The Effects of Glute Strengthening and Hip Mobility on Patellar Tendinopathy – A Case Study

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A Senior Thesis submitted in partial fulfillment
of the requirements for graduation
in the Honors Program
Liberty University
Spring 2021

Acceptance of Senior Honors Thesis

This Senior Honors Thesis is accepted in partial
fulfillment of the requirements of graduation from the
Honors Program of Liberty University

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Abstract

Patellar Tendinopathy is a chronic condition that effects a large number of the athletic population. There have been many treatments used for this condition, yet few of them are acceptable for an athlete placing a large amount of stress on the lower extremities. This case study examines the effects of glute strengthening and increasing hip mobility on a track and field athlete suffering from Patellar Tendinopathy. Many measures including health-related questionnaires, pain-rating scales, and performance were evaluated to determine the outcome of the treatment. After a two-week treatment time, the athlete exhibited lower pain during rest and performance, better quality of life, and successful performance in track and field events.

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Background

Definition

Patellar tendinopathy is a complex pathology in regard to treatment and rehabilitation, especially in the athletic setting. There have not been clear, conclusive results on the treatment of this condition, although many different treatments have been tested. This condition is a chronic pathology without a definitive mechanism of injury, which requires a more thorough evaluation than other injuries. When evaluating for patellar tendinopathy, the clinician must always be in search of the original source of the condition. The symptoms may not be caused by something specific within the knee, which is why treatment plans can range across the entire kinetic chain to find a treatment that is effective and efficient.

Patellar tendinopathy is difficult to treat due to the continuous stress placed on the tendon. Return-to-play time has a wide range due to a variety of variables involving severity, sport, and treatment options. This pathology is not considered to be a traumatic injury, such as an ACL tear, but for an elite athlete, this condition can hinder an athlete's performance and force them to rest from their sport. Rest has shown to be the most successful treatment, which is common when treating chronic injuries. This is due to the logical reasoning that removing the sport or cause of stress from the athlete, will reduce the inflammation and pain. However, in the realm of athletics, rest is not always an option and tends to be needed at the most unfortunate times. Clinicians have been searching continually for a treatment to this condition in order to assist athletes across the nation who suffer from Patellar Tendinopathy. This case study is an

effort to expand and better understand the treatment possibilities for a patellar tendinopathy through closely examining the effects in a track and field athlete.

Before examining this case study, it is important to clarify specific terms that will be used. The term "tendinopathy" covers a wide range of meanings involving the tendon of a muscle. Tendonitis is one form that involves inflammation due to microtears of the tendon caused by an overload of the tendon that is too heavy or too sudden. Tendinosis is another term that refers to the tendon, but it implies a different pathology. Tendinosis is a degeneration of the tendon due to repetitive, chronic stress causing the collagen to degenerate slightly. Many people diagnose tendonitis, but it is actually thought that most cases are considered tendinosis instead.[1] Both conditions usually indicate for the same types of treatments, but the length of return-to-play is quite longer for tendinosis. For this case study, the term Patellar Tendinopathy will be used due to the fact that there was not a microscopic look at the patient's tendon in order to determine the most specific diagnosis. His symptoms and signs of inflammation point towards patellar tendonitis, but this case study will use the broader term of tendinopathy for his injury.

Patellar Tendinopathy is chronic inflammation of the patellar tendon on the anterior portion of the knee. The most common symptom involved with this pathology in athletes is dull pain over the patellar tendon that increases during jumping activities.[2] The pain is usually bearable and most athletes are able to continue playing; however, their performance may be diminished as pain and inflammation increases. This pathology is a chronic injury with an insidious onset, and usually involves a complex mechanism of injury, such as faulty biomechanics, that must be treated instead of only providing temporary relief of pain.

