Pain Management Techniques Used by Student-Athletes to Relieve Muscular Pain: Alternative and Pharmacological Treatments

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Author Note

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Abstract

Student-athletes experience many sports-related injuries throughout their collegiate careers. Numerous treatment modalities exist for relieving pain, and many new treatment methods are being discovered with time. The purpose of the study was to determine which pain relief treatments are used most commonly by student-athletes, and which are most effective at relieving muscular pain. The study was conducted at a small private college, Anna Maria College, with 71 student-athlete participants. Student-athlete participants completed a survey that revealed the most commonly used and the most effective muscular pain treatment modalities.

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Chapter One

Introduction

In the United States, approximately 4.3 million injuries were treated in the emergency department (ED) in July 2000-June 2001 due to sports and recreation; these sports-related injuries accounted for more of the ED visits than motor-vehicle injuries (Gotsch et al., 2002). An article published in an injury prevention journal states that roughly 7 million Americans are treated for sports and recreation-related injuries yearly (Conn et al., 2003). A national survey conducted in the Netherlands displayed 3.5 million sports-related injuries occur yearly (Baarveld et al., 2011). A study in Poland at the University of Szczecin reported that approximately half of the students involved in the study had experienced a sports-related injury (Flinciński, 2008). Sports-related injuries are one of the most commonly reported reasons for treatment in the ED. Specific sports-related injuries that are found most commonly include concussions and musculoskeletal injuries.

In the 2009-2010 through 2013-2014 academic years, based upon the National Collegiate Athletic Association (NCAA) reported injuries, it is estimated that there were 1,053,370 reported sports-related injures within the collegiate level, leading to an estimated number of 210,674 injuries per year (Kerr et al., 2015). A study conducted with 82 university-level athletic participants concluded that each athlete experienced more than two musculoskeletal injuries each year (Lemoyne et al., 2017). More common musculoskeletal injuries that occur include broken bones, dislocations, injuries to the Achilles tendon, patellar tendinitis, runner's knee, injuries to the rotator cuff, shin splints, tennis elbow, strains, and sprains (American Academy of Family

Physicians, 2019). The article *College Sports-Related Injuries — United States, 2009–10 Through 2013–14 Academic Years* (2015) states that roughly half of the reported injuries were classified as sprains or strains.

Musculoskeletal injuries occur in every sport but are more prominent in contact sports such as football, hockey, or soccer. Comparing men's and women's sports injuries, there's a higher recorded incidence of male sports-related injuries. In the 2009-10 through 2013-14 academic years, the NCAA's reported injuries prove that men's football consisted of the largest number of injuries, closely followed by men's wrestling (Kerr et al., 2015). Out of the 25 monitored sports, injuries occurring in men's sports rank in the top four, and women's sports injuries are fifth in most injuries (Kerr et al., 2015). The most common women's sport to report injuries in the 2009-10 through 2013-14 academic years was women's soccer (Kerr et al., 2015).

With a significant number of sports-related injuries comes a significant number of ways to treat and manage the pain associated with the injuries. There are numerous studies and articles that discuss types of injuries or statistics of sports-related injuries. It is also common to find articles that explain injuries and give recommendations for the typical treatments used for those injuries. Many articles related to sports injuries and treatments are geared towards professional athletes or for parents of children athletes in grade school. It is not common to find a study that explores the most common or most effective treatment modalities on a collegiate sport level.

Statement of the Problem

Musculoskeletal sports injuries, particularly sprains or strains within the muscles, have a wide variety of treatment modalities that can be used. College athletes, specifically, have access to treatments given by athletic trainers as well as treatments that can be easily purchased at the

store. Different treatment modalities can fall into three different categories. The three treatment categories include pharmacologic therapy, massage therapy, and alternative therapy.

Pharmacologic Therapy

When experiencing any type of pain, it's typical for people to be drawn towards the use of over-the-counter (OTC) pain relief medications. These medications vary from nonsteroidal anti-inflammatory drugs (NSAIDs) to analgesics to topical creams and patches. NSAID use, such as ibuprofen or naproxen, is common as one of the first treatment methods used due to the reduction of inflammation. Acetaminophen, which has no anti-inflammatory effects, is one of the most popular OTC analgesic drugs used to reduce pain. Topical creams and patches give off an analgesic effect and can also numb the area that it's applied to. Some common topical creams and patches include Aspercreme, Biofreeze, and IcyHot.

Massage Therapy

Massage therapy may be what people think of when they hear of a 'pulled muscle.' Different massage therapy methods can include receiving a massage, using a foam roller, scraping therapy, or using a Theragun. General massage therapy involves receiving a massage from athletic trainers or other professionals. Benefits from receiving a massage include increased flexibility, increased blood circulation, pain reduction, better sleep, and relaxation (Fremont College, 2021a). Foam rollers are very popular and are used to massage your body without assistance from other people. Foam rollers put pressure onto and stretch out the tense fascia, resulting in a decrease in muscular soreness and a possible increase in flexibility (Fremont College, 2021b). Scraping therapy, also known as gua sha, is a treatment that involves the use of a smooth tool to scrape over inflamed body parts or 'pulled muscles' (Cleveland Clinic, 2021b). Scraping therapy can have many benefits, including reduced pain and swelling, alleviating

migraines and tension headaches, as well as positive influences on anxiety, insomnia, and fatigue (Cleveland Clinic, 2021b). Theragun treatment is a type of massage therapy known as percussive therapy (Coast Physical Therapy, 2021). The percussive therapy of a Theragun works by sending high-intensity pulses into muscles and tissues, breaking up muscular knots, increasing blood flow and histamine release, decreasing soreness and inflammation (Coast Physical Therapy, 2021).

Alternative Therapy

Ice baths, ice packs, heating pads, Kinesio tape, compression therapy, Game Ready ice machine, electrical stimulation, yoga, and cupping therapy are all alternative therapies used for muscular pain relief in collegiate athletes. An ice bath, which should be around 15 minutes long in 50-59 degree water, constrict the blood vessels and reduce swelling and the breakdown of tissues (Kolba, 2020). After ice bath submersion, as the body warms back up, circulation increases and can relax muscles and assist in the movement of fluids (Kolba, 2020). Ice packs are similar to ice baths, but they provide cold therapy on small particular body sections. Ice packs are typically used immediately after injuries occur to slow down the body's natural healing process and reduce inflammation and soreness by constricting blood vessels and restricting blood flow (Waldron, 2020). Heating pads, which are recommended for use prior to exercise, dilate blood vessels to promote blood circulation, providing greater oxygen to muscles (Waldron, 2020). Kinesio tape is applied over muscles to support movement, reduce inflammation and pain, and relax muscles (Romano et al., 2021). Compression therapy includes the use of compression garments and bandage wraps. Compressive therapy, similar to heating pads, increases blood flow and the amount of oxygen in the muscles, which can speed the repair of muscular injuries (Complete Health Center, 2021). The Game Ready ice machine combines two therapies, cold therapy, and compression therapy. The Game Ready therapy can decrease inflammation, pain,

muscle stiffness/soreness, and increase blood flow and range of motion (Avanos, 2021). Electrical stimulation is often used to treat muscle strains by reducing pain, inflammation, and muscle spasms, increasing circulation, range of motion, and motor coordination (Trilogy Physical Therapy, 2021). Electrical stimulation involves the passing of electricity through adhesive electrodes on the body for communication with nerves (Trilogy Physical Therapy, 2021). Yoga is a type of therapy designed to strengthen and stretch out the muscle through meditation, movements, and controlled breathing (The President and Fellows of Harvard College, 2015). The final alternative therapy is cupping therapy. Cupping therapy is a modality used by athletic trainers to reduce muscle tension and remove muscular knots (Khan, 2019). Cupping therapy lifts the fascia through suctioning on the skin resulting in loosened muscles and increased blood flow (Khan, 2019).

