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Certified athletic trainer's knowledge on sports hernias

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Certified Athletic Trainer's Knowledge of Sports Hernias

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A thesis submitted to the Graduate Faculty of

JAMES MADISON UNIVERSITY

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Abstract

Context: Over the past twenty years, the number of athletes diagnosed and treated with a sports hernia has increased significantly. A sports hernia is a chronic injury which produces debilitating groin pain caused by a tear or weakness of the transversalis fascia causing compression of the ilioinguinal nerve. Athletes diagnosed with sports hernias are often unable to continue their sport unless they get surgery. Certified athletic trainers (ATCs) are commonly the first people to evaluate an injured athlete and must be knowledgeable in sports hernia recognition and treatment.

Objective: To examine if ATCs have the appropriate knowledge of sports hernias and to see where ATCs have learned about sports hernias.

Methodology: An 18-question electronic questionnaire was randomly sent out to 1,000 ATCs who are members of the National Athletic Trainers' Association. We received 116 complete responses and 130 incomplete responses. Data were analyzed through descriptive statistics and a Chi-Square analysis with level of significant set at 0.05.

Results: Overall, the data suggests that ATCs are able to distinguish a sports hernia. 78% of respondents would consider a sports hernia as one of three diagnoses. ATCs can recognize which populations are most likely to suffer from a sports hernia and when it came to identifying the anatomical structures affected in a sports hernia, 66% of ATCs were able to correctly answer, while 29% are still getting the injury confused with a "true" hernia (inguinal or femoral). There is also a significant Chi-Square value of 17.12 [p-value: 0.00] between means of years as an ATC and means of whether or not respondents felt that their undergraduate education prepared them for sports hernia assessment

Conclusion: ATCs seem to have an adequate understanding of sports hernia recognition, assessment, and treatment. Specifically, ATCs who were certified 0-5 years ago are more confident in assessing and treating sports hernias than ATCs certified 6 years and more, most likely due to athletic training education changes within the last eight years emphasizing a focused curriculum. Secondly, since sports hernias have been increasing in incidence since the 1990s, ATCs may have better knowledge and confidence with the injury.

Chapter 1

Introduction

A sports hernia is a chronic injury which produces debilitating groin pain caused by a tear or weakness of the transversalis fascia causing compression of the ilioinguinal or genitofemoral nerve (Figure 1 & 2)¹⁻¹⁰. Patients diagnosed with sports hernias often complain of insidious groin pain that is exacerbated by sharp, sudden lateral movements, coughing and sneezing, and an abdominal sit-up. Upon examination, there is no palpable mass or deformation (Figure 3)^{1-3,7,8,10-16}. Over the past twenty years, the number of athletes diagnosed and treated with a sports hernia has increased significantly. The average number of patients diagnosed with a sports hernia in the United States in 1986 was two per week. In 2000, that number increased to eight per week and most recently, in 2008, the estimated number of patients diagnosed averaged 25 per week (Figure 4).^{14,17}

Figure 1: Anatomical structures affected with a sports hernia

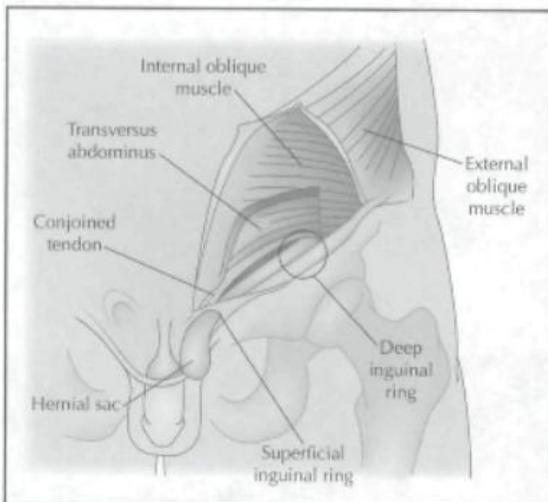


Figure 2: Nerve innervations of the groin and abdomen

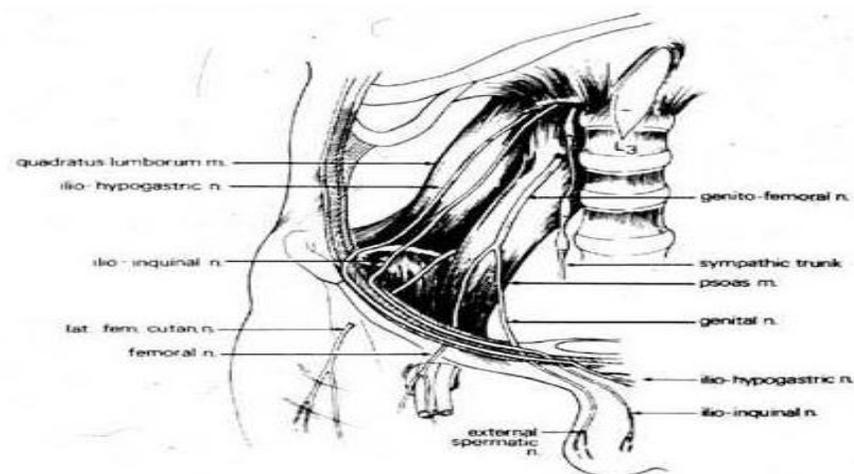


Figure 3: Common areas where pain is felt with a sports hernia

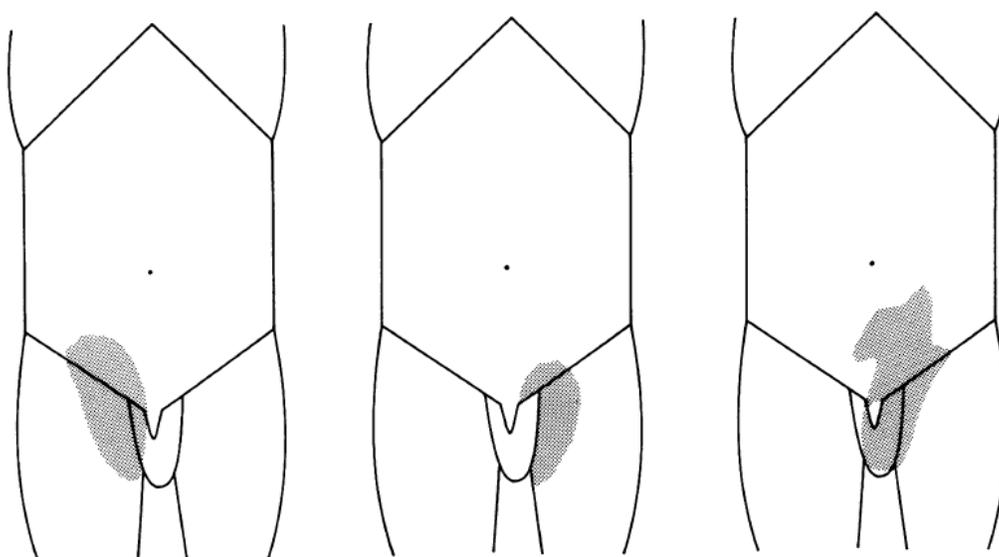
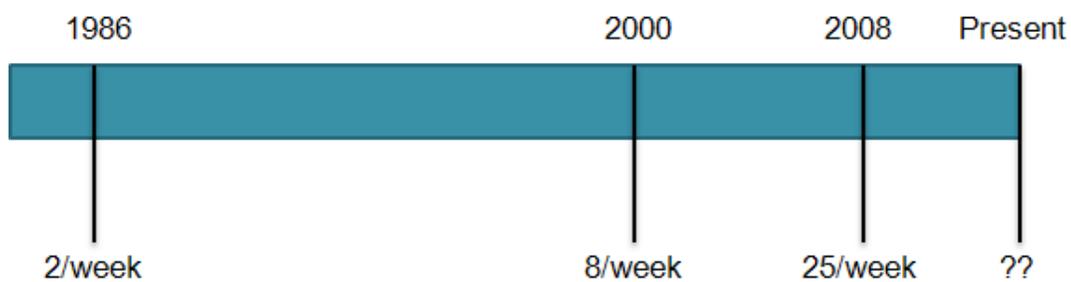


Figure 4: Sports Hernia Prevalence Timeline



Sports hernia recognition is complicated and often delayed because it is an injury

that is diagnosed by excluding other injuries. Sports hernias often present similarly to other groin injuries such as hip flexor or adductor strains or tendinitis, osteitis pubis, or inguinal or femoral hernias. In addition, injuries to the intra-articular hip, spine, rectus abdominus muscle, reproductive organs, urologic organs, or gastrointestinal tract could produce comparable signs and symptoms.^{1,2,7,8,10-13,16-20}

