates, coaches, and fans, avoid unfavorable perceptions, and maintain their athletic identities (Malcom, 2006). In her study of recreational, slow-pitch, female athletes, Malcom found that girls are exposed to the idea of "shaking off" minor injuries and pain as part of the game early in the season. Many of the participants in this study entered the game with dramatic reactions to minor injuries in order to induce sympathy; however, by the end of the season, most of them had learned that such dramas were frowned upon and instead adopted the social norm of "toughing out" injuries in order to maintain their athletic identity. This social standard of coping with pain becomes problematic when the pain becomes a chronic injury. For instance, a player who experiences minor shoulder pain and ignores it for a long period of time can develop tendinitis, capsular strains, or shoulder impingement (Meister, 2000).

Injuries in softball. Rarely do catastrophic injuries occur as a result of softball; however some of the common injuries in softball may still cause considerable time loss from the sport (Axe et al., 2002; Briskin, 2012). Common softball related injuries include bruises, scrapes, ankle sprains, knee internal derangements (typically anterior cruciate ligament tears or medial

collateral ligament tears), pulled muscles in the upper leg and the shoulder of the throwing arm, biceps tendinitis, forearm stress fractures, and ulnar neuritis (Briskin, 2012).

Factors influencing travel softball injuries. There are a wide range of factors that contribute to an athlete's risk of being injured while playing softball. Some of the characteristics that influence risk of injury include experience, gender, flexibility, and frequency of participation. In softball, as with any sport, skills increase as experience increases. Underdeveloped psychomotor skills in young amateur athletes often result in injuries due to improper technique, poor hand-eye coordination, or slow reaction time (Meyers et al., 2001). This often poses a problem in travel softball, when there are significant discrepancies in the skill levels of the teams playing each other. In addition, the anatomical structure of the female body, the pelvis in particular, causes women to bear weight through the legs in such a way that it makes them more susceptible to injury than males (Bartlett, 1999). This is a problem in the travel softball world because the majority of softball athletes are female (Briskin, 2012).

In addition to the two previous problems, flexibility has also been linked to injury. Athletes often have imbalances in flexibility because one muscle group is used during their sport on a consistent basis, and the opposing muscles are rarely used which leads to a tightness in the frequently used muscle groups and laxity in the unused muscle groups. The tightness resulting from these imbalances predisposes the athlete to injury (Bartlett, 1999). A study of collegiate athletes found that low trunk flexibility may effect shoulder and elbow injuries because it limits trunk rotation during the overhead throw (Aargon et al., 2012). Frequent participation has been linked to an increased number of acute and chronic injuries. Frequent participation means that an athlete is engaging in sport-related activities more often.

Common sense dictates that an increase in frequency of participation coincides with an increased chance of being injured as a result. For example, the more times a fastpitch softball athlete takes the field on defense, the more likely that person is to get hit by a batted ball. Being hit by a batted ball is an example of an acute injury that could result from participation in softball. A pitcher developing biceps tendinitis over the course of a year of windmill pitching is another example of a softball injury that is related to frequency of participation; in this example the injury is caused by overuse of the pitching arm. Overuse injuries are likely more common in travel softball athletes than high school or recreation athletes because there is no definite beginning or end to a season.

Originally, sports such as softball had an in-season phase, an off-season phase, and a pre-season phase (Veroni & Brazier, 2006); however, softball is now played year-round via the travel softball circuit. This eliminates the off-season which is intended for athletes to rest and build strength through unstructured recreation activities other than softball, as well as the pre-season which is intended to apply strength gains to sport specific activities, and instead focuses only in in-season competition and skill development (Prentice, 2013; Veroni & Brazier, 2006). Year-round competition can be tough on the joints and result in overuse injuries, particularly so in conjunction with improper technique and a lack of conditioning (Meister, 2000). Chronic shoulder injuries are most common in throwing athletes ages 13-16 (Leonard & Hutchinson, 2010).

Injuries in the pediatric and adolescent population. Sport-related chronic injuries have increased as a result of young athletes specializing in a specific sport and year-round training (Leonard & Hutchinson, 2009). Shoulder injuries have proven to be most prevalent and most researched among high-school students involved in softball (Bonza et al., 2009; Rauh et al.,

2007; Shanley et al., 2011). Rauh and colleagues found that knee and ankle injuries were the other leading causes of injury among high-school students, and report that "the risk of subsequent injury [across 6 sports] was almost three times higher than the risk of initial injury," with softball having greater proportions of practice- or game-related re-injuries than new injuries (2007). The common injuries found in these studies are consistent with what is seen in the literature presented by Briskin (2012).

Though scientists agree on common types of injuries, it is unclear whether the majority of injuries in the pediatric population, particularly high school athletes are due to competitions or practices. One study of high school athletes in nine different sports found that injury rates regarding softball were slightly higher during competition as opposed to practices (Rechel et al., 2008); however, studies involving the investigation of shoulder injuries among high-school baseball and softball athletes revealed that injuries to the shoulder were occurring more frequently in practices opposed to games (Bonza et al., 2009; Krajnik et al., 2010).

Injuries in the collegiate population. Loosli and colleagues conducted a study of injuries to collegiate fastpitch softball pitchers from eight well-ranked colleges and concluded that many pitchers experienced significant time-loss injuries as a direct result of pitching (1992). The majority of these pitching injuries were either tendinitis or strains, which can both be classified as chronic injuries, and are likely due to the amount of time spent pitching and the number of pitches thrown. Another study of fastpitch softball injuries involving collegiate athletes, including pitchers and non-pitchers, analyzed the differences in injuries that resulted from game-play as opposed to practice (Marshall et al., 2007). Researchers found that the lower extremity was injured most often, followed closely by the upper extremity. Ankle sprains and knee internal derangements were the most common leading injuries in both practice and games.

Additional leading injuries include upper leg strains, and shoulder strains and tendinitis. The common injuries found in these studies are also consistent with what is seen in the literature presented by Briskin (2012).

Prevention strategies. The most commonly reported mechanism of softball injury is sliding into a base. Janda and colleagues conducted a study of injuries where break-away bases were employed as a means of reducing injury (1990). These researchers found that the quick-release bases were effective in significantly reducing injuries and they recommend that athletic complexes invest in these types of bases, which cost more than stationary bases, because it would conserve money in the form of healthcare costs in the long run (1990). Another study, concerned with the prevalence of shoulder injuries, suggested that pitch counts for softball athletes could significantly reduce overuse injuries; however there is no current literature regarding the implementation of pitch counts (Marshall et al., 2007). The American Academy of Pediatrics suggests the use of softer balls as a means of reducing contusions among young athletes (2001). Other studies have postulated that neuromuscular training geared specifically toward the shoulders and knees could reduce an athletes' risk of injury (Axe et al., 2002; Marshall et al., 2007). More research regarding the effectiveness of these prevention strategies is needed.

Conclusion

In conclusion, several current studies have investigated injuries among slow-pitch athletes and fast-pitch high school athletes, but no literature has specifically addressed the fast-pitch softball athletes that compete in fast-pitch travel softball leagues. Travel softball leagues are quite different than either recreational leagues or school leagues, and thus merit recognition

and study as a separate entity. Due to the increase in pediatric and adolescent participation in sports, particularly in girls' softball, as well as a lack of data regarding travel softball, and the previous findings regarding injury within other softball populations, there is a need for information about travel softball athletes and the injuries they incur in order to develop injury prevention strategies for this group of people.

The present study examines the relationship between female athletic participation in travel fast-pitch softball and the injuries incurred as a result. Data collected from this study will provide insight into how often travel fast-pitch softball athletes participate in the sport, how often they are injured as a result of their participation, and the type, location, and severity of the injuries. The goal of this study is to call attention to injury rates among travel-ball athletes and provide a foundation for further research in hopes of making the fast-pitch travel softball safer for future athletes.

Methods

The purpose of this study was to investigate the relationship between incidence of injury and frequency of participation in fast-pitch travel softball among female athletes ages 11-18. Specific research questions include:

1) What are the trends associated with participation in fast-pitch travel softball?
2) What trends in injury occur among fast-pitch travel softball athletes?
3) Is there a relationship between frequency of participation in fast-pitch travel softball and softball-related injuries?

Participants

This study included 116 participants, between the ages of 10 and 16. The average age of participants was 13. All the participants in the study were female, and each one was a member of a fast-pitch travel softball team. All teams were registered with the United States Specialty Sport Association (USSSA). All teams were from North Carolina, and were registered in either the 12 and under (12U), 14 and under (14U), or high-school (HS) age bracket. Travel softball athletes perform at a higher level than athletes from recreational softball programs; however, these athletes cannot be considered experts because they are still learning, developing, and growing in both knowledge of the sport and skill sets required to play. The researcher chose this population because fast-pitch travel softball is almost exclusively a female sport, the 12U, 14U and HS age brackets are most common within the sport, and because the researcher had previous connections with this population which enabled recruitment of participants.

Participants were recruited based on their participation within the North Carolina division of the USSSA. The USSSA offered a variety of tournaments across North Carolina within the

time frame needed to conduct data-collection for this study. Specific dates, tournaments, and locations are shown in Table 1. Participants were chosen because the team they played for was enrolled in at least one of the tournaments shown in Table 1, and they participated in one of the following age brackets: 12U, 14U, or HS.

The researcher completed the IRB process with Meredith College prior to initiating data collection. Parental consent and participant assent forms were completed prior to participation in the study. Consent and Assent forms are presented in Appendix B and C respectively. Participation in this study required the completion of a survey. 120 surveys were distributed and 116 surveys were completed and returned. Four athletes consented to participate in the study but neglected to complete and return the survey and were therefore considered drop-outs.

Instruments

Participants were asked to complete a survey created by the principle investigator. Survey questions were related to the age of the participant, the position the athlete plays, the amount of time she spends playing fastpitch softball, and the type, number, and location of any softball-related injuries within the past 2 years. A copy of the survey is presented in Appendix D. Responses to the survey questions were analyzed in order to answer the three research questions.