Anatomy and Physiology

The patellar tendon attaches to the apex of the patella which is situated on the medial portion of the tendon.[3] The tendon also extends to the non-articular surface of the posterior aspect of the patella. This tendon forms a bridge between the patella and tibia by attaching distally to the tibial tuberosity. This tendon functions as a part of the quadriceps muscle, meaning the action of the quads, knee extension, causes the stress to the tendon. The patellar tendon has shown to have increased thickening on some MRIs of a patient with a Patellar Tendinopathy, but that is not a confirmed finding in all cases. Some MRIs have also shown fascicles forming towards the midline of the tendon, but that is also not confirmed in all cases of Patellar Tendinopathy.[4] Through the study of cadavers, it has been shown that the majority of the breakdown of the patellar tendon occurs on the posterior portion of the tendon. However, when examining where the location of the tensile stress, the posterior portion does not undergo as much force as originally thought. In full extension, the knee takes an equal amount of tensile stress on the anterior and posterior portions of the tendon. As the knee goes into light flexion, a larger percentage of the tensile force is placed on the anterior portion, while the posterior portion takes the smaller percentage. As the knee enters higher levels of flexion, the majority of tensile force is placed on the anterior portion, and the posterior portion takes a much smaller portion of the force.[5] These findings have led some to believe that patellar tendinopathy does not result from tensile forces in the knee as originally thought; however, this is not enough evidence to fully support this finding.

An important aspect of the healing process is vascularization because proper healing stems from the important healing factors related to blood flow. A smaller amount of blood flow to a certain area compared to others can be completely normal and unharmful. However, if a

structure in that area is injured, it will cause more issues with healing than those areas which are highly vascularized. When studying the vascularization of the patellar tendon, it is found that the proximal portion of the tendon is very well vascularized, while the distal portion that connects to the tibial tuberosity is not well vascularized.[6] It is common that most cases of Patellar Tendinopathy occur at the proximal portion of the tendon near the inferior pole of the patella. [7] These findings mean that the vascularization of the proximal tendon will promote more healing which is beneficial considering this encompasses most cases of the condition. However, the cases that contain inflammation towards the distal portion of the tendon will have more struggle in the healing process due to the decreased amount of blood flow to the tendon.

Mechanism of Injury

The exact mechanism of injury is not clearly understood, but the most supported concept is that the patellar tendon becomes inflamed due to the traction, overuse, and violent stress that occurs during jumping.[8] In a study determining the causes of certain injuries in track and field, it was found that jumping activities cause the overuse injury of Patellar Tendinopathy.[9] This implies that track and field athletes who are jumpers or those who perform multiple events involving jumping are at more risk for this injury. The pathology is nicknamed “jumpers knee” due to jumping activities being the most common cause of stress. When looking at the biomechanical action of the quads in jumping, it is obvious that the quadricep muscle group produces the force to jump off of a surface, but they also contract eccentrically when landing to control the knee and protect the ligaments. This means that in all jumping and landing activities, the quadriceps place enormous stress on the patellar tendon, and the stress is only increased in sports where jumping is a vital, repetitive movement. This stress can cause numerous changes to

occur in the tendon leading to a patellar tendinopathy. "The histopathologic changes seen in the injured tendon include tendon microtears, separation of collagen fibers, loss of longitudinal alignment of collagen fibers, mucinoid degeneration between fibers, and fibrocartilaginous change at the inferior patellar pole."[10]

Risk Factors

Researchers have studied the potential risk factors that predispose individuals to a patellar tendinopathy. One research study examined results from a questionnaire filled out by 825 participants from different parts of the world and many different sport settings. This study found that four main factors were identified as predisposing factors for patellar tendinopathy through the questionnaire: gender, hours of training, history of knee injury, and hamstring flexibility. This study showed that women were affected less than men, which is conflicting with previous research showing women were more susceptible to patellar tendinopathy. This finding could be due to limitations such as differences in menstrual cycle stage for women or preventative training for men. Hours of training was a factor showing that increasing training time increased symptoms. This was shown by professional or semiprofessional athletes that trained over 20 hours a week were much more susceptible to a patellar tendinopathy. A history of knee injury obviously increased the risk factors for patellar tendinopathy. Lastly, tight hamstrings showed to be a large risk factor for individuals, which points to the possibility of increasing hamstring flexibility as a preventative method for patellar tendinopathy.[11]