Conservative treatment is frequently attempted early on in the injury-recognition process and often includes at least a three week period of relative inactivity that is coupled with a combination of corticosteroid injections, core and lower extremity strengthening and stretching, chiropractic manipulations, and non-steroidal anti-inflammatory drugs.^{1-3,6,7,14,21-23} Typically, athletes with sports hernias will not improve with conservative therapy. Some athletes and medical professionals will attempt unsuccessful conservative therapy for months and even years before they pursue other treatment options.^{1-3,6,7,10,12-16,18,20,23,24} Several orthopedic surgeons have recognized the important role that certified athletic trainers (ATCs) have in early identification of patients who are not responding to conservative, non-operative treatment of chronic groin injuries and recommend that ATCs refer these patients to the appropriate doctors so that more aggressive treatments may be explored.⁷

If conservative treatment fails, patients must be referred to a general surgeon who is knowledgeable about sports hernias.^{1-3,7,10,14-16,21,22,24} A pelvic floor repair is often performed in these patients either by reinforcing the muscle or repairing it with sutures or mesh.^{2,3,7,10,12,14,23} Surgery has an extremely high success rate at about 90% and is often the only way to return an athlete back to their sport and competition level.^{3,10,12-14,22,24}

ATCs are health care professionals who work under the direction of a physician to provide optimal activity and participation in patients, athletes, and/or clients. They are specialized in injury recognition, prevention, diagnosis, treatment and emergency care and must earn a degree from an accredited athletic training program.^{25,26} In most of the textbooks used to teach undergraduate athletic training students, sports hernias are not mentioned or discussed and it is unknown as to why. However, in 2009, in the most recent version of *Arnheim's Principles of Athletic Training*, the textbook primarily used to teach athletic training students, "athletic pubalgia", another name for a sports hernia, is accurately explained.²⁵ The prior version (2006) did not contain information on athletic pubalgia or sports hernias.²⁶ The 2009 version includes some information on common signs and symptoms such as chronic, sharp and burning groin pain during athletic activities that continues for several months. It also mentions that conservative treatment consisting of massage, stretching, and strengthening is commonly used but is ineffective, and that surgical intervention to repair the pelvic floor is often necessary.²⁵ In another recent orthopedic examination textbook, "athletic pubalgia" is accurately explained as well and includes, the structures involved, the evaluation process, and treatment options²⁷. Interestingly, this textbook's previous edition does not mention the term²⁸.

The purpose of this paper is to examine athletic trainer's knowledge on identification of sports hernias and to identify where ATCs have received their knowledge on sports hernias. This information can be used to help identify areas where continuing education on sports hernia assessment and treatment may be beneficial.

Statement of Problem: ATCs may not be knowledgeable in sports hernia recognition, evaluation, and treatment. This may be due to a lack of education during ATCs' undergraduate curriculum

This study will address:

1. If ATCs typically possess the knowledge to recognize, evaluate, and treat a sports hernia.
2. The level of knowledge that an ATC has on sports hernias compared to their duration, district, and setting of employment.
3. Where ATCs who are knowledgeable of sports hernias, received their information on the injury. We will know if this is through their undergraduate education, post-graduate education, continuing education, from a conference, or from having previous experience with the injury.

Significance of Study: This study is significant due to the increasing prevalence of sports hernias in athletes. The injury is debilitating and can prevent an athlete from being involved in their sport. Since the injury commonly does not respond to conservative treatment, ATCs need to refer the athletes to the appropriate doctors in a timely fashion. The results of this study could support the need for athletic training educators to include sports hernias in their injury recognition and evaluation classes. In addition, the study may prompt ATCs who take the questionnaire and are unsure of their answers, to further research sports hernias to become more knowledgeable.

Delimitations of the Study: Application of our findings is limited to the ATCs whom are members of the National Athletic Training Association. It is possible that non-members may answer questions differently. In addition, those choosing to answer the complete

questionnaire may answer questions differently than those who chose not to complete it.

Limitations of the Study: This study will rely on participants to self-report their knowledge. With this style of research, there is a chance for misleading or deceitful answers and the potential for misunderstandings or misinterpretations of questions. In addition, the questionnaire is only being sent out to 1,000 ATCs and could lead to inadequate access to subjects.

Operational Definitions:

Athlete: A patient who is currently or has recently been involved in competitive athletic activity.

Certified Athletic Trainer (ATC): A health-care professional who works under the direction of a physician to help provide optimal activity and participation in athletes, patients, or clients and specializes in injury and illness prevention, diagnosis, treatment, and rehabilitation.

Conjoined Tendon (Figure 1): Tendon that is often disrupted in a sports hernia that is formed from the aponeurosis of the internal oblique muscle and the transverse abdominus muscle

Conservative treatment: A period of three weeks or more of relative inactivity usually combined with corticosteroid injections, core strengthening, stretching, chiropractic manipulations, or non-steroidal anti-inflammatory drugs

Genitofemoral nerve (Figure 2): A nerve branch which innervates the psoas major muscle, the inguinal canal, and the Sartorius that can be irritated and/or compressed by damaged transversalis fascia in a sports hernia.

Ilioinguinal nerve (Figure 2): A nerve branch located laterally to the psoas muscle that is frequently irritated and/or compressed by damaged transversalis fascia in a sports hernia.

Inguinal pain (Figure 3): Any type of mild, moderate, or severe pain that is throbbing, dull, achy and/or burning in nature and occurs near the lower lateral area of the abdomen on either side of the pubic region.

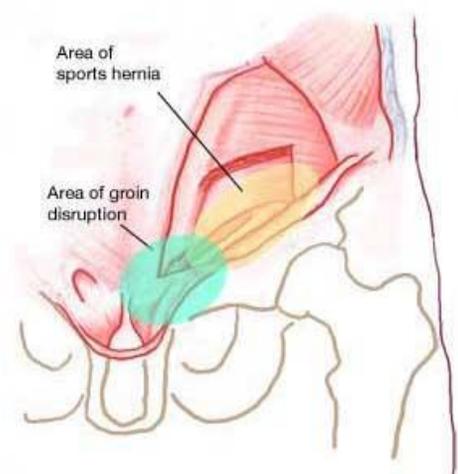
Non-athlete: A patient who is not currently or recently involved in competitive athletic activity, although that may be involved in recreational physical activity.

Pelvic Floor Repair: A broad term that refers to any surgical technique to repair or fortify inguinal floor

Sports hernia (Figure 5): A chronic injury which produces debilitating groin pain caused by a tear or weakness of the transversalis fascia causing compression of the ilioinguinal nerve.

Transversalis fascia: A thick membrane surrounding the transverse abdominus muscle (Figure 1) the ilium and pelvis that helps makes up the posterior inguinal wall of the abdomen.

Figure 5: Area of a sports hernia



Summary

A sports hernia is a chronic injury which produces debilitating groin pain caused by a tear or weakness of the transversalis fascia causing compression of the Ilioinguinal or genitofemoral nerve.¹⁻¹⁰ Over the past twenty years, the number of athletes diagnosed with sports hernias has increased immensely.^{14,17} The injury is painful and debilitating and often prevents the athlete from continuing their sport. Since the signs and symptoms of a sports hernia often mimic other injuries, all other injuries must be ruled out before it is diagnosed. Conservative, non-operative treatment is often tried for a period of at least three weeks, but is often unsuccessful and other treatment options must be considered. Surgical repair of the pelvic floor is often required and typically has a 90% success rate. The purpose of this paper is to examine certified athletic trainer's knowledge on identification of sports hernias and to identify where knowledgeable ATCs have received their knowledge on sports hernias.

Chapter Two

Review of Literature

Approximately 5% of all sports injuries are injuries to the groin.^{4,7-9,12,15,16,18}

There are many causes for groin pain, but one puzzling cause may be a sports hernia.

Sports hernias have an incidence rate of 0.5-6.2% of all sports injuries.^{2,6,19} The data on sports hernias is sparse due to the injury's slow recognition and complicated diagnosis process.

Different authors and orthopedic surgeons have different definitions of the injury. A study done by one of the most recent surgical pioneers of the injury, Ulrike Muschaweck, defines a sports hernia as, "acute or chronic inguinal pain exacerbated by physical activity."⁷ James Moeller, an orthopedic doctor who specializes in sports hernias, says that the injury is "a groin injury that cannot be seen, palpated, or effectively imaged, yet requires surgical repair to alleviate symptoms."⁸

In addition to the differing opinions on what defines the injury, the name "sports hernia"^{2-13,15,16,19,20,22-24,29} is often used interchangeably with other terms such as athletic hernia¹, athletic pubalgia^{2,5,7-9,11,12,14,15,18-21,23,24,29}, and Gilmore's groin^{2,3,5,7,8,15,16,19,29}.