Pilot test

A draft of the survey was reviewed by the Head Athletic Trainer at Meredith College, and necessary changes in wording and presentation were made prior to the pilot test. The survey was then pilot tested by four members of the Meredith College softball team who indicated that they had previous experience playing fast-pitch travel softball. These individuals were informed of the purposes of the study and the target age group. The students completed the survey, and

reported that survey questions were easy to understand, followed a logical order, and were appropriate for the target age group. The survey had not been used previously; therefore measures of reliability have not been conducted. The survey was easy to administer; the principle investigator simply distributed a hard-copy of the survey to fast-pitch travel softball athletes and supplied a pen for the individual to use while answering the questions. The majority of the survey questions were memory-based.

Procedures

The principle investigator accessed the USSSA tournament schedule electronically, and selected three in-state tournaments on three separate weekends in either October or November. After obtaining approval from the IRB, the investigator contacted the tournament director, via email, and requested permission to survey the athletes that attended the chosen tournaments. A copy of the email is displayed in Appendix E.

At each tournament, a table was set up near the main entrance to the athletic facility used to host the tournament. The researcher sat at the table and requested participation in the study from passing athletes. Athletes that expressed interest in participation had to sign an assent form as well as have a parent sign a consent form before filling out the survey. Participants were handed a pre-numbered survey to complete. Upon returning the completed survey to the researcher, the participants received a goodie-bag and were entered in a drawing to win a Target gift card.

Design and Analysis

Forced-response questions were statistically analyzed using SPSS software to generate descriptive statistics. The "free response" questions on the survey asked athletes to mark where

their injury/injuries on a picture of a body. The researcher went through each survey response and tabulated the frequency in which body areas were injured. Body parts were divided into the following regions: head and face, neck, shoulders, upper arm (humeral region), elbow, lower arm (forearm), hand/fingers, chest, back (thoracic and lumbar spine), abdomen, hips/buttocks, upper leg (thigh), knee, lower leg (shin), ankles, and feet. This data was then analyzed using SPSS software which calculated frequencies for responses to each question, and allowed the researcher to complete a Chi-square analysis using responses indicating the number of months spent playing travel softball and the number of injuries incurred as a result.

Results

The purpose of this study was to identify trends associated with participation in fast-pitch travel softball and softball related injuries, and to determine if there was a relationship between these variables. The researcher posed three research questions: 1) What are the trends associated with participation in fast-pitch travel softball?, 2) What are the trends regarding injury among fast-pitch travel softball athletes?, and 3) Is there a relationship between frequency of participation in fast-pitch softball and softball-related injuries?. The researcher developed a survey in order to collect data regarding the three research questions. One hundred and sixteen female softball athletes between the ages of ten and seventeen responded to the survey.

The results of the surveys are presented in reference to the research questions they pertain to, and follow the same order of the research questions. Descriptive statistics were used to analyze the responses to survey questions. These statistics represent how often a particular response was given for a specific survey question. In addition, a Chi-square analysis was used to examine the relationship between frequency of participation in travel softball and softball-related injuries.

Frequency of Participation

In response to survey question one, 54.3% of the individuals surveyed said that they play for only one team; 33.6% said that they play for one team and "guest play" with other teams; 3.4% said they play for two or more teams; 4.3% said they play for two or more teams and "guest play" with other teams; and 4.3% said that they only play as a "guest". This information is depicted in Figure 3.1.

In response to survey question five, 50.9% of the population surveyed said that they play for their school team in addition to their travel team(s); 15.5% said that they play for a recreational team outside of travel softball as well as their travel team(s); 25.9% said that they play for both their school and a recreational team in addition to their travel team(s); and 7.8% said that they do not play for any school or recreation team in addition to their travel team(s). This information is depicted in Figure 3.2.

In response to survey question seven, 19.8% of the athletes surveyed said that they practice less than 2 times per week; the majority (67.2%) said that they practice 2-3 times per week; 6.9% said that they practice 4-5 times per week; and 6.0% said that they practice more than 5 times per week. This information is depicted in Figure 3.3.

In response to survey question eight, 9.5% of the respondents said that they play in tournaments no more than once a month; the vast majority (87.9%) said that they play in 2-3 tournaments per month; and 3.4% said that they participate in softball tournaments on every weekend of every month. This information is depicted in Figure 3.4.

In response to survey question nine, 1.7% of the individuals surveyed said that, on average, they play in less than 3 games per tournament; 29.3% said that they play an average of 4-5 games per tournament; the majority (54.3%) said that they play an average of 6-7 games per tournament; 8.6% said that they play an average of 8-9 games per tournament; and 6.0% said that they play an average of 10 or more games per tournament. This information is depicted in Figure 3.5.

In response to survey question ten, 24.1% of the population surveyed said that they play an average of 3-4 innings per game; the majority (43.1%) said that they play an average of 5-6

innings per game; and 32.8% said that they play an average of 7 or more innings per game. This information is depicted in Figure 3.6.

In response to survey question eleven, 6.9% of the athletes surveyed said that they participate in tournaments less than 8 months out of the year; 27.6% said that they play 8-9 months out of the year; and the majority (65.5%) said that they play 10 or more months out of the year. This information is depicted in Figure 3.7.

Softball-Related Injury

In response to survey question twelve, 59.5% of all the individuals surveyed reported one or more softball-related injuries within the last 2 years; while 40.5% reported no softball-related injuries in the last 2 years. Among those who reported one or more injuries, 21 athletes reported one injury, 16 athletes reported two injuries, 11 athletes reported three injuries, six athletes reported four injuries, 1 athlete reported five injuries, and 14 athletes reported more than five injuries. This information is depicted in Figure 3.8.

In response to question thirteen, 6.0% of the athletes surveyed reported that the injury/injuries that they incurred as a result of softball required surgery, while the vast majority (94%) reported that none of their injuries required surgical treatment. Among those who reported one or more injuries, 7 individuals reported that one or more of their injuries required surgery, and 62 individuals reported that none of their injuries required surgical treatment. This information is depicted in Figure 3.9.

In response to question fourteen, 62.9% of the entire population surveyed said that they have not had a chronic injury within the last two years, while 37.1% said that they have had one or more chronic injuries within the last two years. Among those who reported one or more

injuries, 24 athletes said that they have not had a chronic injury; 23 athletes said that they have had one chronic injury, 12 athletes said that they have had two chronic injuries, 6 athletes said that they have had three chronic injuries, and 2 athletes said that they have had five or more chronic injuries. This information is depicted in Figure 3.10.

In response to question fifteen, 24 of the athletes who reported at least one injury also reported that they have not had any chronic injuries. Among athletes who reported at least one chronic injury, the most frequently reported locations of injury were the shoulder, knee and ankle with 14 incidences each; second was the elbow with 8 incidences. Other chronically injured areas of the body include: the finger/thumb, the shin, the wrist, the back, the hip, the hamstrings, and the calf, each of which occurred 5 or fewer times.

In response to survey question sixteen, 57.8% of the population surveyed reported that they have at least one acute injury, while 42.2% said that they have not had an acute injury. Among those who reported one or more injuries, 9 athletes said that they have not had an acute injury; 25 athletes said that they have had one acute injury; 17 athletes said that they have had two acute injuries; 7 athletes said that they have had three acute injuries; 4 athletes said that they have had four acute injuries; and 14 athletes said that they have had five or more acute injuries. This information is depicted in Figure 3.11.

In response to question seventeen, 9 of the athletes who reported at least one injury also reported that they had not had any acute injuries. Among athletes who reported at least one acute injury, the most frequently reported locations of injury were the knee with 44 incidences, the ankle with 32 incidences, the shoulder with 16 incidences, the elbow with 15 incidences, the back with 10 incidences, the wrist and shin with 9 incidences each, the finger/thumb with 8

incidences, and the hip with 6 incidences. Other injured areas include: heel, head/face, hand, calf, groin, buttocks, upper arm, forearm, quadriceps, and midfoot each of which occurred 5 or fewer times.

Relationship between Frequency of Participation and Injury

The Chi-square statistic ($\chi 2$) was calculated in order to determine whether a significant association exists between the number of months that an athlete participates in travel softball and the number of injuries that occur as a result. The data regarding months of participation was separated into two groups: athletes who play 9 or fewer months per year, and athletes who play 10 or more months per year. The data regarding number of injuries was also separated into two groups: athletes who reported no injuries, and athletes who reported one or more injuries. Results of the Chi-square analysis showed that there was not a significant relationship between the number of months an athlete plays per year and the number of injuries incurred as a result of participation ($\chi 2 = 3.64$, $p = .056$); however, it did indicate that the relationship was approaching significance (Table 2).

Other Results

In response to survey question two, 31.9% of the athletes surveyed reported that they play in the 12 and under age bracket; 24.1% reported that they play in the 14 and under age bracket; 29.3% reported that they play in the high school age bracket; 8.6% reported that they play in both the 12 and under and 14 and under age brackets; and 6.0% reported that they play in the 14 and under and high school age brackets. This information is depicted in Figure 3.12.

In response to survey question three, 4.3% of the individuals surveyed reported that they were younger than 11, but when asked exactly how old they were each individual replied that she

was 10 years old; 15.5% reported that they were 11 years old; 24.1% reported that they were 12 years old; 15.5% reported that they were 13 years old; 18.1% reported that they were 14 years old; 15.5% reported that they were 15 years old; 5.2% reported that they were 16 years old; and 1.7% reported that they were 17 years old. This information is depicted in Figure 3.13.

In response to survey question four, one person (representing 0.9% of the population surveyed) reported that she had less than one year of previous experience playing travel softball; 6.9% reported that they had one year of previous experience; 12.9% reported that they had two years of previous experience; 22.4% reported that they had three years of previous experience; 21.6% reported that they had four years of previous experience; 21.6% reported that they had five years of previous experience; 7.8% reported that they had six years of previous experience, 3.4% reported that they had seven years of experience, and 1.7% reported that they had eight or more years of previous experience. This information is depicted in Figure 3.14.