Summary

Muscular injuries in collegiate athletes can be treated in numerous ways. Choosing which modality should be used can cause stress and worry on the injured student-athlete. Pharmacologic therapies can temporarily relieve the associated pain with muscle injuries by taking and using OTC medications but will have no long-term benefits on the body. Massage therapy and alternative therapy will help alleviate the associated muscular pain with added benefits for the body, but there are many more modalities to choose from than pharmacologic therapy.

Background and Need

Treatment methods for musculoskeletal pain are always evolving, and discoveries for new and improved treatments are brought to light all the time. New treatment methods add on to the current and old methods creating a number of modalities to be chosen from. Along with

many modalities to choose from, there are also different types of treatments. The different treatment types that student-athletes can choose between include pharmacologic therapy, massage therapy, and alternative therapy.

Pharmacologic Therapy

Pharmacologic therapy includes treatments from over-the-counter relief medications. Pharmacologic therapy medications include acetaminophen, ibuprofen, naproxen, and analgesic patches and creams such as IcyHot, Biofreeze, or Aspercreme. By using existing research and descriptions of medication actions and therapeutic effects, the best medication to use for muscular pain can be discovered. A survey by student-athletes will support research for which pharmacologic therapy is most effective and what is used more commonly.

Massage Therapy

Massage therapy includes treatment modalities that put pressure onto muscles to alleviate the pain and to reduce inflammation. Therapies included in massage therapy include using a foam roller, scraping therapy, receiving a massage, and using a Theragun. Current research regarding massage therapies will describe what each technique does to the body and what benefits will occur after treatment. Using this research will reveal which modality is the most beneficial and effective in pain relief. Student-athlete participation in survey conduction will find which massage therapy is utilized most often and will uncover what student-athletes find most effective.

Alternative Therapy

Alternative therapy involves many different categories of treatment methods to relieve muscular pain in student-athletes. The many treatment methods include cupping therapy, heating pads, ice baths, ice packs, yoga, electrical stimulation, Kinesio tape, Game Ready ice machine,

and compression therapy. Research that already exists is utilized to explain the benefits and effects that each treatment has on the body, especially on the muscles. Pairing the existing research with a student-athlete survey will unravel which methods are most common and which are the best to use to relieve muscular pain.

Summary

Plenty of research exists that describes the effects of treatment modalities and their benefits to the body. Even with all of the supporting research, student-athletes still have a variety of modalities to pick and choose from. Choosing the best pain relief technique can be difficult, with no research regarding which works the best for student-athletes. Combining existing research with a survey conducted using student-athlete participation will provide more evidence regarding which treatment modalities are most effective and common.

Purpose of the Study

The purpose of this study was to discover which treatment modalities are used most commonly and are the most effective for treating muscular pain to provide student-athletes in college with effective options for relieving their pain.

Student-athletes have many different types of treatment methods to choose from when in need of relieving their muscular pain. Choosing which method to use can cause stress and anxiety. Athletes may also decide on one particular modality, but it may not be the best option for treatment. Explanations of what treatments can do for the body and discoveries of which are most common and effective can aid students in the deciding process easing their stress as well as pain.

Research for this study was conducted through one survey. Student-athletes at Anna Maria College were sent a survey that was created using *SurveyMonkey.* The survey (Appendix

A) discovers which treatment modalities student-athletes at Anna Maria College use most frequently and reveals which treatment modalities student-athletes at Anna Maria College find most effective in relieving muscular pain.

The goal of this study was to unearth the most common and effective muscular pain relief techniques used by collegiate athletes. The discoveries made are expected to provide an easier way for athletes to choose a pain relief technique alleviating their associated stress and pain.

Research Questions

1. What are the most commonly used treatment modalities used by student-athletes at Anna Maria College to relieve muscular pain?
2. Which of the most commonly used treatment modalities used by student-athletes at Anna Maria College are most effective at relieving muscular pain?

Significance to the Field

This thesis paper is significant to the health care field, particularly nursing and physical therapy. Unraveling which treatment modalities for muscular pain collegiate athletes use most commonly and find to be most effective can aid prescribers as well as athletic trainers on therapy recommendations. The results from the conducted survey will also be useful for student-athletes to try different or new ways to treat the muscular pain that they experience.

Definitions

- Analgesic – producing analgesia, or decrease in pain without loss of consciousness (Merriam-Webster, Incorporated, 2021).
- Concussion – Sudden brain movement that disrupts neurologic function typically resulting from a blow to the head (Story, 2018).
- Constrict – to make narrower, to compress (Merriam-Webster, Incorporated, 2021).

- Dilate – to expand or widen (Merriam-Webster, Incorporated, 2021).
- Fascia – Connective tissues covering muscles and structures in the body (Fremont College, 2021b).
- Histamine – a compound in the body released due to injury or allergy causing capillary dilation, smooth muscle contraction, and gastric acid secretion (Merriam-Webster, Incorporated, 2021).
- Modality – Most commonly, a physical therapeutic intervention (Merriam-Webster, Incorporated, 2021).
- Musculoskeletal – Provides support for the body and protects the organs. Includes the muscles, tendons, ligaments, joints, and bones (Story, 2018).
- Sprain – When a joint is pushed to an unnatural position causing the ligament to stretch or tear (Story, 2018).
- Strain – Also known as a pulled muscle, occurs when a muscle or tendon stretches or tears due to unusual movement of the muscle or inappropriate or overuse of the muscle (Story, 2018).

Limitations

All research studies have limitations. Due to the small sample size of participants in the conducted survey, the external validity of the results could be impacted. The conducted survey is opinion-based and is tailored to what modality works the best individually. Because of the opinion-based survey questions, the results may not be completely accurate as feelings or opinions are able to fluctuate. Another limitation to the study would be time. This study was conducted over a 15-week long course at Anna Maria College. With a longer time frame to complete the study, the sample size could be larger to obtain more results.

Ethical Considerations

Before completion of surveys, participants read and agreed to engage in a research study where all participants are anonymous and must be 18 years or older. The surveys also had an attachment to an information sheet for participation in a research project by a student from Anna Maria College. Although this study uses human subject participation, it was exempt from Institutional Review Board revision. Human subjects were exposed to no risks and were completely anonymous.

Chapter Two

Introduction

Sport-related injuries occur frequently for collegiate athletes. The most common injuries occurring are musculoskeletal injuries, more specifically, strains or sprains. Many different treatments for sports-related injuries exist for collegiate athletes. Due to the constant evolution of pain relief modalities, discovering which technique is most effective can be challenging.

The literature review addresses three categories related to muscular pain relief modalities. The first section addresses research related to pharmacologic therapies for muscular pain management. The second section focuses on research studies regarding massage therapies for muscular pain management. Finally, the third section discusses research concerning alternative therapies for muscular pain management.

Literature Review

Pharmacologic Therapy

Acetaminophen, better known as Tylenol, is one of the most used over-the-counter medications for pain relief. To determine the effectiveness of acetaminophen in the treatment of muscular pain, a study was conducted comparing this medication to placebo, a substance used in experiments to discover the efficacy of the other medication (Merriam-Webster, Incorporated, 2021). This study included 610 participants, over the age of 18, who rated their pain a minimum of 4 out of 10 succeeding a marathon race (Prior et al., 2012). Post-marathon treatment within the study lasted for four days where participants took either the placebo or acetaminophen ER, extended-release, 1300 mg three times a day (Prior et al., 2012). The extended-release form of acetaminophen is designed to slowly release over a longer time period in the body (Merriam-Webster, Incorporated, 2021). The results from this study show that acetaminophen ER is an

effective treatment method for muscular pain and allows less sleep interference during muscular pain recovery (Prior et al., 2021).