Even though these four factors were shown to be the most prominent in one study, there is conflicting evidence about some potential risk factors. Another study which examined the risk factors among 81 track and field athletes diagnosed with patellar tendinopathy found differing

results. This study found that gender was not a risk factor of the condition. It also found that there were not any differences regarding height, age, weight, and level of impact on the prevalence of Patellar Tendinopathy.[12] There is very conflicting evidence regarding the risk factors of Patellar Tendinopathy and majorly depends on the individual factors of the athlete.

Common Treatments

Some common treatments explored for patellar tendonitis include eccentric quadricep exercises, ultrasonography, extracorporeal shockwave treatment (ECST), steroid injection, prostaglandin injection, stem cell implantation, platelet rich plasma (PRP) injection, and surgical treatment. Through the research that has been conducted, stem cells, prostaglandin injection, PRP injection, ECST, and steroid injections all have conflicting research data. The most beneficial treatments thus far are conservative treatment, including rehabilitation, and surgical treatment specifically. Eccentric quadriceps strengthening has shown to be beneficial as well as surgical treatment; however, conservative treatment is recommended due to the decreased recovery time when compared to surgery.[10]

Most athletes turn to injections when faced with chronic pain due to the frustration of failed treatment options. Often times, chronic injuries are something that produce a nagging pain, but they do not put the athlete at risk for a severe, traumatic injury in most cases. A randomized control trial examined the effects of one PRP injection versus two PRP injections.[13] The reasoning for the second injection was that the growth factors from the platelets tend to die off pretty quickly, so the second PRP injection would delay or possibly avoid this outcome. The results showed that those who received two injections reported less pain and improved outcomes on the questionnaires used. However, 23% of the patients failed the PRP injections and had to

have surgery. They reported that at the 34-month follow up, the group with two injections had less symptoms and better outcomes.[13] In the athletic population, it is not healthy for the athlete to need repeated injections. Temporary relief may be needed for a certain time, but this is not an acceptable long-term treatment. Injections have their place in treatment, but it cannot be relied upon in this case of a chronic pathology. This study also included a rehabilitation program that the patients participated in following the injections, so it is undetermined if the injections performed more healing compared to the rehabilitation due to the gap between groups being so slim.

Surgical treatments tend to be successful, but they are usually very extensive and require a longer recovery time compared to other conservative treatment options.[14] More extensive surgical options are termed "open surgery" and include procedures such as the removal of the tip of the patella, removal of abnormal tissue, and fat pad detachment from posterior surface of patellar tendon. Less extensive surgeries involve arthroscopic procedures including arthroscopic shaving, release of posterior paratenon and bone denervation, and resection of lower pole of patella.[14] These options have shown to be successful but are usually only performed once all other treatment options have been exhausted. Most athletes generally do not want to allow for the recovery time that these surgeries require in the middle of their season.

Eccentric quadriceps exercises are one of the most used treatment for patellar tendinopathy. It is thought that the eccentric loading of the patellar tendon will reduce the amount of stress on the tendon and train it to react to the load in a better manner. Healthy human tendons produce inflammatory markers and collagen turnovers while taking a load that causes increased blood flow during functional activity and helps the tendon to recover. Tendinopathic

tendons do not perform this way causing them to lack the recovery ability needed.[15] The eccentric loading program is used to slowly reproduce that load and slowly progress the load, so the tendon can adapt to the load being absorbed. Eccentric loading also requires the athlete to rest from his or her sport because this rehabilitation will not be successful if the athlete is still imposing the same stress on the knee every day before or after treatment. This treatment is successful as long as the loading of the tendon was the original problem. Since the different joints of the body are all connected, the clinician must look at all aspects of the kinetic chain to find where the problem is coming from rather than simply treating the pain. Knee problems could be a result of faulty foot or hip mechanics, so this issue would need to be addressed if long-term pain relief is desired.