In response to question six, 27.6% of the athletes surveyed said that they play one position on a regular basis; 21.6% said that they play two positions on a regular basis; and 50.9% said that they play three or more positions on a regular basis (Table 3). There are nine positions in fastpitch travel softball: pitcher, catcher, first-base, second-base, third-base, short-stop, left-field, center-field, and right-field. The researcher calculated the frequency in which each response was given and results are as follows: 46 athletes said that they pitch, 42 athletes said that they play short-stop, 40 athletes said that they play third-base, 39 athletes said that they play left-field, 38 athletes said that they play second-base, 38 athletes said they play center-field, 37 athletes said that they play first-base, 36 athletes said that they play right field, and 34 athletes said that they catch (Table 4).

In conclusion, over half of the individuals surveyed reported that they participate in 6-7 games per tournament, 2-3 tournaments per month, and play travel softball 10 or more months out of a year. In addition, just over half of the population surveyed reported one or more injury. The Chi-square between months of play and number of injuries was approaching significance with a p-value of 0.056, which suggests that there could be a meaningful relationship between the two variables.

Discussion

The athletes from this study were all females between the ages of 10 and 17 who participated in fast-pitch travel softball in North Carolina with teams that are registered with the United States Specialty Sports Association (USSSA). According to the data collected for this study, most of these athletes participate in 6-7 games per tournament, 2-3 tournaments per month, and play 10 or more months in a year. That means these kids are participating in approximately 120 – 252 games per year. Most athletes reported playing 5-6 innings per game as well, so that adds up to anywhere between 600 – 1,512 innings in a single year. An estimated range of 120 – 252 fast-pitch travel softball games per year is a lot of competition for athletes between ten and seventeen years old, and that estimate does not account for all the time spent practicing or playing for other softball teams in addition to a travel team.

Surprisingly, these athletes don't seem to sustain injuries very often as a result of their participation in fast-pitch softball. In the current study, 72.4% of the athletes surveyed had less than 3 injuries, and 40.5% of them had no injuries at all. In addition, only 7 out of the 116 people surveyed reported having to have surgery as a result of a softball-related injury, which indicates that the current severity of the injuries sustained was minimal. However, literature by Prentice (2013), and Veroni & Brazier (2006) suggests that periodization training, which breaks up the time spent competing in a sport and training for a sport into seasons of play, could be implemented in order to further reduce the likeliness of injury.

Although the results of the chi-square ($\chi 2 = 3.64$, $p = .056$) are not significant by current standards ($p \leq .05$), the relationship was approaching significance, and the researcher is 94.4% confident that the association between months of play per year and number of injuries within the

last two years did not occur by chance. This warrants future research regarding frequency of participation in fast-pitch travel softball and resulting injuries.

The results of this research are consistent with those of previous research in terms of the location of injury. This research, similar to recent research, shows that the shoulder, knee, ankle, and elbow are the most common locations of softball-related injury (Bonza et al., 2009; Marshall et al., 2007 Rauh et al., 2007; Shanley et al., 2011). This is most likely due to the constant stresses put on these joints by throwing or pitching the ball, having to make quick turns when fielding a ball or running the bases, and sliding into bases. This study shows that injuries occurring in the fast-pitch travel softball population are similar to that of the high school softball and college-softball populations.

There are several ways in which this study was limited. First, the survey tool was based on the ability of the participants to accurately remember the number of injuries they had sustained, the location of their injuries, and how the injuries happened. Memory-based surveys leave room for participant error with no way to account for it. Second, the participants who filled out the survey were young and their maturity level and reading level could have impacted their ability to complete the survey to the best of their abilities. Third, many participants relied on the responses of their teammates rather than their own judgment and memory. Last, the amount of time the participants took to complete the survey could have affected the accuracy of the data they provided. Participants who rushed through the survey so they could get back to socializing or playing games were potentially more likely to have made errors than the participants who took their time and carefully read each question.

One way that the study could have been improved was to design the survey for the parents to fill out instead of the child. In most instances, parents have a more accurate memory of events, higher maturity levels, and higher reading levels, so if this study was to be repeated, the researcher would likely address the adults rather than the children.

Future researchers should conduct studies in which they follow one particular team over the course of the year, documenting the frequency in which each athlete on the team practices and plays and the number and type of injuries sustained by the athletes during practices or games. An alternative design for future research may include a longitudinal study of several different athletes in the same age group. Either way, it would be best if the future researchers could collect data based on their own observations of the population rather than gathering memory-based data.

This research showed that athletes in the fast-pitch travel softball community participate in the sport on a frequent basis with relatively few injuries. However, statistical analysis of the relationship between participation in fast-pitch travel softball and the number of softball-related injuries was approaching significance. This suggests that the number of injuries sustained could be reduced if frequency of participation was reduced, thus emphasizing the necessity of seasonal play in order to reduce injuries (Prentice, 2013; Veroni & Brazier, 2006).