This literature review provides student-athletes with the benefits of taking acetaminophen for muscular pain relief as a pharmacologic therapy. This study includes a large number of participants, which is beneficial for the accuracy of study outcomes. Unfortunately, this study was only conducted over the course of four days, which is a very short time period for the treatment of muscular pain.

Another study compared the effects of a lidocaine patch to a placebo patch. Lidocaine is an anesthetic that is used for pain relief and provides a numbing effect (Cleveland Clinic, 2021a). This study included 60 participants, 31 using the lidocaine patch at 5% and 29 using the placebo patch (Lin et al., 2012). Variables that were assessed throughout this three-week-long study were verbal rating scale of pain, pressure pain threshold, neck range of motion, and neck disability (Lin et al., 2012). Each variable was assessed before treatment, 12 hours following final patch removal after one week of patch treatment, one week after treatment completion, and three weeks after treatment completion (Lin et al., 2012). This study concluded that the lidocaine patch is effective at relieving pain and reducing neck disability for treatment longer than one week, but the placebo and lidocaine patch had no differences in reported pressure pain threshold or range of motion (Lin et al., 2012).

This literature review provides student-athletes with benefits and results of using lidocaine pain relief treatments, allowing them to weigh their options for pharmacologic therapy. This study was conducted over a longer period which allowed for multiple variable assessments to be completed, but the participant size of the study was on the smaller side.

Massage Therapy

Massage therapy is a popular treatment for muscular pain relief in exercise-related injuries. To determine what happens within the body following massage therapy, a study was conducted with eleven participants completing exercise that experienced muscle damage (Crane et al., 2012). To determine what happens in the body, biopsies were obtained from the quadricep muscle as a baseline, 10 minutes after receiving a massage, and 2.5 hours following massage (Crane et al., 2012). A biopsy is the extraction of tissues, fluids, or cells in the body that are examined (Merriam-Webster, Incorporated, 2021). The biopsies of massaged participants were compared to biopsies of non-massaged participants. The results of the biopsies showed that massaged muscles influenced mitochondrial biogenesis, which aids in muscle healing (Crane et al., 2012). This study also proved that massage therapy is beneficial at reducing inflammation in affected muscles (Crane et al., 2012).

This literature review provides student-athletes with an explanation of what happens within the body, specifically within muscular cells, during massage therapy. The sample size of only eleven participants in this study could affect the accuracy of results. The type of exercise the participants were taking part of preliminary to the study could also impact the accuracy of the results.

Foam rolling is a type of massage therapy that applies pressure to the muscles using a rolling motion with a foam cylinder. Different studies have been conducted to determine range of motion and stiffness with the use of a foam roller, the study discussed evaluated the pressure pain threshold with the use of a foam roller (Vaughan et al., 2014). This study evaluated the pressure pain threshold of three points of the iliotibial band, a ligament on the outer side of the legs (Vaughan et al., 2014). The pressure pain threshold was evaluated before using a foam

roller, after using a foam roller for three minutes, and five minutes after using the foam roller (Vaughan et al., 2014). The results of this study show that after using the foam roller for three minutes, the pressure pain threshold was increased, meaning the amount of force applied to inflict pain increases (Vaughan et al., 2014). After the five-minute mark, the pressure pain threshold was returned to normal (Vaughan et al., 2014).

This literature review provides student-athletes with a description of pain threshold from the use of foam rollers. Student-athletes can use this information to weigh their options before foam roller therapy. This study was conducted using participants that were asymptomatic, meaning none of the participants were experiencing any pain (Vaughan et al., 2014). To determine a more accurate outcome, participants that experience pain in the iliotibial band should have been observed as well.

Alternative Therapy

Cupping therapy is shown to be useful in the treatment of headaches, back and neck pains, and carpal tunnel syndrome, more recently it is an uprising trend for musculoskeletal disorders in sports medicine (Kim et al., 2017). Passive stretching is used commonly to lengthen muscles, increase range of motion, and increase muscle flexibility (Kim et al., 2017). A comparative study was conducted to discover flexibility, pain threshold, and muscle activity in both cupping therapy and passive stretching (Kim et al., 2017). This study involved 30 participants, without injury, half to receive cupping therapy and half to participate in passive stretching (Kim et al., 2017). This study evaluated range of motion and pain before therapies, after the first treatment, one week after the first treatment, and finally after the second treatment (Kim et al., 2017). The results of this study conclude that cupping therapy and passive stretching are almost equally beneficial on flexibility, range of motion, and pain threshold (Kim et al.,

2017). Since the results to this study were similar, it is suggested that cupping therapy be used instead of passive stretching due to the convenience and easier method of cupping therapy (Kim et al., 2017).

This literature review provides student-athletes with an explanation of cupping therapy and passive stretching. Student-athletes will be able to compare which therapy is more beneficial for their relief of muscular pain. To determine a more accurate outcome, participants that experience muscular pain should have been observed in this study as well.

Another comparative study analyzed the effects of dynamic muscular stabilization with yoga and hot packs. Both alternative treatments strengthen muscles to relax the body and reduce pain (Chhabra and Mrityunjay, 2015). This study evaluated three groups, dynamic muscular stabilization, yoga, and hot packs, each containing ten participants with lower back pain (Chhabra and Mrityunjay, 2015). The study was conducted over a two-week period where the treatments were performed five times per week (Chhabra and Mrityunjay, 2015). Variables that were assessed during this study include general health, physical health, and mental health to determine the quality-of-life post treatment (Chhabra and Mrityunjay, 2015). This study concluded that the dynamic muscular stabilization technique was most beneficial at improving the quality of life than yoga and hot packs (Chhabra and Mrityunjay, 2015). Yoga therapy and hot pack therapy had similar results, but yoga was determined to have a more positive impact on quality-of-life than hot packs (Chhabra and Mrityunjay, 2015).

This literature review provides student-athletes with a comparison of three different types of alternative muscular pain relief therapy. Student-athletes can use this information to determine which technique will be more effective and most beneficial at pain relief.

Summary

Muscular pain relief includes many therapies that each have different effects and varying levels of efficiency. Student-athletes have the difficult job of choosing which muscular pain relief technique will be most beneficial. Gaining knowledge about what techniques do within the body and what benefits each therapy has can aid the decision-making process. Reading comparative studies to understand which therapies have more benefits and are analyzed to be more effective than other therapies can ease the process as well. The studies discussed within the literature review had many limitations regarding sample size, duration of study, and lack of injury within participants. To achieve an accurate understanding of therapy efficiency for student-athletes to relate easier to these studies, participants experiencing muscular pain need to be evaluated. These studies contributed to information that described the efficiency of muscular pain relief techniques and expanded upon the preexisting information regarding how the treatment methods work.

Chapter Three

Establishing a pain relief method that is effective can be difficult for student-athletes. Numerous sports-related injuries occur within the collegiate level every year. More specifically, musculoskeletal injuries are most prominent including sprains or strains. Due to the extensive list of treatment methods available, deciding on one method is challenging.

The following research questions were addressed in this study:

1. What are the most commonly used treatment modalities used by student-athletes at Anna Maria College to relieve muscular pain?
2. Which of the most commonly used treatment modalities used by student-athletes at Anna Maria College are most effective at relieving muscular pain?