Glute Strengthening

Gluteal strength is one area in which almost all athletes struggle.[16] Most athletes target the larger muscle groups like the quadriceps and hamstrings. These muscles are definitely vital to athletes, but in order to maximize performance, even the smaller stabilizing muscles must be trained. The Gluteus Medius is one of the most important muscles that provides stability and decreases the stress placed on the knee. In a previous research study to determine the effects of the glute muscles on patellofemoral pain syndrome, it was shown that weakness of the Gluteus Medius played a large role in adding stress to the knee joint.[16] Lack of strength in the glutes can also result in tightness of the muscles causing other conditions, such as IT band tightness and low back pain.

Another study examined the relation of Gluteus Medius stability when transitioning into a single leg stance. This is vitally important to track and field athletes considering almost all

activities are performed in a single leg stance. The study was conducted based on the principle that the Gluteus Medius controls the amount of pelvic drop that occurs when in the single leg stance. Excessive pelvic drop can add unneeded stress to joints like the pelvis and knee. The study found that the Gluteus Medius strength is extremely important in this aspect, and that weakness of the Gluteus Medius can increase pelvic drop placing a great amount of stress on the knee joint.[17] This increased stress placed by the lack of strength in the glute can cause symptoms of Patellar Tendinopathy in some cases. In this study, the purpose was to find out if strengthening the glute muscles and other stabilizers would result in lessening the Patellar Tendinopathy symptoms.

Hip Mobility

Increasing hip mobility can be an effective treatment for a variety of chronic lower extremity injuries. Decreased hip range of motion can lead to dysfunctional movement patterns which can cause compensation or stress on the body.[18] This stress or compensation can result in a chronic pathology like Patellar Tendinopathy or any other chronic pathology dealing with the lower extremity. Some athletes are already at risk due to structural differences, so there is no need for increasing that risk due to having a lack of hip mobility. Increasing hip mobility would be an adequate treatment due to the idea of treating the original cause of the pain instead of temporarily treating the symptoms.

Purpose of The Study

The purpose of this study was to determine if the effects of glute strengthening and increasing hip mobility are beneficial in the treatment of a track and field athlete with Patellar Tendinopathy pain. At this point in time, most research completed involving Patellar

Tendinopathy treatments have been inconclusive or shown minimal or temporary results. This study can be used to assist in finding more permanent treatments instead of treatment for temporary pain relief. This information could also be used to determine if the use of a prevention program that involves glute strengthening and increasing hip mobility would be beneficial in some athlete's cases. The interventions used in this study were specific to the patient and this patient's weaknesses; however, further research should be done to determine if these are common predisposing conditions for a patellar tendinopathy among all patients or if each individual has a different cause.

Initial Evaluation

On February 18, 2020, a male, freshman, indoor track and field heptathlete presented with left knee pain that began 2 weeks previously. The pain had an insidious onset meaning there was no sudden mechanism of injury. The patient reported the pain beginning and gradually progressing over weeks prior to evaluation. The pain was located over the anterior portion of the knee over the patellar tendon. The pain was rated as a 7/10, worst during jumping, specifically pole vaulting, and a 2/10 currently while resting on the National Pain Rating Scale (NPRS). The patient described the pain as sharp when jumping, but dull during less stressful activity. The patient was able to run and perform ADLs without pain. The patient stated that jumping, specifically pole vaulting, triggers the pain. The patient says the pain is bearable but hinders performance. The patient had not been taking any pain medications since the insidious onset of the pain and denies abnormal sensations and audible sounds during the onset of pain. The patient did undergo a skiing injury one year ago to his left knee, in which his foot was forcefully

externally rotated by being caught on the ground, but did not present with symptoms long-term following the injury. The patient had no other history of injuries.