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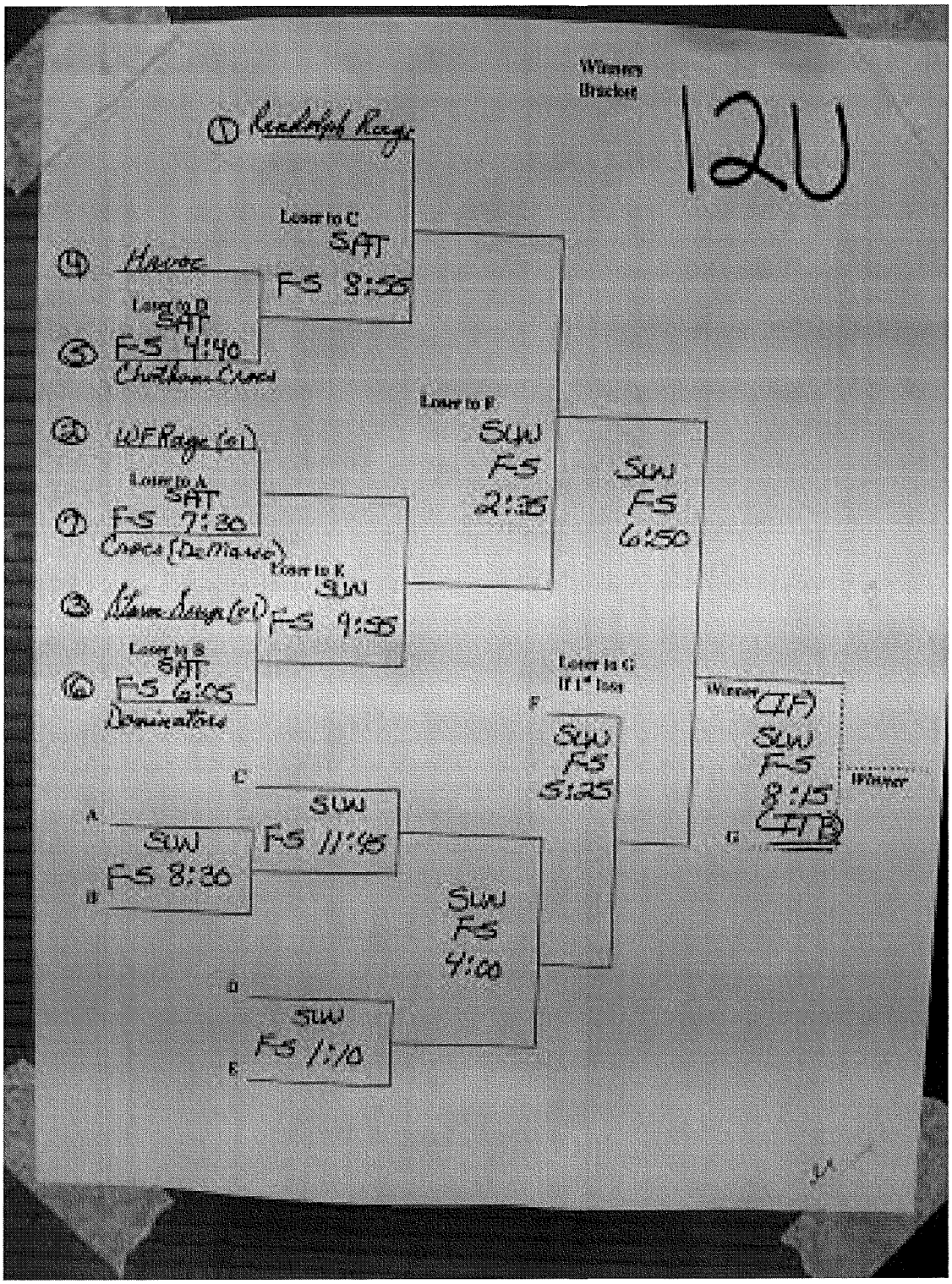
Appendix A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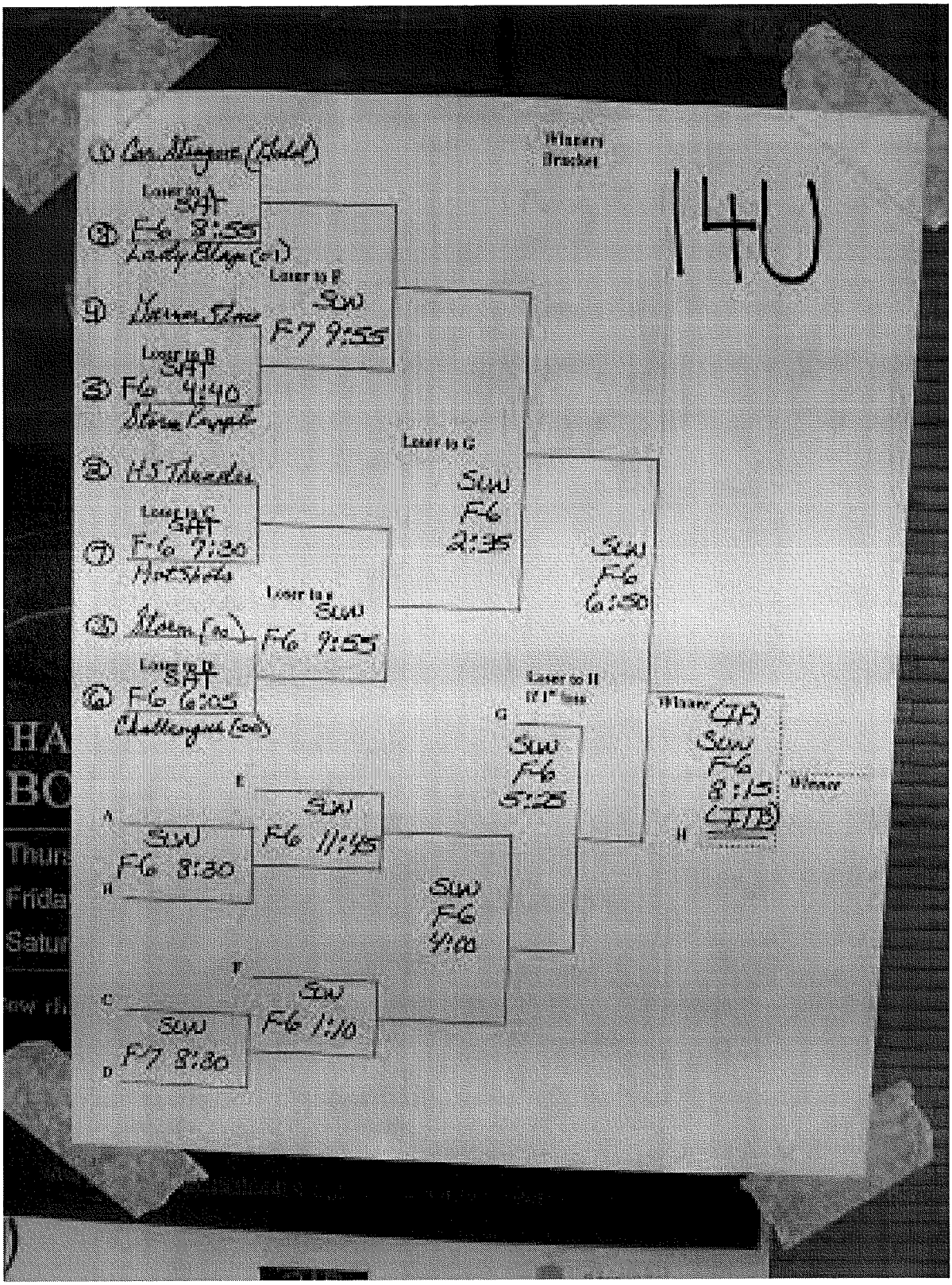
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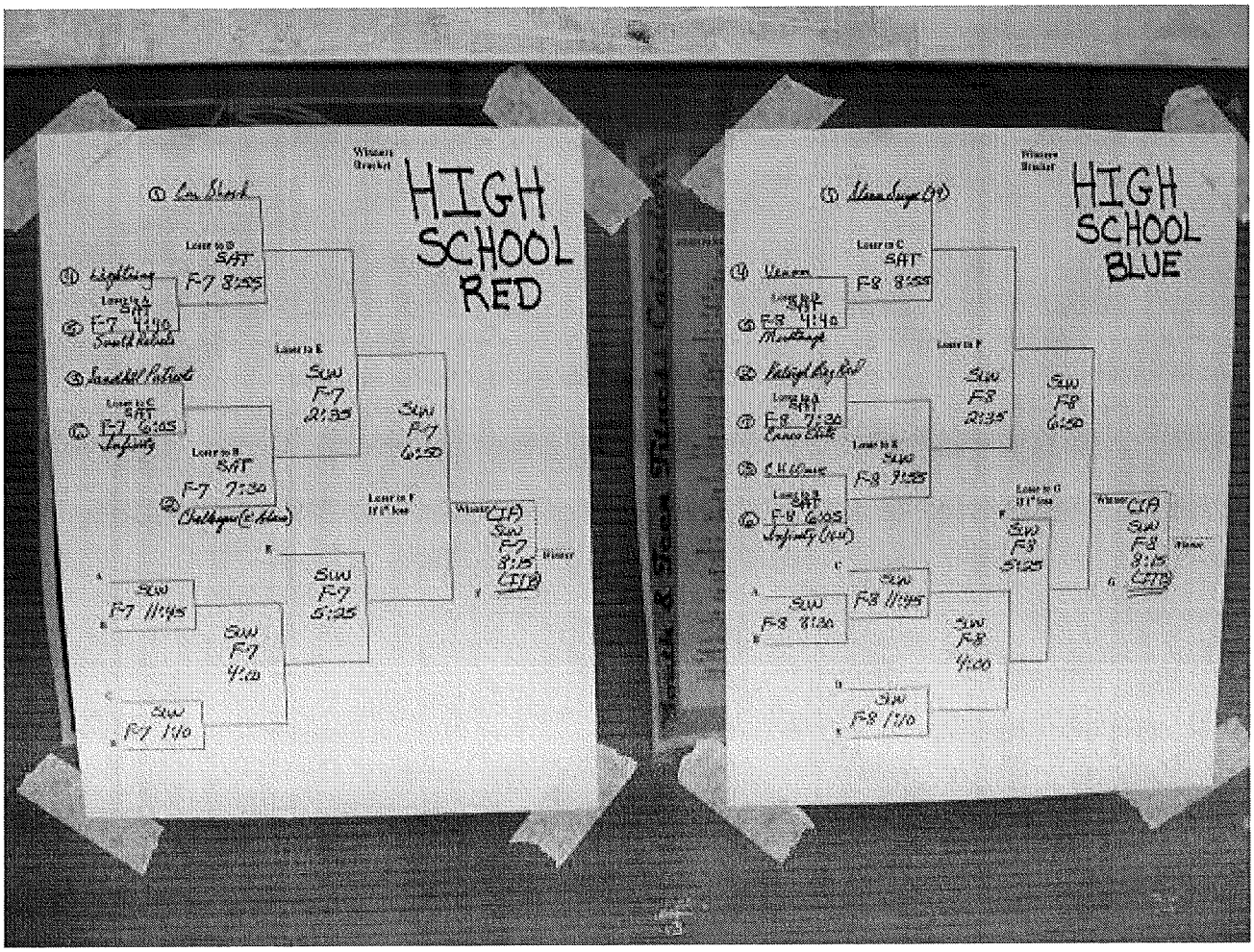
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HIGH SCHOOL BLUE

Appendix B

CONSENT TO PARTICIPATE IN RESEARCH

Injuries Among Fast-Pitch Travel Softball Athletes as They Relate to Frequency of Participation

Principle investigator: Ashley Watkins

Dear Parent of a Travel Softball Athlete,

Your child is invited to participate in a study conducted by Ashley Watkins, the principle investigator, through Meredith College. Your child's participation in the study is voluntary. Please read the following material and ask questions about anything you do not understand before deciding whether or not to allow your child to participate.

The purpose of this study is to examine the relationship between fast-pitch softball injuries and the frequency in which the athlete participates in the sport. Your child has been selected to participate in this study because she plays fast-pitch softball with a travel-softball team, her team is enrolled in one of the following age brackets: 12 and under, 14 and under, or high school, and her team entered in one of the following tournaments: "Halloween Bash Trunk or Treat," "Fall Challenge," "Fall Bash," "November Classic," or "Winter World Series" held in North Carolina, hosted by the United State Specialty Sports Association (USSSA).

Participation in the study is voluntary. Your child can turn down the opportunity to participate without any negative consequences. Participation in the study will not affect the athlete's ability to participate in any tournament in which her team is enrolled.

Your child's participation in the study requires completion of a short survey regarding the frequency in which she practices or plays fast-pitch softball, and the number of injuries she has had as a result of her participation in this sport. The survey is intended to be completed as an anonymous submission. Completion of the survey should take approximately ten minutes.

The results of the research study may be published, but your child's name and identity will remain anonymous. The data collected will be kept in a secure location, and disposed of appropriately at the conclusion of the study. There are no foreseeable risks associated with participation in this study.

The principle investigator of this study is available to answer any questions you may have about the study and will be available by email (watkinsa@email.meredith.edu) should any questions arise after completion of the survey. Questions may also be answered by Dr. Stephanie Little, supervisor of the study, by contacting her at her office phone (919) 760-8176, or via email to littlest@meredith.edu. Questions may also be directed to Dr. Paul Winterhoff, director of undergraduate research at Meredith College, by contacting his office phone (919) 760-2356, or via email to winterhoff@meredith.edu .

Compensation for participating in this study includes a "goodie bag" of assorted candies, and the option of entering a random drawing to receive a Target gift card. You may turn down either or both of the compensatory gifts/opportunities if you do not want your child to have them.

You are making a decision whether or not to have your child participate in this study. Your signature indicates that you have decided to allow your child to participate, that you have read (or been read) the information provided above and that you have received a copy of this consent form.

_____

Name of Child

_____ _____

Signature of Patient, Parent, or Person Responsible Date

_____ _____

Signature of Investigator Date

_____ _____

Signature of Witness Date

Appendix C

Assent Form

Study: Injuries Among Fast-Pitch Travel Softball Athletes as They Relate to Frequency of Participation

Principle Investigator: Ashley Watkins

Department of Exercise and Sports Science at Meredith College

I am a researcher from Meredith College. I am trying to learn whether the amount of time travel softball athletes spend participating in fast-pitch softball is related to the number of injuries that those athletes get. I am studying this in order to help prevent injuries to travel softball athletes your age. If you would like, you can be a part of my study by completing a short survey.