This study followed a quantitative research design, using a survey to determine the most effective and most commonly used treatment modalities for muscular pain. The survey contained numerous treatment modalities that are possible pain relief options for student-athletes. Participation of student-athletes at the collegiate level was used for completion of the survey.

Setting

This study took place in a small college located in the suburban town of Paxton, Massachusetts. Anna Maria College is a private Catholic college that annually enrolls approximately 1,500 students (The Common Application, 2021). Of the approximated 1,500 students, over 40% of the population participates in athletics on Division III NCAA sports teams (Anna Maria College, 2021).

Participants used a website link or scanned a QR code so the survey could be taken online in participant's homes or wherever they were able to. The website link and QR code allowed participants to have access to the survey on their phones, tablets, or on a computer.

Participants

The sampling procedure used in this study was a nonrandom convenience sample. The participants were restricted to those who participate in collegiate athletics. Student-athletes over the age of 18 that attend Anna Maria College completed the survey anonymously. There were 71 total student-athlete participants in the survey.

Intervention and Materials

The independent variable in this study included the many different treatment modalities for muscular pain relief in student-athletes. The treatment modalities being assessed in this study fit into three different categories, pharmacologic therapy, massage therapy, and alternative therapy. The dependent variable in this study was the student-athletes completing the survey. Student-athletes were answering survey questions regarding common and effective pain relief techniques that can influence their muscular pain.

Materials used to conduct this study include *SurveyMonkey*, email, and posters. *SurveyMonkey*, which is an online survey creation website, was used for creation of the survey by the researcher. The survey consists of 37 questions that focus on which pain relief modalities are used most commonly by student-athletes, and which modalities the student-athletes find to be most effective at relieving their muscular pain (see Appendix A). The survey was sent out to student-athletes through email with a link to complete the survey online. The survey was also made available through posters that included a QR code as well as a website that students could use to find the survey online.

Measurement Instruments

The measurement instrument used in this study is a 37-question survey (See Appendix A). The questions in the survey determine which muscular pain relief treatment methods student-

athletes use most commonly, pharmacological, massage, or alternative treatments. The survey also unravels which treatment modalities for muscular pain relief student-athletes find to be most effective at relieving pain.

Procedure

The survey for this study was available to complete for a one-week period. The survey was to be completed online by student-athletes through *SurveyMonkey,* where all data was collected immediately following completion of the survey. Student-athletes received a website link to the survey through email or through a poster. Before taking the survey, student-athlete participants had to agree to participating in the collection of data for this study and acknowledged that all data collected was anonymous and that the participants are over the age of 18.

Data Analysis

The data collected from the single survey was analyzed by the researcher. The analysis was completed by using visual inspection of graphed data. *SurveyMonkey,* the website in which the survey was created and conducted, automatically graphs the collected responses. Each question in the survey was created into a bar graph to present the data. The researcher then interpreted the data to discover which muscular pain relief modalities are used most commonly by student-athletes, and which modalities are most effective.

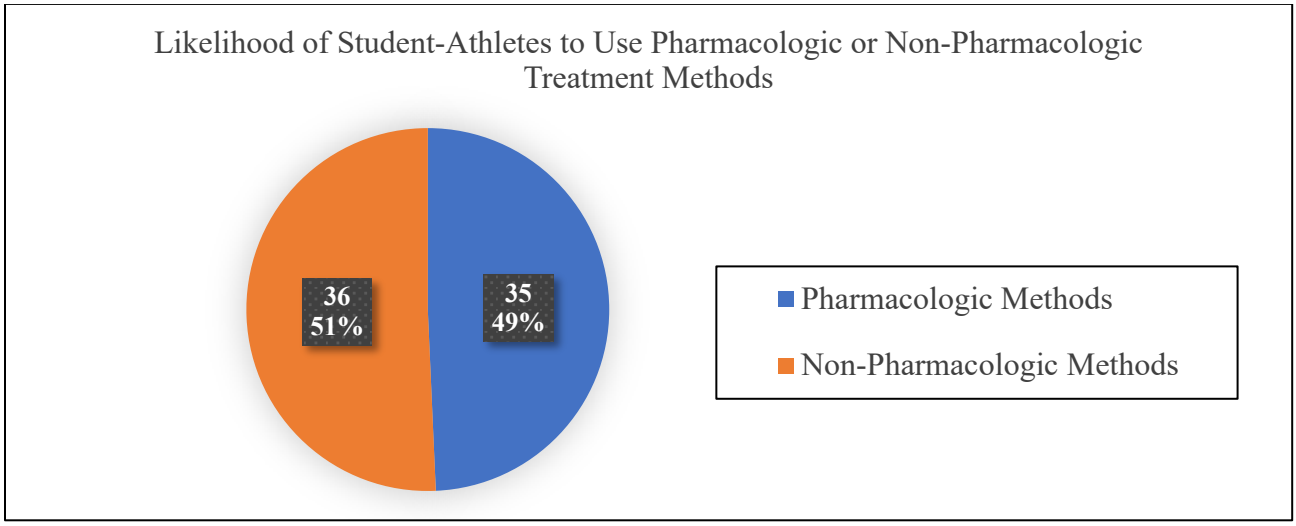
Chapter Four

Musculoskeletal injuries are the one of the most commonly occurring sports-related injuries in student-athletes. A survey was completed by 71 student-athletes at Anna Maria College, a small private college in Massachusetts. This survey titled, *Most Effective and Commonly Used Pain Relief Techniques for Muscular Pain in Student Athletes* (See Appendix A), answered the following research questions:

1. What are the most commonly used treatment modalities used by student-athletes at Anna Maria College to relieve muscular pain?
2. Which of the most commonly used treatment modalities used by student-athletes at Anna Maria College are most effective at relieving muscular pain?

When prompted with the first question on the survey, student-athletes decided which pain relief method, in general, they use the most often, pharmacologic methods or non-pharmacologic methods. The results from this question resulted in no significant difference between which generalized method is used more commonly.

Figure 1.



Out of the 71 student-athletes completing the survey, 36 students reported that they are more likely to use non-pharmacologic methods and 35 students reported that they're more likely to use pharmacologic methods. This leaves the results to be almost an even comparison at 51% versus 49%.

Most Common Treatment Modalities

Throughout the survey, students were prompted with questions to determine the commonness of muscular pain relief techniques. The participants ranked their use for the modalities as either *a great deal, a lot, a moderate amount, a little,* or *none at all*. To determine the most common treatment method, when analyzing the results, the results from *a great deal* and *a lot* were added together to determine the total number of student-athletes that use that method commonly. The therapy techniques in the survey were broken down into three separate categories for analysis, pharmacologic therapies, massage therapy, and alternative therapy.