During observation, the patient's knee had no signs of swelling, discoloration, or deformity. He was tender to palpation over the superior portion of patellar tendon and inferior pole of patella, but had no other palpable tenderness. During range of motion, the patient had minimal pain in AROM extension at end range and no pain with AROM flexion. Resisted range of motion was strong for both extension and flexion (5/5) with only minimal pain in extension. The patient had increased pain at end-range knee extension. The following special tests were performed due to mechanism of previous ski injury but were found negative: (-) McMurrays, (-) Appleys, (-) Thessalys. The patient did present with tight muscles including hamstrings, hip flexors, quads, and glutes. The patient had a severe lack of hip mobility, lack of glute strength and stability, and excellent quad strength. The patient mentioned experiencing constant mild low back pain, as well as occasional symptoms of medial tibial stress syndrome. Along with the National Pain Rating Scale, the patient was instructed to fill out the Lower Extremity Functional Scale (LEFS). He filled this out one day after the initial evaluation and had a score of 78.75% in which he identified squatting, recreational activities, making sharp turns, and hopping to be at least moderately difficult. A complete picture of his progression including NPRS scores and LEFS scores is shown in Table 1.

After evaluation, it was determined that the patient had a patellar tendinopathy of the left knee. The patient was set to compete in the ASUN Indoor Track and Field Championships in less than two weeks from the initial evaluation. The main goal was to decrease his pain enough to allow for the best performance possible. The initial treatment given to the patient on the day of

Table 1: Timeline and Patient Reported Outcomes

Initial Evaluation and Treatment ***02/18/2020***		
	Status	**Treatment/Intervention**
	NPRS* – 7/10 jumping 7/10 running 2/10 resting LEFS** – 78.75	Ultrasound Glute strengthening exercises Hip mobility exercises Stretching Patellar tendon Strap
Second Evaluation and Treatment ***02/24/2020***		
	NPRS – 4/10 jumping 2/10 running 0/10 resting	Ice cup massage Glute strengthening exercises Hip mobility exercises Stretching Power/speed exercises Patellar tendon strap
Final Evaluation and Treatment ***02/27/2020***		
	NPRS – 2/10 jumping 0/10 running 0/10 resting	Stretching Hip mobility exercises Ultrasound

*NPRS = Numeric Pain Rating Scale
**LEFS = Lower Extremity Functional Scale

evaluation consisted of premodulated electrical stimulation for 10 minutes, ultrasound (1.0 W/cm^2, 3.3MHz using a numbing cream with ultrasound gel as the medium for 5 minutes), along with rehabilitation exercises targeting glute strengthening and increasing hip mobility. The patient was also instructed in foam rolling and stretching for the lower extremity. A complete table of the rehabilitation exercises used for the first week is shown in Table 2. The patient was allowed to continue in practice while sitting out of jumping events and practicing all other events. The patient also wore a patellar tendon strap during practice and reported it helped with the pain.

Second Evaluation

The second evaluation took place 6 days following the diagnosis on February 24th, 2020 which was 4 days prior to the ASUN Indoor Track and Field Championships. At this time the patient had been performing consistent rehabilitation shown in Table 2 for four days and taking the weekend off to rest. Since the first evaluation, the patient minimally participated in practice by participating in all running and throwing events but sitting out of most jumping events including long jump, high jump, and pole vaulting. On this day, the reevaluation took place prior to practice. He reported his pain to be a 4/10 while jumping in practice during the previous week, 2/10 when running, and 0/10 currently on the National Pain Rating Scale (NPRS). The patient scored a 96.25% on the LEFS when taken before practice, in which he identified minimal difficulty with recreational/sporting activities, making sharp turns, and hopping. The patient reported no pain at the time of evaluation. All range of motion was equal and pain free. The paint was not tender to palpation and reported pain only during activity. Following the evaluation, the patient performed rehabilitation which began to be more intensive as shown in