If you decide you would like to be part of my study, you will be asked to fill out a survey that asks questions about how often you play fast-pitch softball, and how many injuries you have had as a result of playing fast-pitch softball.

Other people will not know if you participated in my study or not. If I need to talk about your specific answers, I will use the "participant number" on the survey rather than your name, so no one will know who I am talking about.

Your parents or a legal guardian have to say it's OK for you to be in the study. After they decide, you also get to choose if you want to be in the study. If you don't want to be in the study, no one will be mad at you, and you will still be able to play in the tournament with your team.

My telephone number is (919) 417-6698. Please call me if you have any questions about this study.

I will give you a copy of this form in case you want to ask questions later.

Agreement

I have decided to be in the study even though I know that I do not have to do it. My questions have been answered, and I know who to call if I have any other questions.

_____	_____
Signature of Study Participant	Date
_____	_____
Signature of Researcher	Date

Appendix D

SURVEY

Please complete only ONE survey, and answer the following questions based on your participation in *FASTPITCH SOFTBALL* within the last two years unless the question specifies otherwise.

1) How many travel softball teams do you play for?
   a) One team
   b) One team and I play as a guest for other teams when my team is not playing
   c) Two teams
   d) Two or more teams
   e) Two or more teams and I play as a guest for other teams when none of my teams are playing
   f) Guest play only

2) What age bracket do you currently play in? (If you currently play in more than one age bracket, circle all that apply)
   a) 12 and under bracket
   b) 14 and under bracket
   c) High school bracket

3) How old are you?
   a) Younger than 11
   b) 11
   c) 12
   d) 13
   e) 14
   f) 15
   g) 16
   h) 17
   i) 18
   j) Older than 18

4) How long have you participated in travel fastpitch softball?
   a) Less than 1 year
   b) 1 year
   c) 2 years
   d) 3 years
   e) 4 years
   f) 5 years
   g) 6 years
   h) 7 years
   i) 8 years
   j) More than 8 years

5) Do you also play for a school softball team or a recreation softball team?
   a) School softball team
   b) Recreation softball team
   c) Both school and recreation softball teams
   d) Neither school nor recreation teams

6) What position do you play on a **regular basis**? (circle all that apply for all teams you play with)
   a) Pitcher
   b) Catcher
   c) First base
   d) Second base
   e) Third base
   f) Short stop
   g) Left field
   h) Center field
   i) Right field

7) How often do you practice with the team(s) you play for?
   a) Less than 2 times per week
   b) 2-3 times per week
   c) 4-5 times per week
   d) More than 5 times per week

8) On average, how often do you participate in travel softball tournaments?
   a) Less than once a month
   b) Once a month
   c) 2-3 times per month
   d) Every weekend of every month

9) On average, how many games do you participate in per tournament?
   a) Less than 3
   b) 4-5
   c) 6-7
   d) 8-9
   e) 10 or more

10) On average, how many innings do you play (this number should only include innings that you were on the field either defensively or offensively).
   a) 2 or less
   b) 3-4
   c) 5-6
   d) 7 or more

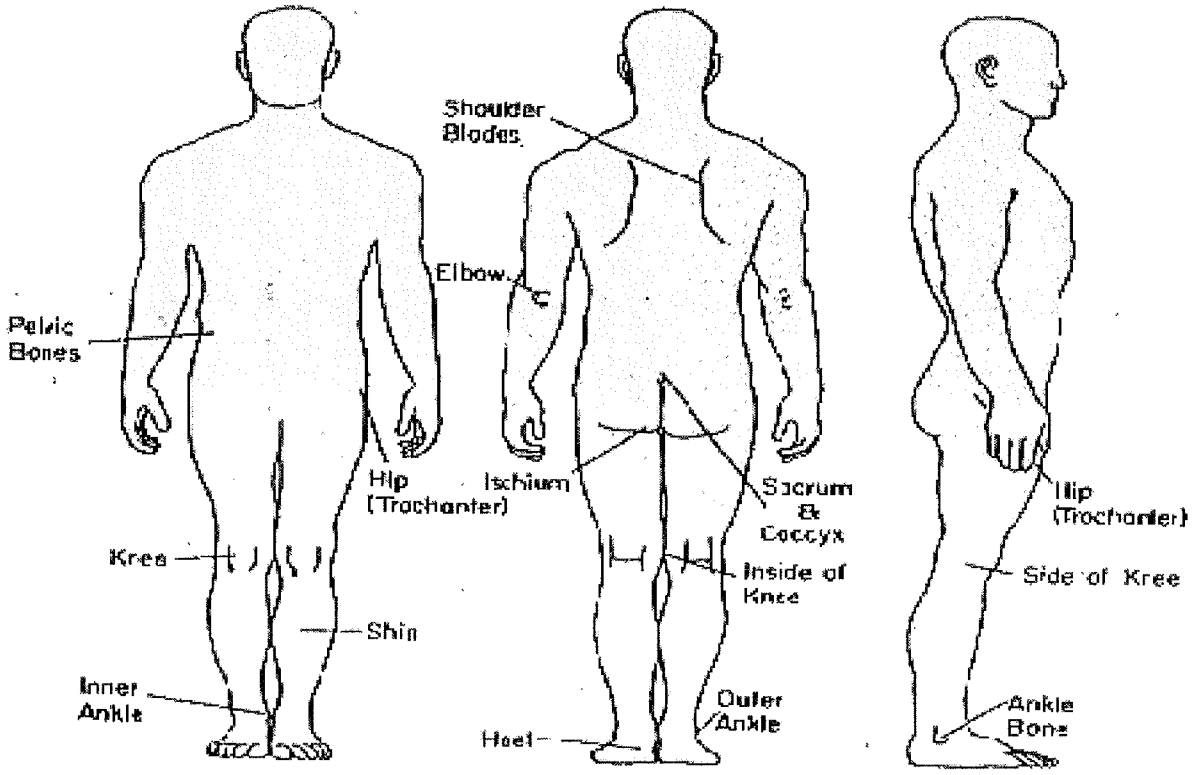
11) How many months out of the year do you participate in softball practices or games?
   a) Less than 4 months
   b) 4 or 5 months
   c) 6 or 7 months
   d) 8 or 9 months
   e) 10 or more months

12) ***Injury*** is defined by the NCAA as: having been restricted for one or more calendar days after the injury, or required medical attention by certified athletic trainer or physician.
   How many softball-related injuries have you had over the last 2 years as a result of your participation in travel softball?
   a) None
   b) Once
   c) Twice
   d) Three times
   e) Four times
   f) Five times
   g) More than 5 times

13) Did any of the injuries you sustained require surgical treatment?
   a) Yes
   b) No

14) ***Chronic injury*** is defined as an injury with long onset and long duration
   How many **CHRONIC INJURIES** have you had within the last 2 years?
   a) None
   b) One
   c) Two
   d) Three
   e) Four
   f) Five or more

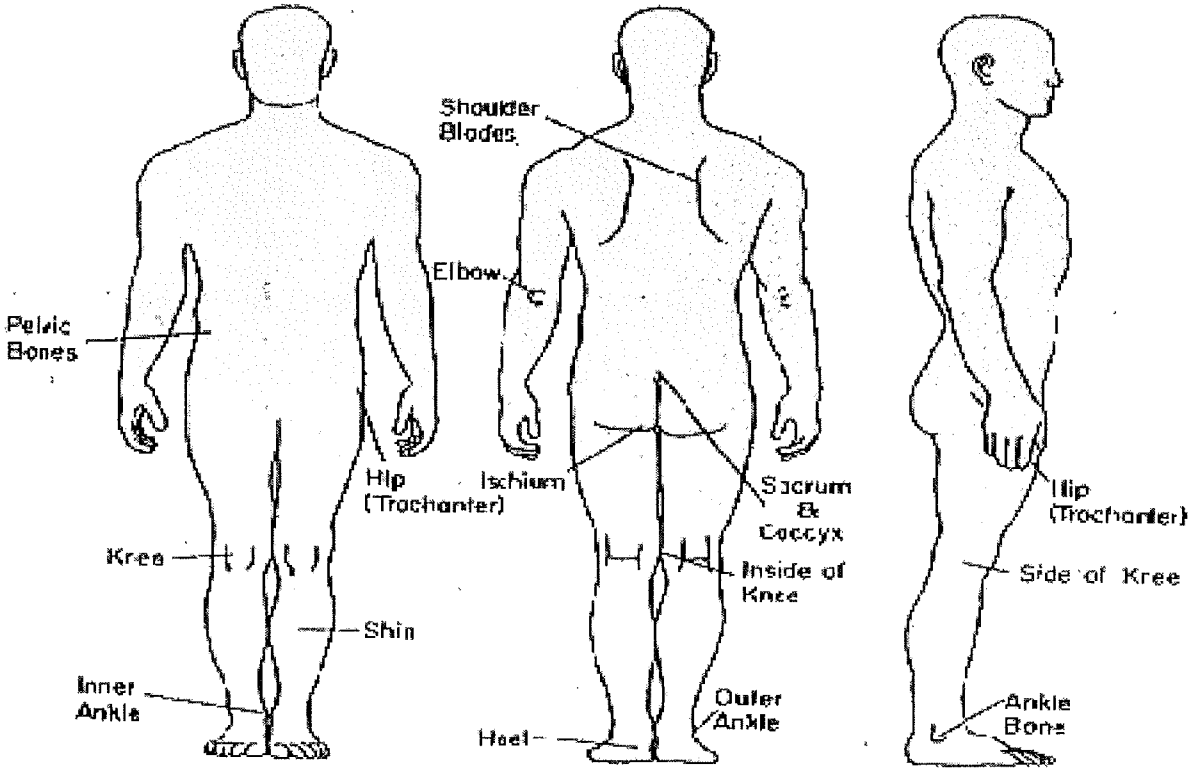
15) Please mark the location of your **CHRONIC injury/injuries** with an **X** on the body below (use an x for each individual injury) Ex: If you had injured your right shoulder twice there should be two x's on the right shoulder.