Researchers do not completely agree about what areas are anatomically affected with a sports hernia. Most would agree that it is a defect or tear in the posterior wall and transversalis fascia^{1,2,7,8,20} and that either the ilioinguinal or genitofemoral nerve becomes entrapped and/or compressed.^{1,2,5,7,20} In some individuals with sports hernias, there is a disruption of the conjoint tendon^{1,4,6,10,12,16} or a tear of the external oblique aponeurosis.^{1,10,12,16}

The majority of athletes and patients with a diagnosed and treated sports hernia

have similar signs and symptoms (Table 1). Most complained of chronic inguinal pain that was exacerbated by sudden sharp movements, coughing, athletic activities and had adductor and pubic tubercle tenderness. Unlike a femoral or inguinal hernia, there will be no visible or palpable herniation.^{1-3,8,10,12-17} A sports hernia is an “occult”, or unexplained, hernia.^{2,12}

Table 1: Common Signs and Symptoms of Sports Hernias

<i>Signs/Symptoms</i>
Insidious Groin Pain ^{1,2,4,5,7,8,11,13-15,19}
Pain with Laughing, Coughing, and/or Activities that Increase Intra-Abdominal Pressure ^{1,3,4,6-8,10,12-14,16,19,20}
Pubic Tubercle Tenderness ^{1,2,4-8,12,19}
Pain with Active and/or Resisted Hip Adduction ^{1-3,7,10,11,14-16}
Pain with Active and/or Resisted Abdominal Sit-Up ^{1,2,5,7,12,14-16}
Pain with Athletic Activities ^{2,3,6,7,10,11,13-16,19}
Pain with Active and/or Resisted Hip Flexion ^{2,3}
Pain with Active and/or Resisted Hip Internal Rotation ^{2,5,7,11}
Adductor Tenderness ^{6,10,13}
No Palpable Defect ^{1-3,8,10-16}

Other injuries, diseases, and illnesses must be considered when dealing with lower-abdominal/inguinal pain. Many serious conditions present with similar signs and symptoms and each must be ruled out before making a proper sports hernia diagnosis. Table 2 shows many of the conditions that could be confused for a sports hernia and

each must be eliminated by blood tests, imaging, and evaluation before a sports hernia can be diagnosed.

Table 2: Common Diagnoses Made for Groin Pain

<i>Differential Diagnosis</i>
Osteitis Pubis ^{1,2,6-13,16,18-20,22,29}
Adductor or Psoas Strain or Tendinitis ^{1,2,6-13,16,18-20,22,29}
Referred Pain from Spine ^{1,2,7,9,10,12,16,19,22}
Intra-articular Hip Injury ^{1,2,7-10,12,14,16,18,19,22,29}
Rectus Abdominus or External Oblique Strain or Tendinitis ^{1,9,12,14,16,18-20,29}
Femoral, Inguinal, or other “true” Hernia ^{1,8,9,14,16,18}
Pubic Bone, Pelvis or Femoral Stress Fracture ^{1,2,6-10,12,13,16,19,20,22}
Urological Disease (such as; prostatitis, epididymitis, urethritis, hydrocele) ^{2,7-10,14,16,18,19,22,29}
Connective Tissue Disease (such as; rheumatoid arthritis, Reiter’s syndrome) ^{2,19}
Other (such as; appendicitis, pelvic inflammatory disease, inflammatory bowel disease, ovarian cysts) ^{6-9,14,16,18,29}

The sport the athlete plays seems to put athletes at risk for sports hernia, with an alarming number of sports hernias occurring among athletes in the same sports (Table 3). Soccer, football, hockey, and rugby are the most common sports where sports hernias occur. The injury appears to affect athletes who are involved in sudden deceleration with their lower body or torso or athletes who perform sudden twisting, change of direction, or kicking.^{1,2,4-6,9,11,13-16,19,22,24}

Table 3: Most Common Sports That Cause Sports Hernias

<i>Study</i>	<i>Subjects</i>	<i>Sports</i>
Copperhite, 2010	N=2	Football (1/2) 50% Track (1/2) 50%
Hackney, 1993	N=15	Football (6/15) 40% Track (4/15) 27% Rugby (3/15) 20% Netball/Squash (2/15) 13%
Kulacoglu et al., 2011	N=17	Soccer (17/17) 100%
Kumar et al., 2002	N=27	Soccer (19/27) 70% Ice Hockey (2/27) 7% Rugby (2/27) 7% Other (4/27) 13%
Larson et al., 2011	N=37	Hockey (14/37) 38% Soccer (11/37) 30% Track (8/37) 21% Other (4/37) 11%
Meyers et al., 2000	N=157	Soccer (73/157) 46% Hockey (26/157) 17% Football (21/157) 13% Baseball (7/157) 4% Track (6/157) 4% Other (24/157) 16%

The prevalence of this injury is substantially higher among males compared to females.^{12,14,17,29} It is unknown why this injury affects males more than it does females, but several authors offer explanations.^{6,11,14} One hypothesis is that women are less involved in the highly competitive sports that would cause a sports hernia such as soccer, football, and ice hockey.¹⁴ Another hypothesis is that the pelvic anatomy of a woman somehow reduces their risk for sports hernias.¹⁴ Copperhite agrees that a man's pelvis may predispose them to a sports hernia because the pelvis is heavier and more narrow than a woman's pelvis and this changes the distribution of forces across the pelvis.¹¹ Another suggestion is that the aponeurosis on the anterior aspect of the pubic bone may be more pronounced in men and can put males at a greater risk.⁶ Athletes who are

involved at high levels of competition in their respective sports are more prone to sports hernias. Collegiate Division I athletes and professional athletes are diagnosed with sports hernias more than any other level of athlete (Table 4).

Table 4: Competition Levels of Athletes Diagnosed with Sports Hernias

<i>Study</i>	<i>Level</i>	<i>Patients</i>
Diaco et al., 2005	Professional	96/96 (100%)
Edelman & Selesnick, 2006	Professional & Amateur Level	10/10 (100%)
Hackney, Roger G., 1993	Regional/National	6/15 (40%)
	Amateur/Professional	4/15 (27%)
	Club	4/15 (27%)
	Armed Services	1/15 (6%)
	Collegiate	
Kulacoglu et al., 2011	Professional	13/17 (76%)
	Recreational	3/17 (18%)
	Amateur	1/17 (6%)
Larson et al., 2011	Collegiate	15/37 (40%)
	Club	9/37 (24%)
	Professional	8/37 (22%)
	High School (Elite)	5/37 (14%)
Meyers et al., 2000	Collegiate	56/157 (36%)
	Professional	44/157 (28%)
	Regional/National Amateur	24/157 (15%)
	Recreational	16/157 (10%)
	Semi-professional	9/157 (6%)
	High School	8/157 (5%)

Sports hernias are often resistant to conservative treatment or “non-operative” therapy. Meyers et al defines non-operative therapy as “a trial of prolonged rest, physical therapy, oral or injected steroids, or deep massage”.^{14,17,29} Many other authors agree with first trying a period of conservative treatment when an athlete has the signs and symptoms of a sports hernia, but often times it is unsuccessful.^{1,3,6,7,10,12,14-16,18,20,23,24} If conservative treatment fails to help the athlete, surgery is then considered. Surgery does

prove to be very successful in returning athletes to their pre-injury level and typically has a 90% success rate (Table 5).^{3,4,7,12,14,15,20,21,22} Conservative therapy almost always fails.^{3,4,7,12,14,20,22,23}

Table 5: Sports Hernia Surgical Repair Success

<i>Study</i>	<i># of Subjects</i>	<i>Success with Surgery (returning to pre-injury performance)</i>
Copperhite, Kelly E., 2010	N=2 Athletes	2/2 (100%)
Diaco et al., 2005	N=96 Professional Athletes	93/96 (97%)
Edelman & Selesnick, 2006	N=10 Athletes	9/10 (90%)
Hackney, Roger G., 1993	N=15 Athletes	14/15 (93%)
Kulacoglu et al., 2011	N=17 Athletes	16/17 (94%)
Kumar et al., 2002	N=27 Athletes	25/27 (93%)
Meyers et al., 2000	N=157 Athletes	151/157 (96%)

Textbooks used to teach undergraduate athletic training students have not mentioned sports hernias before the year 2009. In the 13th edition of *Arnheim's Principles of Athletic Training*, “athletic pubalgia” is described and accurately explained²⁵. It includes information on signs and symptoms, structures involved, and conservative and surgical treatment options. The previous, 12th edition of this book does not include the injury²⁶.

In another orthopedic examination textbook published in 2010, “athletic pubalgia” is correctly explained as well and includes the structures involved, the evaluation process, and treatment options²⁷. This textbook’s previous edition does not mention the term²⁸.

Chapter Three

Methodology

A stratified random sample of ATC's who are members of the National Athletic Trainer's Association (NATA) was used. An electronic cross-sectional questionnaire (see Appendix B) was sent through three e-mails over ten days to invite and encourage participation in the survey. It began with a description of the questionnaire, including risks, benefits, right to forego participation, confidentiality, and an IRB approved consent form (Appendix A). The electronic questionnaire consisted of a combination of 18 close-ended questions developed to investigate ATCs' current knowledge of sports hernias.