Table 2: Week 1 Rehabilitation Exercises

Week 1 Rehabilitation Exercises (usually, 3x10 for each exercise; single leg exercises performed bilaterally)	
Strengthening	Hip Mobility
Lateral side steps with band Monster walks with band Hip abduction with band Fire hydrants Single leg balance with ball toss Single leg balance cup touches Step downs Split squats with kettlebell Banded glute bridges Clams with band	Pretzel leg movements (shown in figure 1) Iron crosses IT band stretching Hip flexor stretching Foam rolling (full lower body) Piriformis Release

Table 3 and then participated in practice. The patient was instructed to attempt a full practice including all jumping activities. The patient attempted long jump, performing a few trials, then reported pain as a 1/10 when landing in the sand. Following long jump, he did not participate in high jump due to pain, but attempted running and was able to complete a 300m, 200m and 100m all without pain.

This evaluation was at the beginning of the second week of rehabilitation. During this week, the rehabilitation was advanced to include more power, speed, and sport specific activity with a focus on jumping. Due to the pain experienced during long jumping, a special focus was placed on landing on unstable surfaces, so a bosu ball was incorporated into many exercises. The patient performed rehabilitation each day before practice, as well as receiving treatment following practice and attempting all events in practice until pain became limiting. The rehabilitation included more advanced exercises as well as simple exercises to maintain hip mobility. These exercises are shown in Table 3 and show what the patient performed each day until the meet.

Final Evaluation

The final evaluation occurred on Thursday, February 27, 2020 which was the day before the competition. During this evaluation the patient reported pain as a 0/10 currently and during activity. He stated some jumping activities produced pain equal to a 1/10 or 2/10 on the NPRS. Since the second evaluation, the patient had practiced including long jump and high jump; however, he did not practice pole vaulting. The patient also dealt with a fear of the pain being reproduced which could have played a role in the excessive limitation from activity during the second week of rehabilitation. During this evaluation, the patient had a LEFS score of 97.5%, in

Table 3: Week 2 Rehabilitation Exercises

Week 2 Rehabilitation Exercises (usually 3x12 or 3x15 for each exercise; single leg exercises performed bilaterally)	
Strengthening	Hip Mobility
Lateral side steps with band Monster walks with band Fire hydrants Single leg balance with ball toss Banded glute bridges Split squats with kettlebell **Added progressed exercises:** Side lunges onto bosu ball Forward lunges onto bosu ball with kettlebell Lateral jumps onto bosu ball Lateral step ups Box jumps Single leg hops (horizontal and vertical) Burpees	Pretzel leg movements (shown in figure 1) Iron crosses IT band stretching Hip flexor stretching Foam rolling (full lower body) Piriformis Release

which he reported minimal difficulty with making sharp turns and hopping. During the day before competition, the practice consisted of light activity and run throughs in order to avoid soreness on the day of competition. Rehabilitation was light and consisted of pain relief treatment, stretching, and mobility exercises.

On the day of competition, the patient warmed up with heat before performing. The championships were a two day event for the heptathletes, and on the first day, they participated in long jump, high jump, shot put, and 60 meter dash while the second day included pole vaulting, 60 meter hurdles, and the 1000 meter run. Following the first day, the patient presented with minimal pain following the jumping. For treatment the patient was given an ice cup massage and instructed to rest. The patient warmed up in the same way on the second day, and following the events, he presented with more pain due to pole vaulting, but was able to finish the competition. The patient placed third in the competition and was able to perform all events. The patient reported feeling good and only having minimal limitation due to pain. During the following weeks, the patient learned his list of exercises and continued rehabilitation on his own in order to maintain mobility and prevent pain. Further evaluation and rehabilitation during outdoor season was not possible due to the abrupt end to the season caused by the coronavirus.