16) ***Acute injury*** is defined as an injury with sudden onset and short duration
How many **ACUTE INJURIES** have you had within the last 2 years?

a) None
b) One
c) Two
d) Three
e) Four
f) Five or more

17) Please mark the location of your **ACUTE injury/injuries** with an x on the body below (use an x for each individual injury) Ex: If you had injured your right shoulder twice there should be two x's on the right shoulder.



Appendix E

Good afternoon Mr. Skinner, my name is Ashley Watkins, and I am a Meredith College student as well as a former Apex Sting softball player and assistant coach for the Apex Sting Organization run by my aunt, Melinda Cowley. I am contacting you because I would like to conduct research at several of the tournaments hosted by the USSSA in North Carolina during October and November. I am investigating the relationship between injuries among travel softball athletes and the frequency in which they participate in the sport. The study consists of a short survey to be completed by athletes in the 12U, 14U, and HS age brackets. A copy of the survey has been attached to this email. I submitted a description of my research study to the Meredith College Internal Review Board and it has been approved, but I would like your approval before I begin collecting data.

Data collection would occur at the following tournaments:
10/19 Halloween Bash Trunk or Treat: Kinston, NC at Connor Fields
10/26 Fall Challenge: Fayetteville, NC at Arnette Park
11/2 Fall Bash: Rocky Mount, NC at the Rocky Mountain Sports Complex
11/9 November Classic: Clayton, NC at Greater Cleveland Athletic Association
11/16 Winter World Series: Cary, NC at Thomas Brooks Park and Middle Creek Park

I plan to arrive at the tournament location before teams arrive to warm-up and set up a table at the main entrance of the park. I would ask athletes to complete a paper copy of my survey. Parental consent and participant assent are required prior to the completion of the survey. I am also offering a "goodie bag" as an incentive for participation in the study, as well as the opportunity to win a Target gift-card by random drawing at the end of the day. Goodie Bags would contain an assortment of candies (lollipops, skittles, jolly ranchers, etc...) and a 'thank you' note. I expect to be there at least until all the teams have arrived, and hold a drawing for the gift card in the afternoon.

Could you help me spread the word about my research to the teams participating in the aforementioned tournaments? I believe that notifying people about the opportunity to participate in research prior to arrival at the tournament would increase participation in the study. Also, would you be able to provide a rough estimate of the number of athletes expected at the tournament? I'd like to make sure I have ample amounts of surveys and goodie bags to hand out to the participants.

If you have any questions or concerns regarding my research project please contact me via email (watkinsa@email.meredith.edu) or phone (919) 417-6698.

Thank you!

It will be fine for you to attend these tournaments and do your survey. Just make sure you send me an email the Wednesday before each tournament that you want to attend just to remind me that you will be attending.

Thanks,

Rod Skinner

Tables

Table 1

Tournament Dates and Locations

Date	Tournament name	Location
Oct. 19-20	Fall Bash	Cary, NC at Thomas Brooks Park
Oct. 26-27	Fall Challenge	Selma, NC at Selma middle school and Glendale Recreational Fields
Nov. 2-3	Fall Bash	Rocky Mount, NC at Rocky Mountain Sports Complex

Table 2

Chi-square analysis between months of play and number of injuries

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.637[a]	1	.056		
Continuity Correction[b]	2.918	1	.088		
Likelihood Ratio	3.612	1	.057		
Fisher's Exact Test				.074	.044
N of Valid Cases	116				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 16.21.

b. Computed only for a 2x2 table

Table 3

Number of positions played on a regular basis

Number of Positions played regularly	Number of Athletes	Percent of population
one	32	27.6
two	25	21.5
three or more	59	50.9
total number of athletes surveyed	116	100

Table 4

Frequency of Defensive position played

Position	# of athletes
pitcher	46
catcher	34
first base	37
second base	38
third base	40
short stop	42
left field	39
center field	38
right field	36

Figures

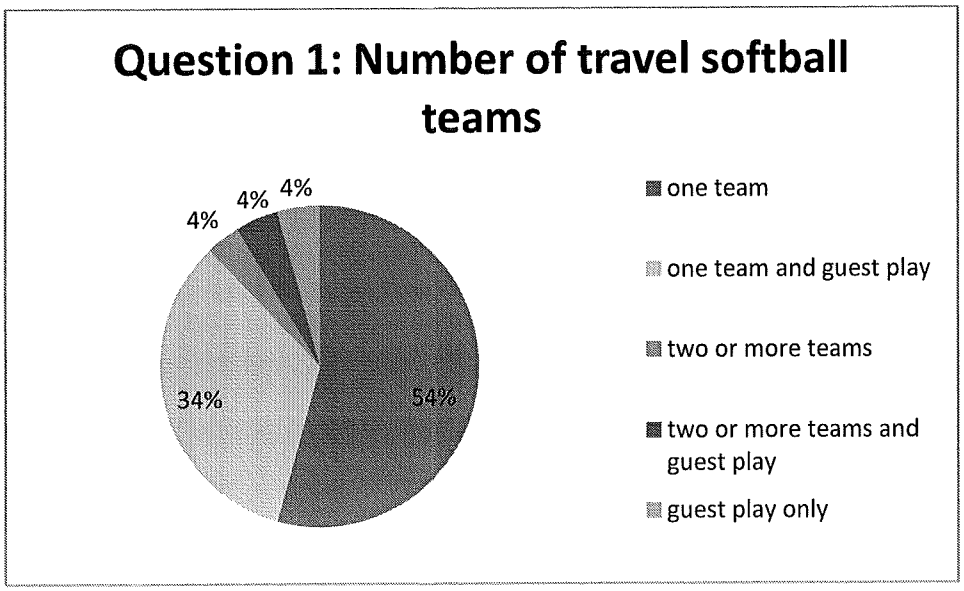


Figure 3.1. Question 1: Number of travel softball teams.

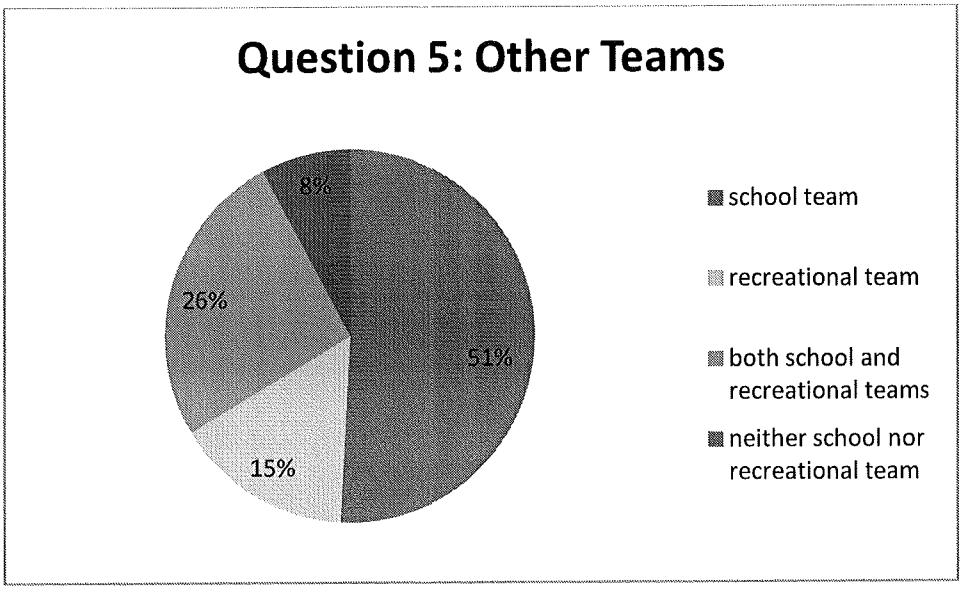


Figure 3.2. Question 5: Other teams.

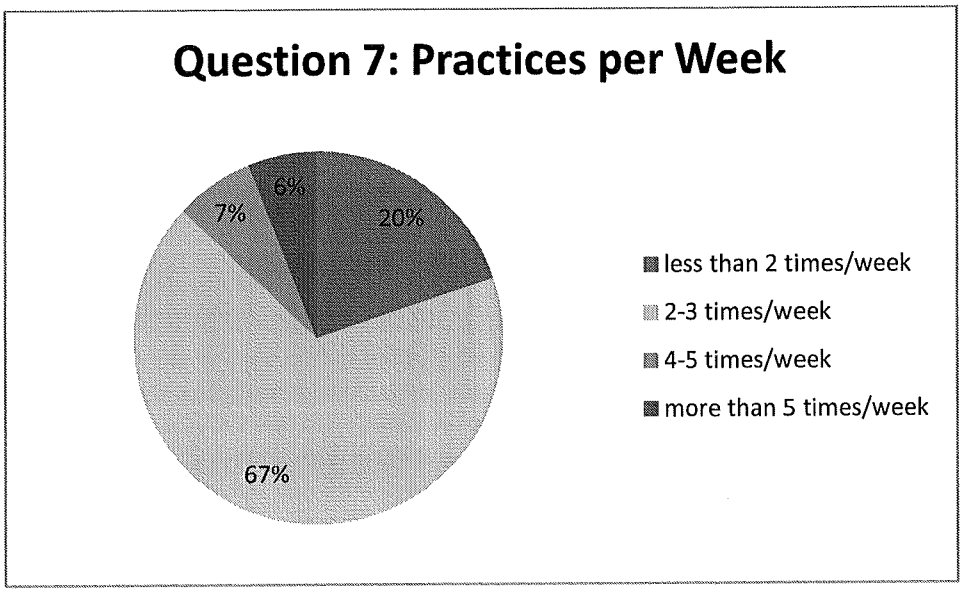


Figure 3.3. Question 7: Practices per week.