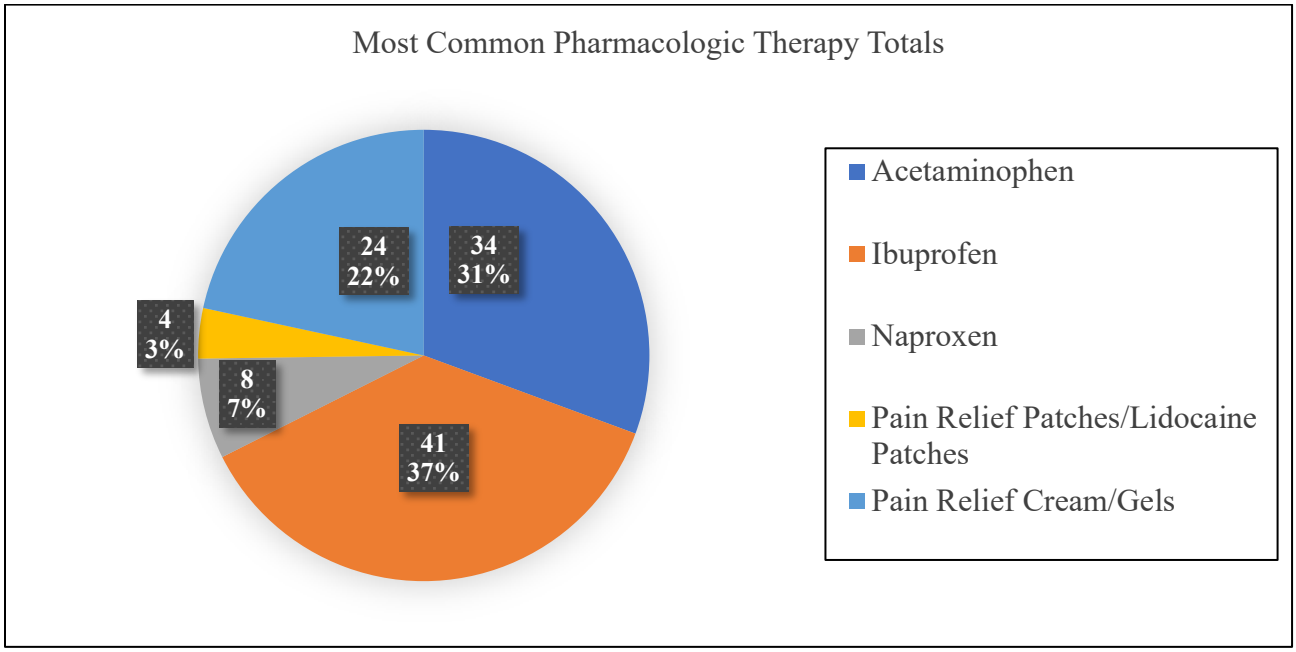
Pharmacologic Therapy

The pharmacologic therapy techniques that student-athletes were prompted to rank in the survey included acetaminophen, ibuprofen, naproxen, pain relief patches/lidocaine patches, and pain relief cream/gel.

Figure 2.

Most Common Pharmacologic Therapy			
Treatment Method	A Great Deal	A Lot	Total Participants for Most Common Use
Acetaminophen	26	8	34
Ibuprofen	22	19	41
Naproxen	6	2	8
Pain Relief Patches/Lidocaine Patches	3	1	4
Pain Relief Cream/Gel	13	11	24

Figure 3.



After adding the results from *a great deal* and *a lot,* ibuprofen is the most commonly used pharmacologic treatment method for muscular pain relief in student-athletes. 41 student-athletes, or 37% of the participants, reported that ibuprofen is the pharmacologic treatment method that they use. Acetaminophen was a close second treatment method with 34 student-athletes, or 31% of participants. The least common reported treatment method by student-athletes was the use of pain relief cream/gels at 3% of participants.

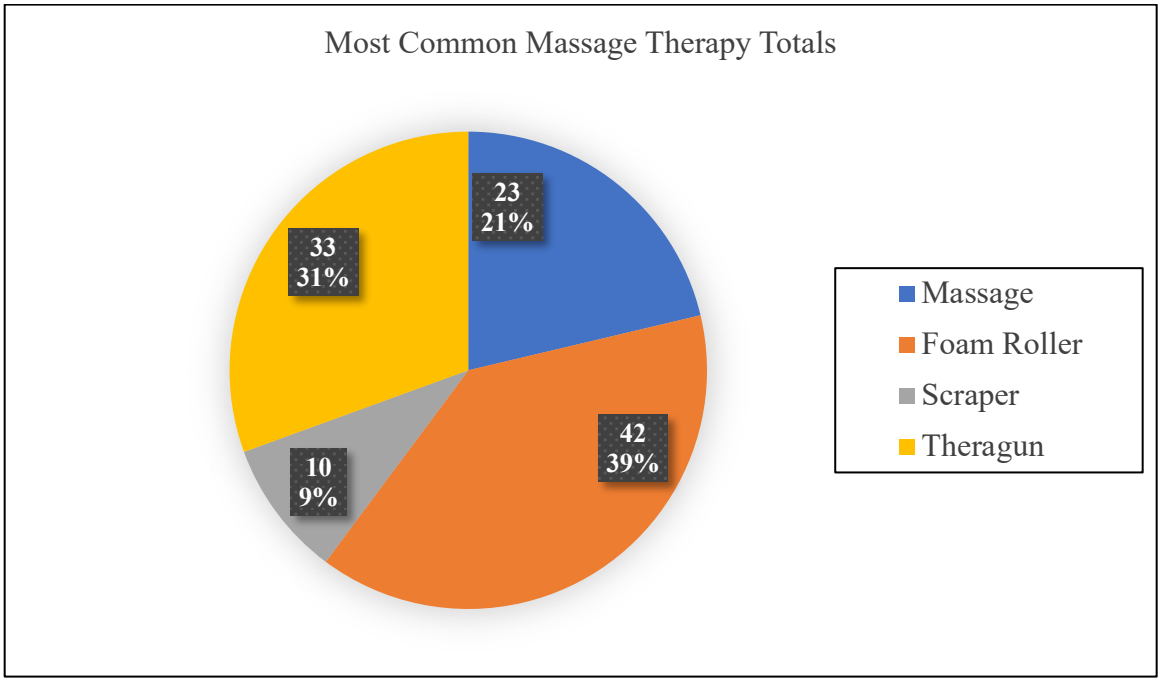
Massage Therapy

The massage therapy techniques that student-athletes were prompted to rank in the survey included massage therapy, foam roller, scraper, and Theragun.

Figure 4.

Most Common Massage Therapy			
Treatment Method	A Great Deal	A Lot	Total Participants for Most Common Use
Massage Therapy	6	17	23
Foam Roller	20	22	42
Scraper	3	7	10
Theragun	15	18	33

Figure 5.



After adding the results from *a great deal* and *a lot,* the foam roller is the most commonly used massage therapy treatment method for muscular pain relief in student-athletes. 42 student-athletes, or 39% of the participants, reported that using a foam roller is the massage therapy treatment method of choice. The use of a Theragun was the second most common treatment method with 33 student-athletes, or 31% of participants. The least common reported massage therapy treatment method by student-athletes was the use of a scraper at 9% of participants.