Discussion

Treatment of patellar tendinopathy can be difficult because the pathology can arise from many different causes. There are many resources to assist with temporary pain relief, but a permanent, consistent treatment plan has yet to be identified. Most studies examine treatment for this pathology on a long-term basis, meaning the patient would undergo that treatment for months. There has been minimal research on the short-term effects of treatment for patellar

tendinopathy. Short-term treatments that are considered successful are usually different types of injections. This study is an attempt to find a treatment that will work both short-term and long-term and does not require injections. This study could also point to a possible prevention program for athletes who have certain predisposing factors for patellar tendinopathy.

In a study comparing the use of a PRP injection with rehabilitation, each group participated in rehabilitation while one group received a PRP injection and the other received a saline injection. This study showed almost equal results between the two groups meaning that the PRP injection did not produce a significant effect, and after 6 weeks, the PRP group actually showed a worsening of the condition.[19] A another study compared the effects of eccentric exercise, heavy slow resistance exercise, and a corticosteroid injection on the symptoms of patellar tendinopathy after 3 months. In the beginning all three treatments appeared to be beneficial, but as time went on, the effects of the steroid injection deteriorated while the eccentric and heavy slow resistance exercise maintained their results.[20] These studies show that effective rehabilitation can produce equal or better results than injections and steroids not only in the short term impact but also for the long term results.

It is safe to say that treatments like steroid injections are only temporary, and they can be beneficial but have to be continually used. Treatments that involve other forms of rehabilitation may be slower at first, but they will allow for more long-term relief for the athlete than the injections. Surgery is always an option, but if the athlete can manage the condition with more conservative treatments or use preventative protocols to decrease severity, the outcome will be much better long-term. There are many different paths when treating patellar tendinopathy. Many factors such as age, sport, level of play, and personality can all help determine the best

route to take for treatment. All aspects should be considered when identifying the best treatment for each athlete.

Limitations in this case study include a multitude of variables that accompanied the rehabilitation. The patient began wearing a patellar tendon strap following the initial evaluation, so it is unclear if this could have played a role in pain relief, and if so, how much pain relief the strap provided compared to the glute strengthening and hip mobility exercises. A randomized control trial studying effectiveness a patellar tendon strap found that it does reduce pain, but no more than a placebo taping that was tested.[13] Therefore, the strap may have caused a reduction in pain in this study, but it is unclear if that is due to the actual strap or the placebo effect. Another limitation includes the fact of testing two treatment methods including both the glute strengthening and increasing hip mobility. The treatment plan has shown to be successful in this study; however, it is unclear which treatment plan provided the best effect or if they were equally responsible for the pain reduction. Studying each method independently and comparing results would allow the clinician to better understand which treatment is more successful. Lastly, the designated treatment plan lasted for two weeks followed by a competition which was followed by light practice before the beginning of outdoor practice. Outdoor meets were unable to be attended due to the coronavirus closings, so the long-term implications of this treatment are unknown. It is obvious that the treatment plan was successful short-term, but the long-term impact is unable to be determined at this time. Future studies should allow for more time to discover the long-term effects on the athlete without outside circumstances interfering.

Conclusion

The purpose of this study was to determine the effects of glute strengthening and increasing hip mobility on a track and field athlete suffering from patellar tendinopathy . The results show that these treatments were successful in decreasing pain and allowing the patient to be more functional. This study shows short-term results for this specific plan that was made for this specific athlete. Future studies should examine more long-term effects of these treatments, as well as study each treatment individually in order to determine the effect of each. This information could also be used to create specialized prevention programs for athletes who are predisposed to patellar tendonitis. This information could assist the health care profession in discovering the most effective and proficient treatment for a patellar tendinopathy in athletics.

Figures

Figure 1: Hip squares – patient switches leg positions back and forth while feet remain in same place. Increase hip rotation and mobility

Figure 2: Side lunges onto bosu ball – progression involves patient jumping rather than stepping

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