No validated instrument exists to evaluate ATC's knowledge of sports hernias. A comprehensive literature review was performed and questions were developed by a group of athletic trainers and a physician's assistant with a special interest in sports hernias. Basic demographic and descriptive information was included in the questionnaire such as athletic training district, setting or years of employment to determine if those factors had an influence on sports hernia knowledge (Table 6). Respondents' names, age, gender, race, and other identifiable information were not included to protect anonymity. Questions pertaining to confidence in participant knowledge were added to examine whether ATCs felt confident in their knowledge of sports hernias. Lastly, the researchers felt it would be important to determine where ATCs received their sports hernia knowledge, especially since experience and continuing education after undergraduate education may play a large factor.

Table 7: Table of Specifications

	Question Number
Demographic Data	
• District of Employment	1
• Setting of Employment	2
• Years of Employment	3
Sports Hernia Evaluation & Treatment	
• Signs & Symptoms	4, 5
• Incidence	6, 7, 8
• Imaging	9
• Mechanism	10
• Anatomical Involvement	12
• Treatment	13
Confidence in Knowledge	
• Anatomical Involvement	11
• Diagnosing/Evaluating Ability	15
Knowledge Obtainment	
• Where, When, How	14, 16, 17, 18

Data Analysis, Confidentiality, & Risks:

Data was analyzed through Qualtrics. Descriptive statistics summarized the demographic information and Chi Square analysis was run between independent variables as appropriate with a significance level of 0.05.

Data was stored on a password protected Qualtrics account. The risks for participants who took this survey were very small since no identifiable information was recorded or asked.

Chapter 4

Results

We received 116 complete responses and 130 incomplete responses (11.6 – 13% response rate). Demographic data are described in Table 7. In summary, we received answers from ATCs in every district. Most of the respondents work in District 4 (25%), 13% of respondents work each in District 2 and 3, and 11% of respondents work in Districts 8 and 9. We also received responses from ATCs who work in a variety of different settings. The majority of the respondents work in the collegiate setting with 19% at the Division I level, 12% at the Division III level, and 7% at the Division II level. In addition, a large percentage of respondents worked at a high school (27%). We had a smaller number of respondents work in clinic (2%) and clinic-outreach (13%) settings, non-traditional settings (2%), and an “other” setting (13%). The majority of the respondents were certified for 0-5 years (41%), with 24% of respondents certified for 16-30 years, 16% for 6-10 years, 14% for 11-15 years, and 5% for over 30 years. The answers to the 18-question survey are described in Tables 8-15.

Sports Hernia Assessment: Signs & Symptoms

Overall, the data suggests that this pool of ATCs was able to distinguish a sports hernia. When given a situation of an athlete complaining of the signs and symptoms associated with a sports hernia 78% of respondents would consider a sports hernia as one of three diagnoses (Table 8). 84% of ATCs know that insidious groin pain, having pain with coughing and/sneezing (84%), having pain with performing sharp, sudden movements (92%), and having pain with performing a sit-up (81%) are signs and symptoms of a sports hernia (Table 9).

Table 7: Demographics

Demographics	
Response Variable (number of respondents)	Number (%)
District (127)	
1	6 (5)
2	17 (13)
3	16 (13)
4	32 (25)
5	13 (10)
6	6 (5)
7	4 (3)
8	14 (11)
9	14 (11)
10	5 (4)
Setting (128)	
Sales	1 (1)
High School	35 (27)
Clinic Only	2 (2)
Clinic Outreach	16 (13)
Physician Extender	3 (2)
Div 3 College	15 (12)
Div 2 College	9 (7)
Div 1 College	24 (19)
Semi Pro/Pro	3 (2)
Non-Traditional	3 (2)
Other	17 (13)
Years of Certification (128)	
0-5 years	53 (41)
6-10 years	20 (16)
11-15 years	18 (14)
16-30 years	31 (24)
31+ years	6 (5)

Table 8: Differential Diagnosis

<i>Differential Diagnosis: Choose Three</i>	<i>Responses</i>	<i>Percentage (%)</i>
Referred pain w/intra-articular hip injury	10	8
Groin/Hip flexor strain	83	64
Osteitis Pubis	35	27
Inguinal/Femoral hernia	83	64
Referred pain from spine	7	5
Testicular pathology	18	14
Femoral neck stress fracture	3	2
Rectus abdominus tear	44	34
<i>Sports hernia</i>	<i>101</i>	<i>78</i>

Table 9: Signs and Symptoms

<i>Signs/Symptoms: Select all that apply</i>	<i>Responses</i>	<i>Percentage (%)</i>
<i>Insidious groin pain</i>	99	84
Acute groin pain associated w/specific mechanism of injury	43	36
<i>Pain w/coughing and/or sneezing</i>	99	84
Low-grade fever	11	9
Nausea and/or vomiting	9	8
<i>Pain w/sharp, sudden movements</i>	108	92
Reduced hip flexion range of motion	50	42
Reduced hip adduction range of motion	24	20
Reduced hip abduction range of motion	40	34
Reduced hip extension range of motion	40	34
Ecchymosis over groin	12	10
<i>Pain performing a sit-up</i>	96	81
Unable to bear weight	2	2
Clicking and/or popping in hip when going upstairs	5	4
An “unstable” feeling	11	9
Antalgic gait	33	28
Pain w/ urination	12	10

Answers in italics are correct answers

Sports Hernia Incidence

The data also suggests that these ATCs can recognize which populations are most likely to suffer from a sports hernia. 82% of respondents correctly answered that

males are more prone to sports hernias (Table 10). When asked which three sports had the highest sports hernia incidence, 74% correctly included football and 56% correctly included both ice hockey and soccer. In addition, 47% of respondents correctly answered that Division I college athletes and professional athletes are more likely to get a sport hernia.

Table 10: Gender Most Affected

<i>Gender Most Affected</i>	<i>Responses</i>	<i>Percentage (%)</i>
<i>Male</i>	96	82
There are no gender differences	21	18

Correct answers are in italics

Sports Hernia Assessment: Recognition, Diagnosis, & Treatment

When it came to identifying the anatomical structures affected in a sports hernia, 66% of ATCs were able to correctly answer, while 29% are still getting the injury confused with a “true” hernia (inguinal or femoral). When asked if there was a gold standard diagnostic test for sports hernias, 49% correctly answered that there was not a gold standard, while 23% answered that an MRI with contrast and an MRI without contrast (17%) would be best. 65% of respondents knew that a sports hernia was caused by an overuse mechanism, and not an acute event. 62% of respondents answered that the best treatment for a sports hernia is surgical repair.

Table 11: Anatomical Definition

<i>Anatomical Definition</i>	<i>Responses</i>	<i>Percentage (%)</i>
<i>Correct Sports Hernia Definition</i>	74	66
Intra-articular hip pathology definition	2	2
“True” hernia definition	33	29
Osteitis Pubis definition	3	3

Sports Hernia Education

As shown in Table 12, a high percentage of respondents felt that they did not receive adequate education on sports hernias from their undergraduate education (77%). Those who had some knowledge on the topic reported that they obtained it from their undergraduate athletic training education program (32%), clinical experiences (28%), from the internet (3%), a continuing education conference (3%), or graduate school education program (3%).

Table 12: Sports Hernia Knowledge Obtainment

<i>Sports Hernia Knowledge Obtainment</i>	<i>Responses</i>	<i>Percentage (%)</i>
Undergraduate athletic training education program	36	32
Graduate school education program	3	3
Clinical experience	31	27
From the internet	3	3
From a continuing education conference	3	3
I do not feel that I have learned adequate information	37	33

Years Certified & Undergraduate Preparation

The differences between years as an ATC and whether or not respondents felt that their undergraduate education prepared them for sports hernia assessment was examined. The results are significant with a Chi square value of 17.12 and a p-value of 0.00 (Table 13). This suggests that the difference among the means of the two groups is largely proportional in ATCs certified between 0 and 5 years and their preparedness by their undergraduate education in sports hernia assessment.

Table 13: Years as a Certified Athletic Trainer and if Undergraduate Education Prepared for Sports Hernia Assessment

<i>If Undergraduate Education Prepared for Sports Hernia Assessment</i>		0-5 yrs	6-10 yrs	11-15 yrs	16-30 yrs	31+ yrs
	Yes	20 40.8%	2 10.5%	3 17.6%	1 4%	0 0%
No	29 59.1%	17 89.5%	14 82.4%	24 96%	4 100%	
Total	49 100%	19 100%	17 100%	25 100%	4 100%	

Percentages are out of years as certified athletic trainer

Years Certified and Understanding of Anatomical Structures

Table 14 displays the difference between years as an ATC and if the respondents correctly understood which anatomical structures are affected in a sports hernia. With a Chi square value of 20.30 and a p-value of 0.21, the difference between the means of the two groups are not significant and/or proportional to ATCs.