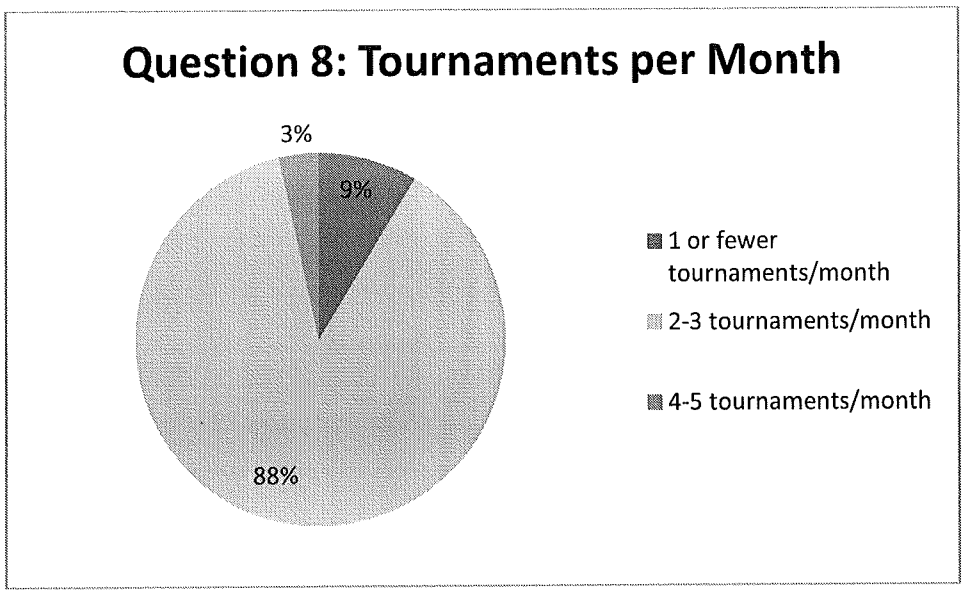


Figure 3.4. Question 8: Tournaments per month.

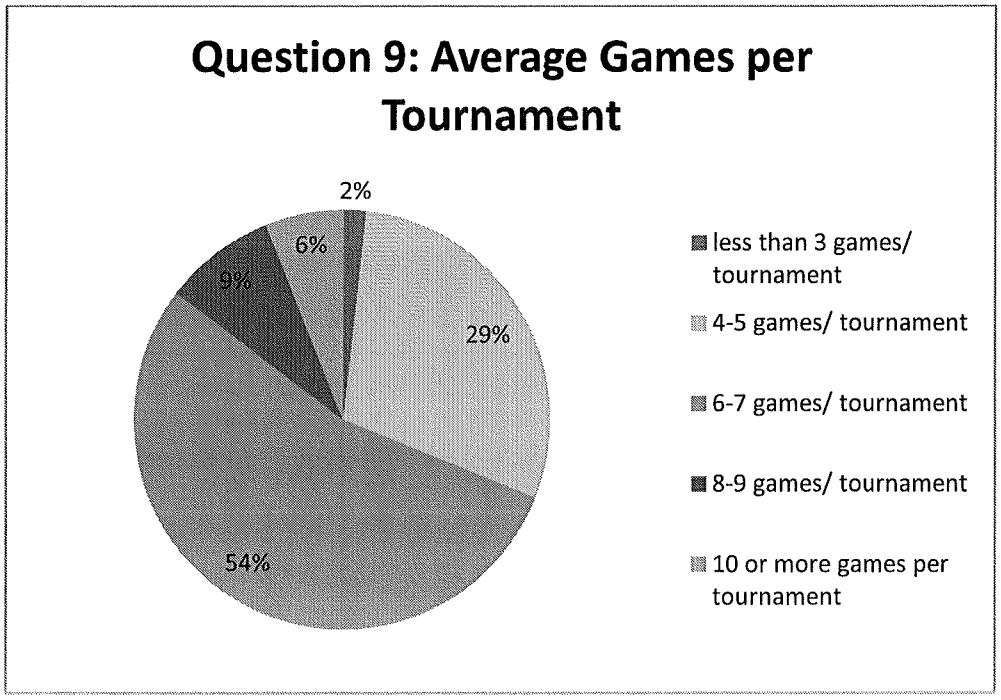


Figure 3.5. Question 9: Average number of games per tournament.

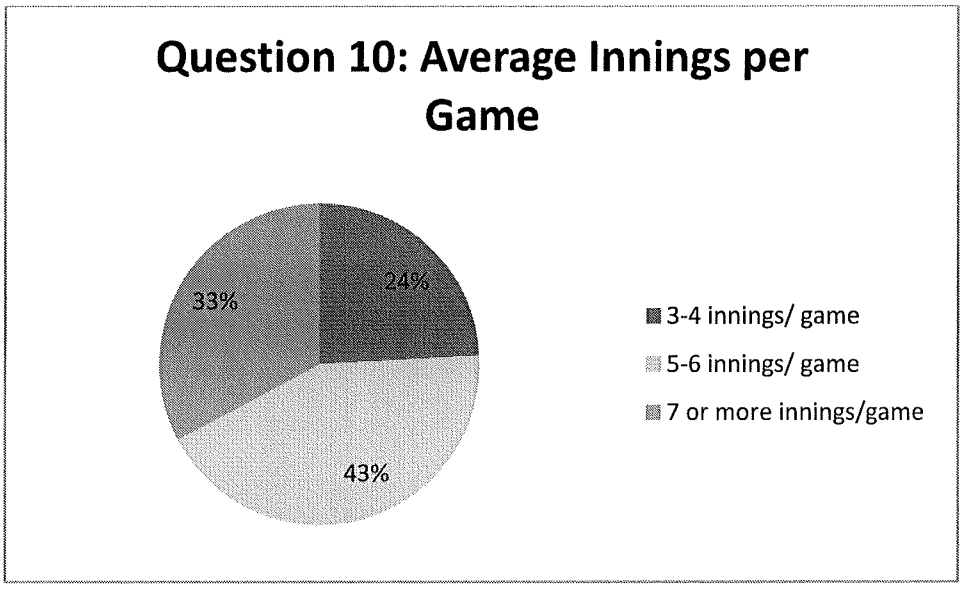


Figure 3.6. Question 10: Average number of innings played per game.

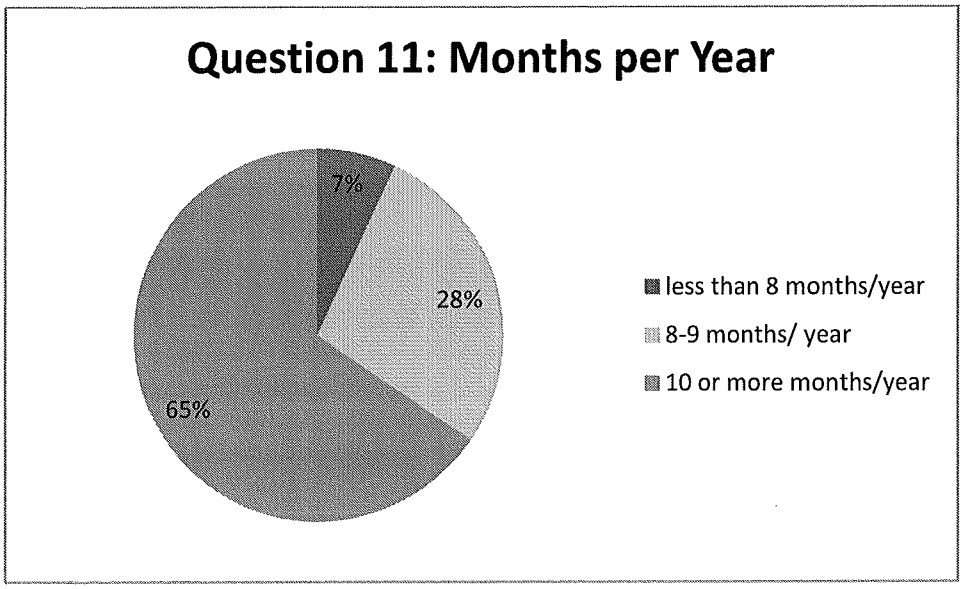


Figure 3.7. Question 11: Months spent playing travel softball per year.