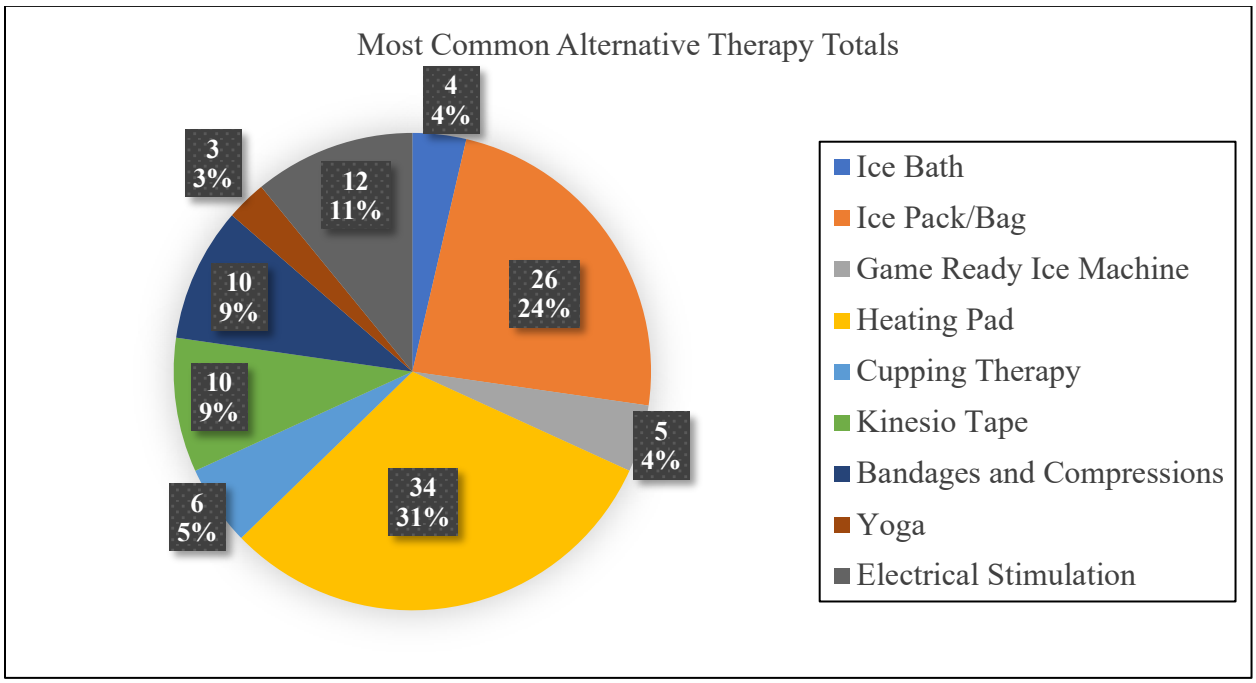
Alternative Therapy

The alternative therapy techniques that student-athletes were prompted to rank in the survey included ice baths, ice packs/bags, the Game Ready Ice Machine, heating pads, cupping therapy, Kinesio tape, bandages and compressions, yoga, and electrical stimulation.

Figure 6.

Most Common Alternative Therapy			
Treatment Method	A Great Deal	A Lot	Total Participants for Most Common Use
Ice Bath	0	4	4
Ice Pack/Bag	15	11	26
Game Ready Ice Machine	4	1	5
Heating Pad	19	15	34
Cupping Therapy	3	3	6
Kinesio Tape	3	7	10
Bandages and Compressions	7	3	10
Yoga	1	2	3
Electrical Stimulation	3	9	12

Figure 7.



After adding the results from *a great deal* and *a lot,* the heating pad is the most commonly used alternative treatment method for muscular pain relief in student-athletes. 34 student-athletes, or 31% of the participants, reported that using a heating pad is the method of choice for alternative therapy treatment. The use of an ice pack was a close second treatment

method with 26 student-athletes, or 24% of participants. The least common reported alternative therapy treatment method by student-athletes was yoga at 3% of participants.

Summary

The three most commonly used treatment methods for relieving muscular pain in student-athletes is the pharmacologic treatment method of ibuprofen with 41 reported student-athletes, the massage therapy treatment method of a foam roller with 42 reported student-athletes, and the alternative treatment method of a heating pad with 34 reported student-athletes. Overall, the most commonly used treatment modality for student-athletes in relieving muscular pain is the foam roller.

Most Effective Treatment Modalities

Throughout the survey, students were prompted with questions to determine the effectiveness of muscular pain relief techniques. The participants ranked the effectiveness for the modalities as either *extremely effective, very effective, somewhat effective, not so effective,* or *not at all effective*. To determine which treatment method is the most effective at relieving muscular pain in student-athletes, when analyzing the results, the results from *extremely effective* and *very effective* were added together to determine the total number of student-athletes that fine that method to be effective. The therapy techniques in the survey were broken down into three separate categories for analysis, pharmacologic therapies, massage therapy, and alternative therapy.

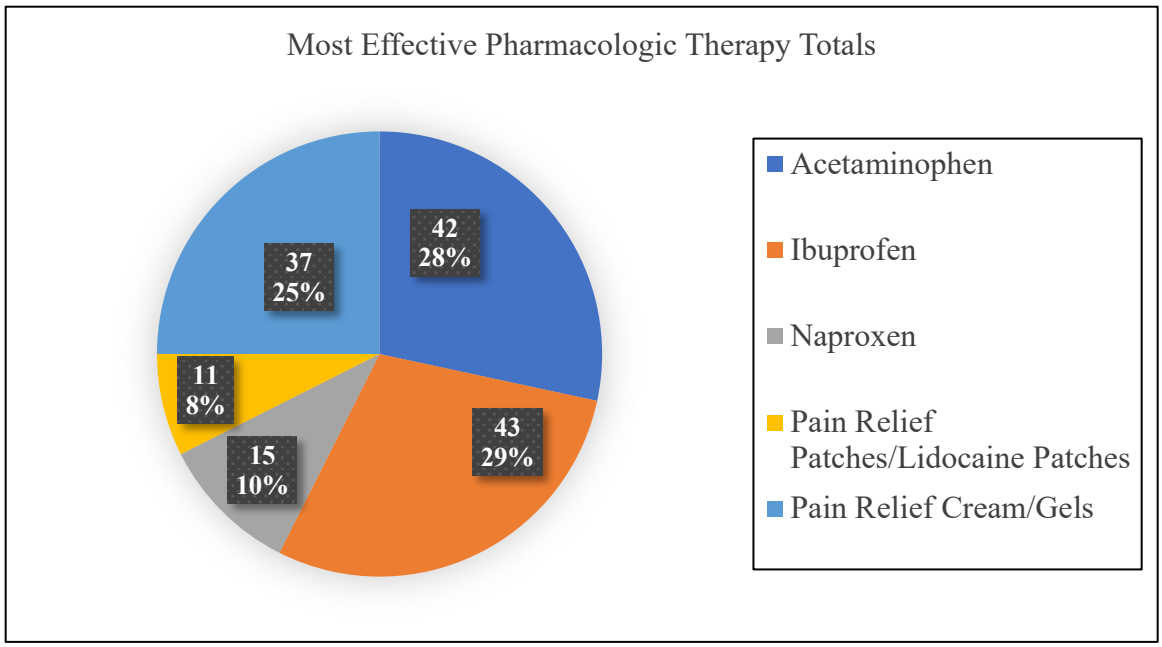
Pharmacologic Therapy

The pharmacologic therapy techniques that student-athletes were prompted to rank in the survey included acetaminophen, ibuprofen, naproxen, pain relief patches/lidocaine patches, and pain relief cream/gel.

Figure 8.

Most Effective Pharmacologic Therapy			
Treatment Method	Extremely Effective	Very Effective	Total Participants for Most Effective Use
Acetaminophen	13	29	42
Ibuprofen	12	31	43
Naproxen	4	11	15
Pain Relief Patches/ Lidocaine Patches	3	8	11
Pain Relief Cream/Gel	13	24	37

Figure 9.



After adding the results from *extremely effective* and *very effective,* the most effective pharmacologic treatment method for muscular pain relief in student-athletes is ibuprofen. 43 student-athletes, or 29% of the participants, reported that using ibuprofen is the most effective method of choice for pharmacologic treatment. A very close second with 42 student-athletes, or 28% of participants, was the use of acetaminophen. The least effective reported pharmacologic treatment method by student-athletes was pain relief patches/lidocaine patches at 8% of participants.