Table 84: Years as a Certified Athletic Trainer and Understanding of the Anatomical Structures Affected in a Sports Hernia

<i>Years Certified as an Athletic Trainer</i>						
<i>Correctly Understanding the Anatomical Structures Affected in a Sports Hernia</i>		0-5 yrs	6-10 yrs	11-15 yrs	16-30 yrs	31+ yrs
	Correct Definition	24 50%	15 78.9%	13 86.6%	20 76.9%	3 75%
	Definition of "True" Hernia	23 47.9%	4 21.1%	1 6.7%	4 15.3%	1 25%
	Definition of intra-articular hip injury	0 0%	0 0%	0 0%	1 3.9%	0 0%
	Definition of Osteitis Pubis	1 2.1%	0 0%	1 6.7%	1 3.9%	0 0%
	Total	48 100%	19 100%	15 100%	26 100%	4 100%

Percentages are out of years as certified athletic trainer

Years Certified and Where Sports Hernia Knowledge Was Obtained

The difference between years as a certified athletic trainer and where they obtained their sports hernia knowledge was examined and found to be not significant as well (Chi-square=34.87, p-value=0.17) (Table 15).

Table 95: Years as a Certified Athletic Trainer and Where ATCs Learned About Sports Hernias

		<i>Years as a Certified Athletic Trainer</i>				
<i>Knowledge Obtained From...</i>		0-5 yrs	6-10 yrs	11-15 yrs	16-30 yrs	31+ yrs
		Undergraduate Athletic Training Education Program	25 51%	5 26.3%	4 25%	2 8%
	Grad School	2 4%	1 5.2%	0 0%	0 0%	0 %
	Experience	10 20.4%	5 26.3%	5 31.3%	7 28%	4 100%
	Internet	2 4%	0 0%	0 0%	1 4%	0 0%
	Conference	0 0%	1 5.2%	1 6.2%	1 4%	0 0%
	Have not learned	10 20.4%	7 36.8%	6 37.5%	14 56%	0 0%
	Total	49 100%	19 100%	16 100%	25 100%	4 100%

Percentages are out of years as certified athletic trainer

Chapter 5 Summary & Conclusion

Summary

Overall, the data suggests that ATCs have an understanding of sports hernia recognition, assessment, and treatment. However, the possibility of a disproportionately knowledgeable sample must be acknowledged. From the data, ATCs who were certified 0-5 years ago felt that they were prepared to appropriately assess and treat sports hernias because of their undergraduate athletic training education program. Notably, ATCs certified six years and later felt that they were unprepared by their undergraduate athletic training education programs.

It is not surprising that ATCs who were certified six years and later may have felt unprepared for sports hernia assessment by their athletic training education programs. Undergraduate athletic training education programs have been continuously evolving since 1956 formal athletic training education began. Athletic training education was very different at that time compared to the education structure of today.

In 1969, the first undergraduate athletic training education programs became officially recognized by the National Athletic Trainers' Association (NATA). As this was happening, the NATA was in the process of developing a national certification examination and completed it in 1970. After 1970, there were several routes to becoming a certified athletic trainer. First was to graduate from an NATA-approved athletic training education program, second was to complete an "apprenticeship program" where one needed at least 1,500 hours of athletic training supervision and hands-on experience, and third was graduating from a school of physical therapy. By the year 1982, there were 62 undergraduate athletic training education programs and there

became less of an emphasis on physical therapy school and athletic training separated itself from physical therapy and took on its own identity. Entry and graduation from a physical therapy program quickly was no longer required as a means to certification. In 1990, the American Medical Association recognized athletic trainers as an allied health profession. When this happened, all athletic training education programs were required to become accredited by the Commission on Accreditation of Allied Health Education Programs (CAAHEP). In 2004, the NATA required that in order to be eligible to take the Board of Certification exam, all candidates had to receive a bachelor's degree from a CAAHEP-accredited athletic training education program. When this rule was passed, the "apprenticeship program" route to sit for the certification examination was eliminated³⁰. ATCs who were certified before 2004 and who chose the apprenticeship program route to certification could have definitely felt unprepared in sports hernia assessment by their undergraduate education.

In addition to the elimination of the apprenticeship route, sports hernias were not standard knowledge until the year 2000. In fact, a sports hernia is an injury that is relatively new to be diagnosed. For many years, severe and unspecified groin injuries have sidelined athletes and ended their athletic careers. It is unknown if sports hernias were to blame, but with the latest research on the injury it is certainly speculated that it could have been¹⁴. It was not until the 1990s, through the use of cadavers and several unpublished surgical clinical trials, when researchers learned more about the anatomical make-up of the groin. The abdominal muscles and their attachments to the pubic bones and hips were examined in several patients. Doctors also looked at how the abdominal muscles were involved in all lower extremity movements and how one weak link in any

of those muscles could lead to groin pain and specifically, sports hernias. In the early 2000s, athletic trainers and doctors became better equipped with the knowledge to better recognize the injury, as well as have the knowledge to better treat it²⁹. ATCs who were certified before the early 2000s, may not have learned about sports hernias during their undergraduate athletic training education simply because sports hernias were not a well-known injury at the time and there was not enough research to teach the injury.

Sports and true hernia's are often confused. A sports hernia is not a "true" hernia. In fact, the word "hernia" may be misleading, since a sports hernia is technically a "hernia without herniation"¹. When examining the data from the question pertaining to the anatomical structures affected in a sports hernia, it seems that several ATCs (29%) are confusing a sports hernia with a femoral/inguinal hernia. In addition, when asked if ATCs have ever treated someone with a sports hernia and if they have ever treated someone with an inguinal or femoral hernia, we received almost the exact number of responses. 44% have treated a sports hernia before and 43% have treated someone with a true hernia. This leads us to believe that ATCs are confused by the difference between a sports hernia and a true hernia and that ATCs may believe that are the same injury.

It is encouraging that a high number of respondents answered the correct answers for the sports hernia knowledge questions. 78% of respondents would include a sports hernia in their differential diagnosis when evaluating a male athlete complaining of insidious inguinal groin pain that is exacerbated by sharp, sudden lateral movements, coughing and sneezing, has pain with a sit-up, and has no palpable mass. However, it should be noted that the title of the survey was sent to the respondents, and they may have been more inclined to choose sports hernia as an option since they knew the topic

of the survey pertained to sports hernias. Many ATCs could recognize the appropriate signs and symptoms of a sports hernia. The most important signs and symptoms to recognize are insidious groin pain, pain with sharp and sudden movements, pain with performing a sit-up, and pain with sneezing and/or coughing. In hindsight, being unable to palpate a bulge should have been an answer choice for a sign of a sports hernia and should have been included in the survey since that is a large difference between a sports hernia and a true hernia. It should be noted that, although not a major finding of this study, a few ATCs responded with answers that show a complete lack of sports hernia knowledge. For example, in the signs and symptoms of a sports hernia question, 9% of respondents answered that patients would have a low-grade fever, nausea/vomiting (8%), ecchymosis over groin (10%), and pain with urination (10%). This data demonstrates that *some* ATCs lack knowledge regarding sports hernias, although this cannot be applied to the entire population.

Future Research & Clinical Recommendations

Since this is the first study of its kind, there is a lot more research that can be done. In the future, a survey should be sent out to ATCs without the title or with more situation-type questions where sports hernia may not be an answer choice in an attempt to camouflage what we are studying and decrease the participant's bias to particular answers. Additionally, there should have been a question to fill-in exactly what year the ATCs were certified rather than having to choose from a wide range of years. It would be interesting to survey patients who had a sports hernia and ask about their interaction with the athletic trainer who evaluated them.

ATCs also seem to be confusing a sports hernia with a "true" hernia such as a

femoral or inguinal hernia. More research should be completed that specifically distinguishes the differences between the injuries so that it is clear which injury they have knowledge.

The results of this study have several clinical applications. First, it seems that undergraduate athletic training program educators are doing a better job at preparing their students for sports hernia assessment and treatment than in the past. However, those certified beyond five years ago may need extra education on the topic. It may be beneficial for ATCs certified beyond five years ago to attend a conference where there is a presentation on sports hernias or to learn more about sports hernias through an academic journal. This way when someone is complaining of sports hernia-like symptoms the patient can receive the best and most timely care. Second, the results of this survey may increase awareness on sports hernias and those who took this survey may be more inclined to research the topic further if they felt un-educated. Lastly, any ATCs who took this survey who were educators or clinical instructors of undergraduate students may be more inclined to make it a point to include sports hernia education in their curriculum or clinical competencies. Overall, the results of this study may make ATCs better and more informed clinicians.