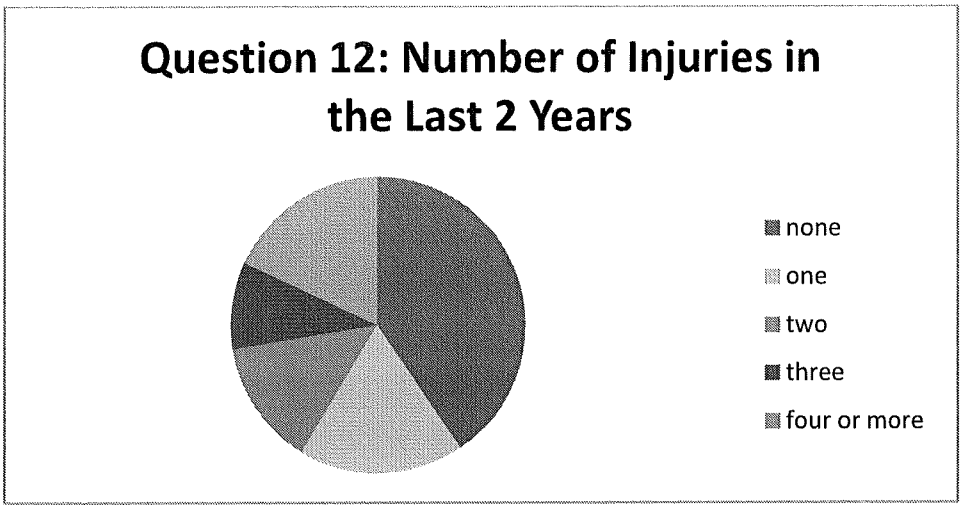


Figure 3.8. Question 12: Number of softball-related injuries in the last 2 years

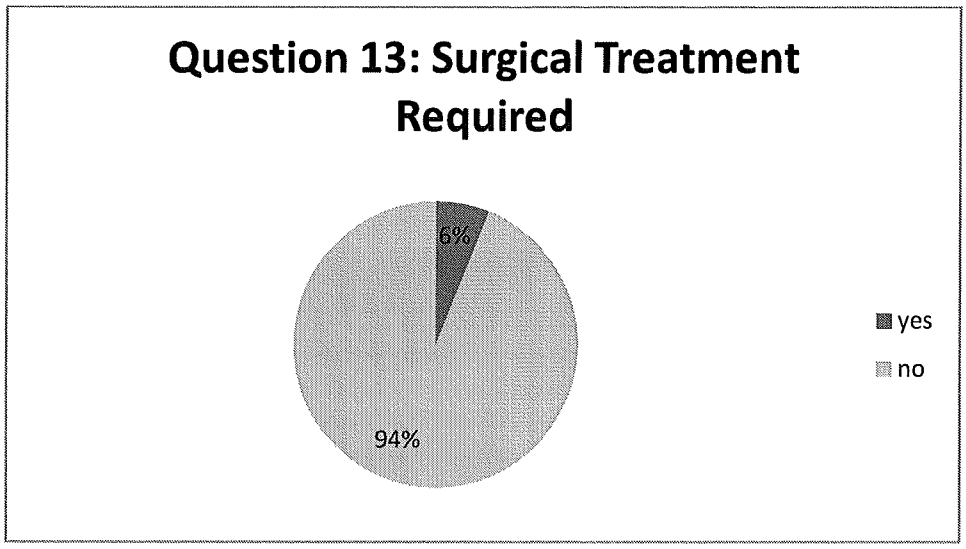


Figure 3.9. Question 13: Injury required surgical treatment

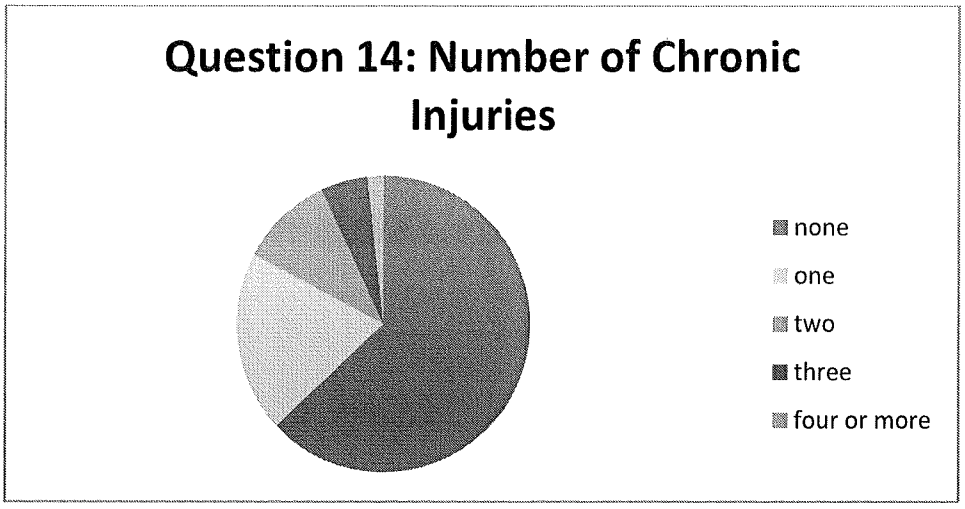
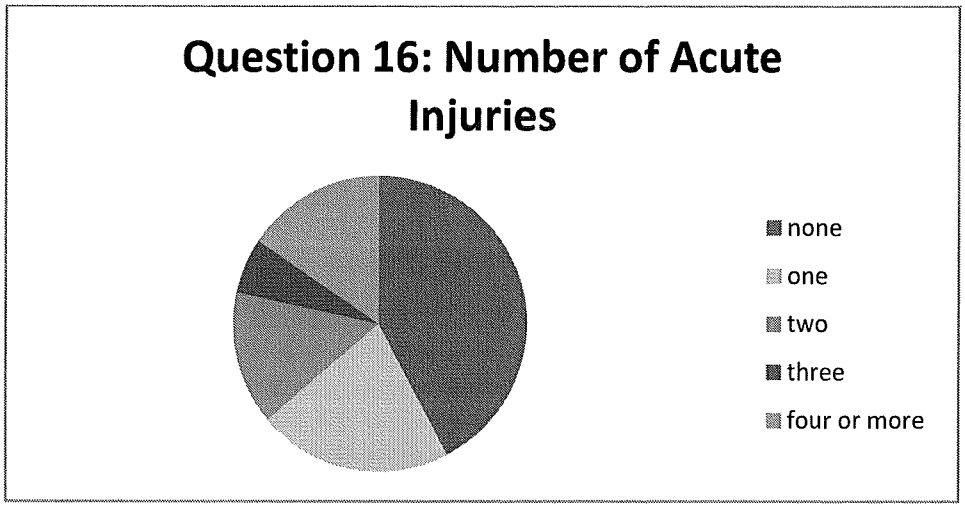


Figure 3.10. Question 14: Number of softball-related chronic injuries



Figur3 3.11. Question 16: Number of softball-related acute injuries

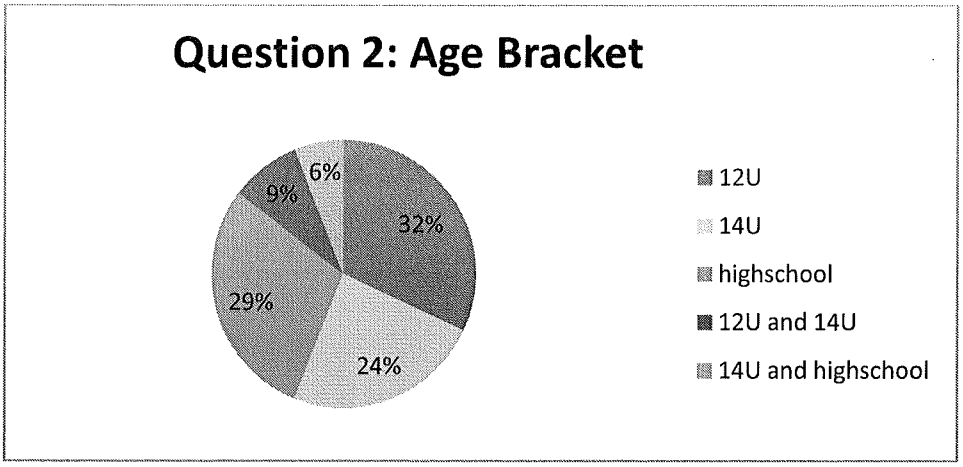


Figure 3.12. Question 2: Age bracket.

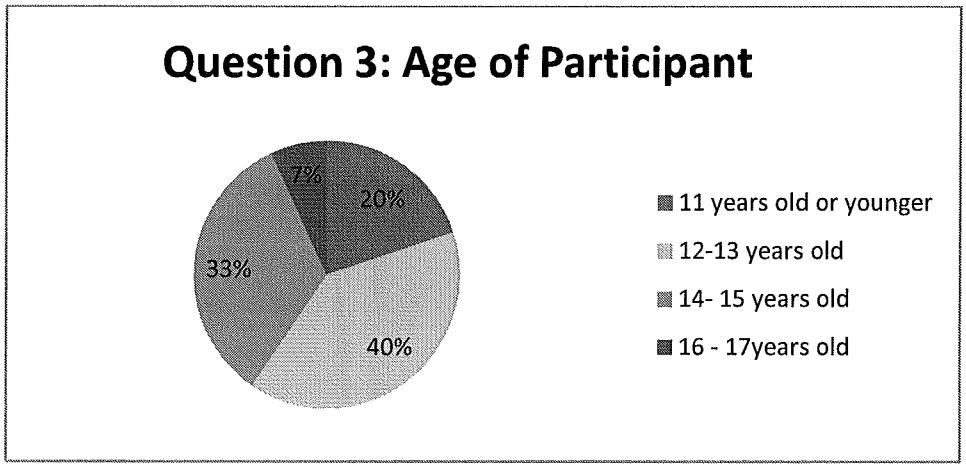


Figure 3.13. Question 3: Age of participant.

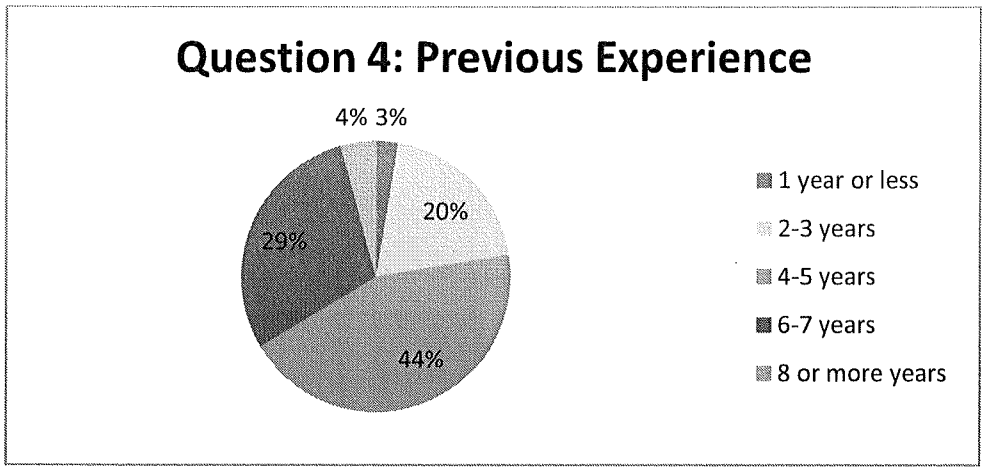


Figure 3.14. Question 4: Number of years of previous experience playing travel softball.