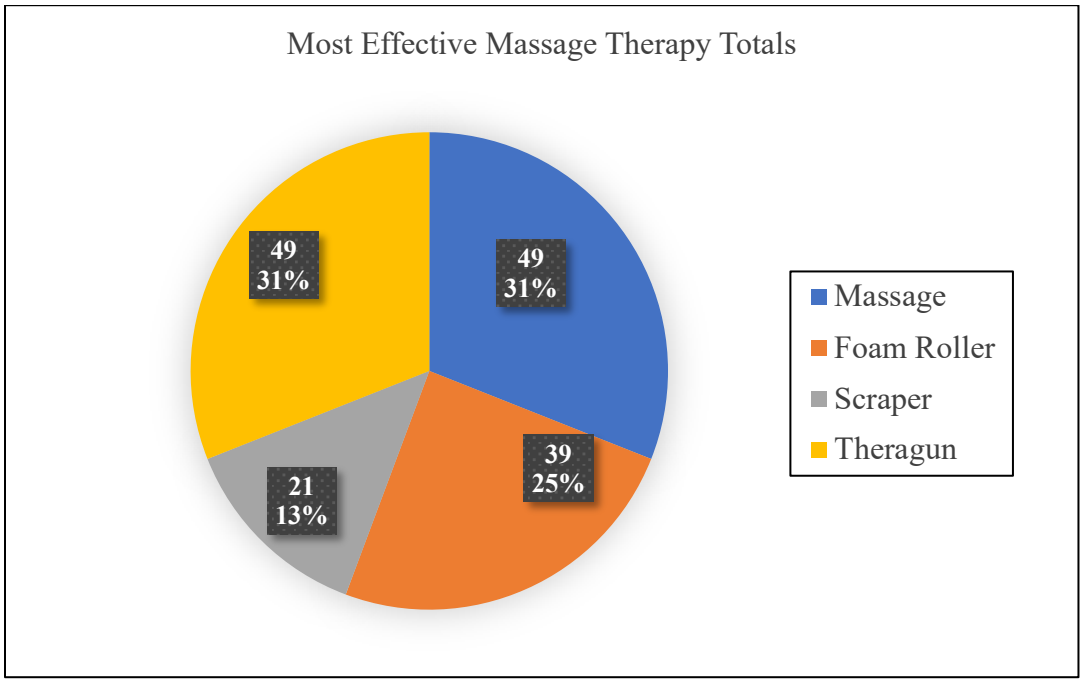
Massage Therapy

The massage therapy techniques that student-athletes were prompted to rank in the survey included massage therapy, foam roller, scraper, and Theragun.

Figure 10.

Most Effective Massage Therapy			
Treatment Method	Extremely Effective	Very Effective	Total Participants for Most Effective Use
Massage Therapy	14	35	49
Foam Roller	13	26	39
Scraper	5	16	21
Theragun	15	34	49

Figure 11.



After adding the results from *extremely effective* and *very effective,* the most effective massage therapy treatment method for muscular pain relief in student-athletes was determined to be a tie between massage therapy and the use of a Theragun. 49 student-athletes, or 31% of the participants, reported that massage therapy and the use of a Theragun are the most effective

methods of choice for massage therapy treatment. The least effective reported massage therapy treatment method by student-athletes was the use of a scraper at 13% of participants.

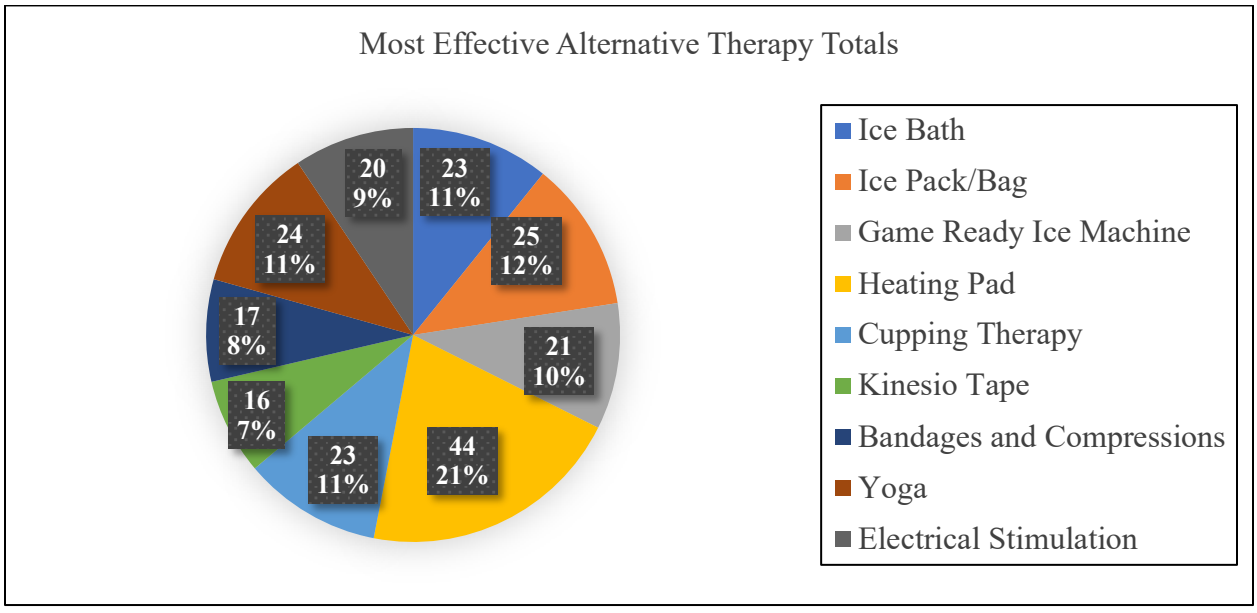
Alternative Therapy

The alternative therapy techniques that student-athletes were prompted to rank in the survey included ice baths, ice packs/bags, the Game Ready Ice Machine, heating pads, cupping therapy, Kinesio tape, bandages and compressions, yoga, and electrical stimulation.

Figure 12.

Most Effective Alternative Therapy			
Treatment Method	Extremely Effective	Very Effective	Total Participants for Most Effective Use
Ice Bath	3	20	23
Ice Pack/Bag	4	21	25
Game Ready Ice Machine	6	15	21
Heating Pad	13	31	44
Cupping Therapy	8	15	23
Kinesio Tape	2	14	16
Bandages and Compressions	2	15	17
Yoga	10	14	24
Electrical Stimulation	4	16	20

Figure 13.



After adding the results from *extremely effective* and *very effective,* the most effective alternative treatment method for muscular pain relief in student-athletes is the use of a heating pad. 44 student-athletes, or 21% of the participants, reported that using a heating pad is the most effective method of choice for alternative treatment. The use of an ice pack/bag was the second most effective treatment with 25 student-athletes, or 12% of participants. The least effective reported alternative treatment method by student-athletes was Kinesio Tape at 7% of participants.

Summary

The four most effective treatment methods for relieving muscular pain in student-athletes is the pharmacologic treatment method of ibuprofen with 43 reported student-athletes, the massage therapy treatment methods of massage therapy and the use of a Theragun both with 49 reported student-athletes, and the alternative treatment method of a heating pad with 44 reported student-athletes. Overall, the most effective treatment modalities for student-athletes in relieving muscular pain, with an equivalent ranking score, is massage therapy and the use of a Theragun.

Chapter Five

Introduction

Student-athletes encounter many different injuries throughout their athletic careers. These injuries vary extensively, but the most common injury experienced by student-athletes are musculoskeletal injuries. Sprains and strains are common musculoskeletal injuries that are come across. Discovering which treatment modality works the best for relieving muscular pain can be a difficult task for student-athletes.

This study compared three different types of pain relief modalities, pharmacologic therapy, massage therapy, and alternative therapy. Student-athletes were asked to take a survey to reveal which treatment methods are the most commonly used and which modalities are the most effective at relieving muscular pain.