Conclusion

ATCs seem to have an adequate understanding of sports hernia recognition, assessment, and treatment. Specifically, ATCs who were certified 0-5 years ago are better prepared to assess and treat sports hernias. This could be because of the athletic training education structure and how it has evolved over the years. ATCs may also have been confusing sports hernias with “true” hernias such as the femoral or inguinal hernia

and more research should be done on this topic that specifically clarifies the difference between the two.

Investigator: Please respond to the questions below. The IRB will utilize your responses to evaluate your protocol submission and/or to determine whether your project is qualified for exemption.

1. YES NO Does the James Madison University Institutional Review Board define the project as *research*?

The James Madison University IRB defines "research" as a "*systematic* investigation designed to develop or contribute to *generalizable knowledge*."

All research involving human participants conducted by James Madison University faculty and staff and students is subject to IRB review.

Some, but not all, studies that involve human participants are considered research and are subject to full or expedited IRB review, including those:

- intended to satisfy the academic requirements for Independent Study, Bachelor's Essay, Honors/Senior Thesis, or the Master's Thesis;
- intended or expected to result in publication, presentation outside the classroom, or public dissemination in some other form;
- conducted outside the classroom and/or departmental research participant pool if they involve
 - minors (*i.e.*, persons under the age of 18),
 - a targeted population of adults whose ability to freely give informed consent may be compromised (*i.e.*, persons who are socio-economically, educationally, or linguistically disadvantaged, cognitively impaired, elderly, terminally ill, or incarcerated),
 - pregnant women and/or fetuses who may be put at risk of physical harm,
 - a topic of a sensitive or personal nature, the examination or reporting of which may place the research participant at more than minimal risk, or
 - any type of activity that places research participants at more than minimal risk.

Other studies are eligible to *request* exemption from IRB review, including those

- conducted solely within the confines of the classroom or within a departmental research participant pool if they
 - are a general requirement of a course,
 - have the sole purpose of developing the student's research skills, and
 - will be overseen by a faculty member;
- conducted outside the classroom and outside departmental research participant pools, provided they do not involve minors, do not target special adult populations, do not pose a risk of physical harm to pregnant women and fetuses, do not deal with a topic of sensitive or personal nature, or do not involve any type of activity that places the participants at more than minimal risk (see details above); and provided the investigator does not intend to publish the results or share them with others in a public forum (*i.e.* conference presentations, senior theses).
- that are part of a larger research project that has current James Madison University IRB approval; or

- that are part of a larger research project that has current approval of a registered IRB at another institution, provided that, if research participants are to be recruited at James Madison University, the University's IRB has given permission for such on-campus recruitment.

2. **YES** **NO** Are the human participants in your study *living* individuals?

3. **YES** **NO** Will you obtain data through *intervention* or *interaction* with these individuals?

"Intervention" includes both physical procedures by which data are gathered (*e.g.*, measurement of heart rate or venipuncture) and manipulations of the participant or the participant's environment that are performed for research purposes. "Interaction" includes communication or interpersonal contact between the investigator and participant (*e.g.*, surveying or interviewing).

4. **YES** **NO** Will you obtain *identifiable private information* about these individuals?

"Private information" includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, or information provided for specific purposes which the individual can reasonably expect will not be made public (*e.g.*, a medical record or student record). "Identifiable" means that the identity of the participant may be ascertained by the investigator or associated with the information (*e.g.*, by name, code number, pattern of answers, etc.).

5. **YES** **NO** Does the study present *more than minimal risk* to the participants?

"Minimal risk" means that the risks of harm or discomfort anticipated in the proposed research are not greater, considering probability and magnitude, than those ordinarily encountered in daily life or during performance of routine physical or psychological examinations or tests. Note that the concept of risk goes beyond physical risk and includes psychological, emotional, or behavioral risk as well as risks to employability, economic well being, social standing, and risks of civil and criminal liability.

CERTIFICATIONS:

For James Madison University to obtain a Federal Wide Assurance (FWA) with the Office of Human Research Protection (OHRP), U.S. Department of Health & Human Services, **all** research staff working with human participants must sign this form and receive training in ethical guidelines and regulations. "Research staff" is defined as persons who have direct and substantive involvement in proposing, performing, reviewing, or reporting research and includes students fulfilling these roles as well as their faculty advisors. The Office of Sponsored Programs maintains a roster of all researchers who have completed training within the past three years.

By signing below, the Responsible Researcher(s), and the Faculty Advisor (if applicable), certifies that he/she is familiar with the ethical guidelines and regulations regarding the protection of human research participants from research risks. In addition, he/she agrees to abide by all sponsor and university policies and procedures in conducting the research. He/she further certifies that he/she has completed training regarding human participant research ethics within the last three years.

Test module at OSP website <http://www.jmu.edu/sponsprog/irb/irbtraining.html>

Name of Researcher(s)	Signature of Researcher(s) and Faculty Advisor (if applicable)	Date	Traini ng Comp leted
Stephanie Pikus, ATC		2/23/2012	<input checked="" type="checkbox"/>
Lisa Holzhauer, ATC		8/8/2011	<input checked="" type="checkbox"/>
Jamie Frye, PhD, ATC		3/16/12	<input checked="" type="checkbox"/>
Signature of Faculty Advisor also required (if Student protocol)	⇒		<input type="checkbox"/>

For additional training interests visit the National Institutes of Health Web Tutorial at:
<http://cme.nci.nih.gov/>

Purpose & Objective: A sports hernia is a chronic injury which produces debilitating groin pain caused by a tear or weakness of the transversalis fascia causing compression of the ilioinguinal nerve (Atkins et al, 2010, Campanelli, G., 2010, Harmon, K. G., 2007, Kulacoglu et al, 2011, and Minnich et al, 2011). Over the past twenty years, the number of athletes diagnosed and treated for sports hernias has increased significantly. The average number of patients diagnosed with a sports hernia in 1986 was two per week. In 2000, that number increased to eight per week and most recently, in 2007, the number of patients diagnosed per week averaged 25 (Meyers et al, 2000 and 2007). Increased pathology awareness is needed to match the increase incidence of this sport related injury.

This study will examine if certified athletic trainers (ATCs) have the adequate knowledge to appropriately recognize and evaluate sports hernia. Sports hernia recognition is complicated and often delayed because it is a diagnosis of exclusion and often presents similarly to other groin injuries such as hip flexor or adductor strains (Moeller, J. L., 2007).

Orthopedic surgeons have recognized the important role that ATCs have in early identification of patients who are not responding to conservative, non-operative treatment of chronic groin injuries and recommend that ATCs refer these patients to the appropriate doctors so that more aggressive treatments may be explored. (Minnich et al, 2011).

The purpose of this paper is to examine athletic trainer's knowledge on early identification of sports hernias, as well as their reaction to non-responsive patients undergoing conservative treatment. This information can be used to help identify areas

where continuing education on sports hernia assessment and treatment may be beneficial.

Procedures/Research Design/Methodology/Timeframe:

An electronic survey (see Appendix B) will be sent to certified athletic trainers (ATCs) randomly selected from a pool of e-mail addresses from the National Athletic Trainers' Association (NATA). Two e-mails will be sent, two days apart to invite and encourage participation in the survey. It will begin with a description of the survey, including risks, benefits, right to forego participation, confidentiality, and an IRB approved consent form. (Appendix A)

The electronic survey consists of 18 questions in English developed to investigate ATCs' current knowledge of sports hernias. The survey will take about 15 minutes of the participants' time. When taking the survey, participants will have the choice to answer questions they want to and to skip questions they prefer not to answer. Once the survey is submitted, their access to the survey will close and they will not be able to return to it. No validated instrument exists on this topic. A comprehensive literature review was performed and questions were developed by a group of athletic trainers and a physician's assistant who has a special interest in sports hernias. Basic demographic and descriptive information was included in the questionnaire (i.e. years of athletic training certification, region and type of employment). Respondents' names, age, gender, race, and other identifiable information will not be asked or recorded to protect anonymity. All participants will be at least 18 years of age.

Data Analysis, Confidentiality, & Risks:

Descriptive statistics will summarize the demographic information. Data will be analyzed by using the Statistics Package for Social Science (SPSS) version 18.0. Level of significance will be set *a priori* $p < 0.05$. Questions and answers will be coded so that the

subject is not connected to the data.

Qualitative data will be reviewed and coded for trends from the participant's answers.

Data will be stored on a password protected JMU computer. The computer is in a locked office. The risks for participants who take this survey are very small since no identifiable information is asked or recorded.

Reporting Procedures:

The audience of this study will be the researcher's thesis committee with consideration to be presented at a conference or submitted to a professional journal once completed. At the completion of the study, should the subjects want a final copy of the aggregate results, they may obtain them by contacting the researcher.

Experience of the researcher (and advisor, *if student*):

Dr. Jamie L. Frye, PhD, ATC is a professor in Health Sciences who has been involved with a number of studies involving human volunteers while a master's student at Indiana State University, a doctoral student at the University of Virginia, a faculty member at the University of Toledo, and a faculty member at James Madison University. She is also a certified athletic trainer.

Stephanie Pikus, ATC is a certified athletic trainer working to complete her Master's of Science in Kinesiology. This is her first research experience.

Lisa Holzhauer, ATC is a certified athletic trainer working to complete her

Master's of Science in Kinesiology. This is her first research experience.

Appendix B. IRB Approval Letter



SPONSORED PROGRAMS ADMINISTRATION

MEMORANDUM

TO: Ms. Stephanie Pikus, Principal Investigator
Ms. Lisa Holzhauser, Principal Investigator

FROM: Carolyn Strong, IRB Research Coordinator c.s.

DATE: March 28, 2012

RE: Human Research Protocol Approval

The Human Subject Research protocol entitled, "Examining the Current Knowledge of Certified Athletic Trainers on Sports Hernias" has been approved by James Madison University's Institutional Review Board (IRB). A signed copy of the Action of the Board form is enclosed for your records. Your research protocol has been assigned the ID Number 12-0409.

As a condition of the IRB approval, your protocol is subject to annual review. Therefore, you are required to complete a follow-up report before your project end date. You *must* complete the follow-up report regardless of whether you intend to continue the project for another year. For your convenience, a hard copy is enclosed. An electronic copy of the follow-up report form can be found on the Sponsored Programs Administration web site at the following URL:
<http://www.jmu.edu/sponsoredprog/allforms.html#IRBform>.

You are reminded that any changes in your protocol that affects human subjects must be submitted to the IRB for approval *before* implementing new procedures. This requirement applies to changes in subjects, equipment, procedures, investigators, survey tools, and location of the data collection site. Also, should any adverse events occur during your study, you are required to *immediately* notify Carolyn Strong, IRB Research Coordinator. To avoid confusion, please use the assigned protocol number when communicating with the IRB Research Coordinator about your project.

Federal Guidelines stipulate that you are required to keep a copy of your approved human subjects' protocol, including the approved informed consent form and site letter of permission, for at least three years after completion of your research. The protocol must be accessible for inspection and copying by authorized representatives of the department or agency supporting or conducting the research at reasonable times and in a reasonable manner. Please let me know if you need additional assistance or further clarification.

Co: Dr. Jamie Frye, Department of Kinesiology

From the desk of...
Carolyn Strong, CIM
IRB Research Coordinator
Sponsored Programs Administration
James Madison University
JMAC Building 6, Suite 26, MSC 5723
Harrisonburg, VA 22807

strongc@jmu.edu
Phone: 540-568-2318
Fax: 540-568-6240

JAMES MADISON UNIVERSITY
INSTITUTIONAL REVIEW BOARD
ACTION OF THE BOARD

Date: March 22, 2012 ID Number: 12-0409

Title of Study: *Examining the Current Knowledge of Certified Athletic Trainers on Sports Hernias*

Principal Investigator(s): Ms. Stephanie Pikus & Ms. Lisa Holzhauser

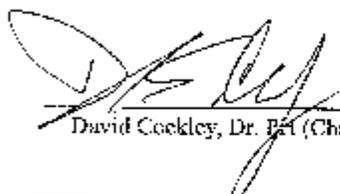
The Institutional Review Board took the following action on the human subjects study cited above:

Approved Disapproved

Approval of the study is for the period from 3/14/2012 through 4/20/2012.

The Investigator(s) shall immediately bring to the attention of the Institutional Review Board any changes proposed for the approved study as they relate to the care or use of human subjects. The IRB will decide whether the extent or type of changes proposed warrants formal committee review. If such a review is deemed necessary, the chairperson shall schedule the review for the earliest feasible time.

*FOR EXTERNALLY FUNDED PROJECTS, INVESTIGATOR(S) ARE RESPONSIBLE FOR CONVEYING A COPY OF THIS DOCUMENT TO THE OFFICE OF SPONSORED PROGRAMS TO BE FORWARDED TO THE APPROPRIATE FUNDING AGENCY.



 David Cockley, Dr. Ed (Chairperson)

03/26/12

 Date

*Your Follow-up Report must be submitted within 30 days of the project end date listed above.

**If you wish to continue your study past the approved project end date above, you must submit a Follow-up Report indicating an Extension Request, along with supporting information.

Although the IRB office sends reminders, it is ultimately your responsibility to submit the continuing review report in a timely fashion to ensure there is no lapse in IRB approval.

Please return IRB Follow-up Report to the Office of Sponsored Programs: Campus Mail MSC 5728.

Appendix B. Informed Consent

Identification of Investigators & Purpose of Study

You are being asked to participate in a research study conducted by Stephanie Pikus and Lisa Holzhauser from James Madison University. The purpose of this study is to examine the current knowledge of certified athletic trainers on sports hernias. This study will contribute to the researchers' completion of their master's theses.

Research Procedures

Should you decide to participate in this research study, your consent will be assumed. This study consists of a survey that will be administered to certified athletic trainers at random through the National Athletic Trainers' Association Website using Qualtrics (an online survey tool). You will be asked to provide answers to a series of questions related to your current knowledge on sports hernias. You will have the capability to skip questions if you would like to, but there is also the option to choose "I don't know" if you are unsure of an answer. Once the survey is submitted, your access to the survey will close and you will not be able to return to it.

Time Required

Participation in this study will require about 15 minutes of your time.

Risks

The investigators do not perceive more than minimal risks from your involvement in this study (that is, no risks beyond the risks associated with everyday life).

Benefits

Potential benefits from participation in this study include being involved in enriching the educational field of Athletic Training.

Confidentiality

The results of this research could possibly be published or presented at a conference. The researchers retain the right to use and publish non-identifiable data. While individual responses are anonymously obtained and recorded online through the Qualtrics software, data is kept in the strictest confidence. All data will be stored in a secure location accessible only to the researchers.

Participation & Withdrawal

Your participation is entirely voluntary. You are free to choose not to participate. Should you choose to participate, you can withdraw at any time without consequences of any kind. However, once your responses have been submitted and anonymously

recorded you will not be able to withdraw from the study.

Questions about the Study

If you have questions or concerns during the time of your participation in this study, or after its completion or you would like to receive a copy of the final aggregate results of this study, please contact:

Stephanie Pikus, ATC
Kinesiology
James Madison University
pikusm@dukes.jmu.edu

Dr. Jamie L. Frye, PhD, ATC
Health Sciences
James Madison University
540-568-8836
fryejl@jmu.edu

Questions about Your Rights as a Research Subject

Dr. David Cockley
Chair, Institutional Review Board
James Madison University
(540) 568-2834
cocklede@jmu.edu

Giving of Consent

I have read this consent form and I understand what is being requested of me as a participant in this study. I freely consent to participate. I certify that I am at least 18 years of age. Continuing with this survey is giving consent to being involved in this study.

Appendix C: Sports Hernia Survey (Developed by Qualtrics)

1. What district do you currently work in?
 - a. District 1
 - b. District 2
 - c. District 3
 - d. District 4
 - e. District 5
 - f. District 6
 - g. District 7
 - h. District 8
 - i. District 9
 - j. District 10
2. What setting do you work in?
 - a. Sales
 - b. High School
 - c. Clinic Only
 - d. Clinic Outreach
 - e. Physician Extender
 - f. Division 3 College
 - g. Division 2 College
 - h. Division 1 College
 - i. Semi-professional/Professional
 - j. Non-traditional (industrial, military, etc.)
 - k. Other _____ (Fill in)
3. How many years have you been an athletic trainer?
 - a. 0-5 years
 - b. 6-10 years
 - c. 11-15 years
 - d. 16-30 years
 - e. 31 years+
4. Imagine you are evaluating a male athlete who complains of insidious inguinal groin pain. The pain is exacerbated by sharp, sudden lateral movements, coughing and sneezing, has pain with a sit-up, and has no palpable mass. What three injuries would you most likely suspect?
 - a. Referred pain from an intra-articular hip injury
 - b. Groin/hip flexor strain
 - c. Osteitis Pubis
 - d. Inguinal/Femoral Hernia
 - e. Sports Hernia
 - f. Referred pain from the spine