Discussion

Most Common Treatment Modalities

Student-athletes completed a survey in which they were asked to answer multiple questions regarding how often they used treatment modalities. Student-athletes reported that non-pharmacologic (massage and alternative) treatment methods are used more commonly than pharmacologic treatment methods. The result from this broad comparison was very close; 51% of participants answered non-pharmacologic treatment, and 49% reported pharmacologic treatment is used most often. After answering more precise questions regarding pharmacologic, massage, and alternative treatment methods, ibuprofen, foam rollers, and heating pads were determined to be the most commonly used modalities from each category.

Out of the 71 student-athlete participants, 41 reported that they use ibuprofen as a pharmacologic treatment method, 42 reported that they use a foam roller for massage therapy,

and 34 reported using a heating pad for an alternative therapy treatment method. Out of each commonly used treatment method, the most common is a foam roller with 42 participant votes. With the foam roller achieving the highest number of participant votes for common use, non-pharmacologic massage therapy modalities are determined to be the most commonly used treatment for relieving muscular pain in student-athletes. This data supports results from the broad, first question of the survey where student-athletes reported that non-pharmacologic treatment methods are used more than pharmacologic methods.

Most Effective Treatment Modalities

In the survey that student-athletes completed, they also answered questions regarding the effectiveness of each treatment modality. Student-athletes reported that ibuprofen, massage therapy, the Theragun, and the heating pad are the most effective at relieving muscular pain from each category, pharmacologic, massage, and alternative.

Of the 71 student-athlete participants, 43 reported that ibuprofen is the most effective pharmacologic treatment, 49 student-athletes reported that massage therapy and the Theragun are equally effective massage therapy treatments, and 44 student-athletes reported that the heating pas is the most effective alternative therapy modality. The most effective treatment modality from all three categories was determined to be a tie between massage therapy and the Theragun. Both modalities are massage therapy treatments, which concludes that massage therapy treatment methods are the most effective at relieving muscular pain.

Although the results from the survey resulted in observable data for most effective treatment modality used by student-athletes, the analyzed data involved a tie. The tie between massage therapy and the Theragun for most effective modality could have been a result of inconsistent participation within the survey. To determine the effectiveness of each treatment

modality, the survey questions were phrased, “If you use the treatment method of…, how effective would you say this technique is?”. These questions were designed in this manner to have participants vote on the effectiveness of the treatment methods that they use. Not all participants followed this design. As an example, when determining how common student-athletes use ice baths, 37 participants reported that they do not use this treatment method, but only 13 participants skipped the following question regarding the effectiveness of this modality, where all 37 who reported not using this method should have skipped the question.

Limitations

The greatest limitation that was encountered during this study was the time frame. This study was completed within a 15-week long semester, and the survey used for data collection was only available for a one-week period. With a small time period for data collection, the participation could have been influenced resulting in a smaller sample size than there would have been with a longer time period. The inconsistent participation throughout the survey also contributed as a limitation to this study. Student-athlete participants who reported not utilizing a particular treatment method should not have rated the effectiveness of the same modality. Consistent participation following the design of the survey questions could have brought about different results, or more accurate results.

Recommendations for Future Research

Based on the results from the study, there are a few recommendations for future research. Having a longer time period for data collection would be beneficial in achieving a larger sample size. A larger sample size will allow for more accurate results within the opinion-based survey questions. Rather than having one survey with questions regarding both the commonality and effectiveness of treatment modalities, a future study should split the single survey into two. The

first survey should determine the most common treatment methods from each category, pharmacologic, massage, and alternative. After the first survey is completed, the second survey should use the analyzed data from the first to create a survey that determines the effectiveness of the common modalities. Another recommendation for future research would be to also determine the sex and age of participants as well as their ethnicity and what sport they are involved in.

Conclusions

There are three critical conclusions that were discovered based upon the results of the study. The first conclusion is that student-athletes use the non-pharmacologic, massage therapy treatment method of a foam roller most commonly. Although this method was found to be the most commonly used, it was not found to be the most effective at relieving muscular pain. The second conclusion from this study is that student-athletes find two massage therapy treatment methods to be the most effective at relieving their muscular pain. The most effective treatment methods include massage therapy and the use of a Theragun. Due to the very close statistics that resulted from the survey, the final conclusion from this study is that student-athletes most likely use more than one modality at a time to relieve their muscular pain.

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Appendix A

Most Effective and Commonly Used Pain Relief Techniques for Muscular Pain in Student Athletes

1. Would you say that you are more likely to use pharmacologic methods to relieve muscular pain (taking a pain reliever pill), or non-pharmacologic techniques (massage therapy, heating pads etc.)?

- pharmacologic methods (pain reliever pill)
- non-pharmacologic methods (massage therapy, heating pads etc.)

2. How often would you say that you use the pain relief technique of an ice bath?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

3. If you use the treatment method of an ice bath, how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

4. How often would you say that you use the pain relief technique of an ice pack/ice bag?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

5. If you use the treatment method of an ice pack/ice bag, how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

6. How often would you say that you use the pain relief technique of the Game Ready Ice Machine (cold compression therapy)?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

7. If you use the treatment method of the Game Ready Ice Machine (cold compression therapy), how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

8. How often would you say that you use the pain relief technique of heating pads?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

9. If you use the treatment method of a heating pad, how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

10. How often would you say that you use the pain relief technique of cupping therapy?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

11. If you use the treatment method of cupping therapy, how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

12. How often would you say that you use the pain relief technique of massage therapy?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

13. If you use the treatment method of massage therapy, how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

14. How often would you say that you use the pain relief technique of "rolling out" by using a foam roller?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

15. If you use the treatment method of "rolling out" by using a foam roller, how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

16. How often would you say that you use the pain relief technique of Kinesio tape?

- A great deal
- A lot
- A moderate amount

- A little
- None at all

17. If you use the treatment method of Kinesio tape, how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

18. How often would you say that you use the pain relief technique of using bandages and compressions?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

19. If you use the treatment method of bandages and compressions, how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

20. How often would you say that you use the pain relief technique of yoga?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

21. If you use the treatment method of yoga, how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

22. How often would you say that you use the pain relief technique of using a scraper?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

23. If you use the treatment method of scraping therapy, how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

24. How often would you say that you use the pain relief technique of electrical stimulation?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

25. If you use the treatment method of electrical stimulation, how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

26. How often would you say that you use the pain relief technique of a Theragun?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

27. If you use the treatment method of a Theragun, how effective would you say this technique is?

- Extremely effective

- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

28. How often would you say that you use the pain relief technique of taking acetaminophen (Tylenol)?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

29. If you use the treatment method of taking acetaminophen (Tylenol), how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

30. How often would you say that you use the pain relief technique of taking ibuprofen (Advil)?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

31. If you use the treatment method of taking ibuprofen (Advil), how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

32. How often would you say that you use the pain relief technique of taking naproxen (Aleve)?

- A great deal
- A lot
- A moderate amount
- A little

- None at all

33. If you use the treatment method of taking naproxen (Aleve), how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

34. How often would you say that you use the pain relief technique of using pain relief patches/lidocaine patches (Aspercreme)?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

35. If you use the treatment method of using pain relief patches/lidocaine patches (Aspercreme), how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective

36. How often would you say that you use the pain relief technique of using pain relief cream/gel (IcyHot, Biofreeze)?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

37. If you use the treatment method of using pain relief cream/gel (IcyHot, Biofreeze), how effective would you say this technique is?

- Extremely effective
- Very effective
- Somewhat effective
- Not so effective
- Not at all effective