- g. Testicular pathology
 - h. Femoral neck stress fracture
 - i. Rectus Abdominus tear
5. Which signs/symptoms are most associated with sports hernias? Select all that apply.
- a. Insidious groin pain
 - b. Acute groin pain associated with a specific mechanism of injury
 - c. Pain with coughing and/or sneezing
 - d. Low-grade fever
 - e. Nausea and/or vomiting
 - f. Pain with sharp, sudden movements
 - g. Reduced hip flexion range of motion
 - h. Reduced hip adduction range of motion
 - i. Reduced hip abduction range of motion
 - j. Reduced hip extension range of motion
 - k. Ecchymosis over groin
 - l. Tingling in buttocks that may or may not radiate down posterior leg
 - m. Pain performing a sit-up
 - n. Unable to bear weight
 - o. Clicking and/or popping in hip when going upstairs
 - p. An “unstable” feeling
 - q. Antalgic gait
 - r. Pain with urination
6. Which gender is more likely to have a sports hernia?
- a. Males
 - b. Females
 - c. There are no gender differences
 - d. I don't know
7. Which sports have the highest incidence of sports hernia? Please choose three.
- a. Baseball
 - b. Basketball
 - c. Field Hockey
 - d. Football
 - e. Ice Hockey
 - f. Lacrosse
 - g. Soccer
 - h. Tennis
 - i. Track/Field
 - j. Volleyball
 - k. Wrestling

8. What experience/playing level are sports hernias mostly seen?
 - a. Child/youth
 - b. High School
 - c. Division 2/3 College Athletes
 - d. Division 1/Professional Athletes
 - e. Masters (>age 50) Athletes
 - f. Non-athletes
9. Which of the following is the gold standard test used to diagnose a sports hernia?
 - a. X-Ray
 - b. MRI without contrast
 - c. MRI with contrast
 - d. Ultrasound
 - e. Bone Scan
 - f. There is no gold standard
10. Are sports hernias primarily caused by an acute or overuse mechanism?
 - a. Acute
 - b. Overuse
11. What is your confidence in defining the *anatomical structures* specifically involved in a sports hernia?
 - a. 0-100% (Sliding bar)
12. Which of the following statements best describes the anatomical structures involved in a sports hernia?
 - a. A sports hernia is weakness of the transversalis fascia causing compression of the ilioinguinal nerve.
 - b. A sports hernia is referred pain to the groin from an intra-articular hip pathology.
 - c. A sports hernia is protrusion of bowel or intestine through an abnormal opening of the anterior abdominal wall.
 - d. A sports hernia is injury at the rectus abdominus insertion and at the adductor tendon origination.
 - e. A sports hernia is inflammation and bone marrow edema at the pubic symphysis.
13. What is the most successful sports hernia treatment for an athlete?
 - a. A corticosteroid injection
 - b. Conservative treatment with core strengthening
 - c. Chiropractic manipulations
 - d. A two-month course of non-steroidal anti-inflammatories (NSAIDs)
 - e. Hip-spica wrap
 - f. Core shorts or a sports hernia belt
 - g. Surgical repair

- h. Electrical stimulation and ice
 - i. Kinesiotape
 - j. I don't know
14. Where have you obtained the majority of your sports hernia knowledge?
- a. Undergraduate athletic training education program
 - b. Graduate school education program
 - c. Doctoral education program/Residency
 - d. Clinical experience
 - e. From television
 - f. From the internet
 - g. From a continuing education conference _____ (Fill in)
 - h. I do not feel like I have learned adequate information on sports hernias
15. How confident are you that you would be able to recognize an athlete who had the symptoms of a sports hernia?
- a. 0-100% (Sliding bar)
16. Have you ever treated a patient who was diagnosed with a sports hernia?
- a. Yes
 - b. No
17. Have you ever treated a patient who was diagnosed with an inguinal or a femoral hernia?
- a. Yes
 - b. No
18. Do you feel that your undergraduate education prepared you to handle sports hernia assessment and/or treatment?
- a. Yes
 - b. No

REFERENCES

1. Atkins JM, Taylor JC, Kane SF. Acute and overuse injuries of the abdomen and groin in athletes. *Current Sports Medicine Reports*. 2010;9(2):115-120.
2. Campanelli G. Pubic inguinal pain syndrome: the so-called sports hernia. *Hernia*. 2010;14:1-4.
3. Diaco JF, Diaco DS, Lockhart L. Sports hernia. *Operative Techniques in Sports Medicine*. 2005;13(1):68-70.
4. Hackney RG. The sports hernia: a cause of chronic groin pain. *British Journal of Sports Medicine*. 1993;27(1):58-62.
5. Harmon KG. Evaluation of groin pain in athletes. *Current Sports Medicine Reports*. 2007;6:354-361.
6. Mann CD, Lloyd DM. Groin pain in the athlete: non-bony pathology including sportsman's groin. *The Open Sports Medicine Journal*. 2010;4:81-92.
7. Minnich JM, Hanks JB, Muschaweck U, Brunt LM, Diduch DR. Diagnosis and treatment highlighting a minimal repair surgical technique. *The American Journal of Sports Medicine*. 2011;39(6):1341-1349.
8. Moeller JL. Sportsman's hernia. *Current Sports Medicine Reports*. 2007;6:111-114.
9. Omar IM, Zoga AC, Kavanagh EC, et al. Athletic pubalgia and "sports hernia": optimal MR imaging technique and findings. *RadioGraphs*. 2008;28:1415-1438.
10. Wales D. Diagnosis and treatment of inguinal canal disruption. *Sport Ex Medicine*. 2007;31:16-22.
11. Copperthite KE. Athletic pubalgia, part 1: anatomy and diagnosis. *Athletic Therapy Today*. 2010;15(5):4-6.
12. Kumar A, Doran J, Batt ME, Nguyen-van-tam JS, Beckingham IJ. Results of inguinal canal repair in athletes with sports hernia. *Journal of the Royal College of Surgeons of Edinburgh*. 2002;47(3):561-565.
13. Lynch SA, Renstrom PA. Groin injuries in sports. *Sports Medicine*. 1999;28(2):137-144.
14. Meyers WC, Foley DP, Garrett WE, Lohnes JH, Mandlebaum BR. Management of severe lower abdominal or inguinal pain in high-performance athletes. *The American Journal of Sports Medicine*. 2000;28(1):2-8.
15. Preskitt JT. Sports hernia: the experience of Baylor University medical center at Dallas. *Proceedings (Baylor University Medical Center)*. 2011;24(2):89-91.
16. Waryasz GR. Exercise Strategies to prevent the development of the anterior pelvic tilt: implications for possible prevention of sports hernias and osteitis pubis. *Strength and Conditioning Journal*. 2010;32(4):56-65.
17. Meyers WC, Mckechnie A, Philippon MJ, Horner MA, Zoga AC. Experience with "sports hernia" spanning two decades. *Annals of Surgery*. 2008;248(4):656-665.
18. Kai B, Lee KD, Andrews G, Wilkinson M, Forster BB. Puck to pubalgia: imaging

- of groin pain in professional hockey players. *Canadian Association of Radiologists Journal*. 2010;61:74-79.
19. Fon LJ, Spence RAJ. Sportsman's hernia. *British Journal of Surgery*. 2000;87:545-552.
 20. Kulacoglu H, Ozyaylali I, Kunduracioglu B, Yazicioglu D, Ersoy E, Ugurlu C. The value of anterior inguinal exploration with local anesthesia for better diagnosis of chronic groin pain in soccer players. *Clinical Journal of Sports Medicine*. 2011;21(5):456-459.
 21. Copperthite KE. Athletic pubalgia, part 2: case reports. *Athletic Therapy Today*. 2010;15(5):7-9.
 22. Edelman DS, Selesnick H. "Sports" hernia: treatment with biologic mesh. *Surgery of Endoscopy*. 2006;20:971-973.
 23. Jansen JA, Mens JM, Backx FJ, Kolfschoten N, Stam HJ. Treatment of longstanding groin pain in athletes: a systematic review. *Scandinavian Journal of Medicine & Science in Sports*. 2008;18:263-274.
 24. Larson CM, Pierce BR, Giveans MR. Treatment of athletes with symptomatic intra-articular hip pathology and athletic pubalgia/sports hernia: a case series. *Arthroscopy*. 2011;27(6):768-775.
 25. Prentice WE. *Arnheim's Principles of Athletic Training: A Competency-Based Approach*. 13th ed. New York, NY:McGraw-Hill; 2009.
 26. Prentice WE. *Arnheim's Principles of Athletic Training: A Competency-Based Approach*. 12th ed. New York, NY:McGraw-Hill;2006.
 27. Starkey C, Brown SD, Ryan J. *Examination of Orthopedic and Athletic Injuries*. 3rd ed. Philadelphia, PA:F.A. Davis Company;2010.
 28. Starkey C, Brown SD, Ryan J. *Examination of Orthopedic and Athletic Injuries*. 2nd ed. Philadelphia, PA:F.A. Davis Company;2002.
 29. Meyers WC, Yoo E, Devon ON, et al. Understanding "sports hernia" (athletic pubalgia): the anatomic and pathophysiologic basis for abdominal and groin pain in athletes. *Operative Techniques in Sports Medicine*. 2007;15(4):165-177.
 30. Delforge, G. D., & Benhke, R. S. (1991). The History and Evolution of Athletic Training Education in the United States. *Journal of Athletic Training* , 34 (1), 53-61.