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RESEARCH ARTICLE

Kinesio Tape 14-Day Application Cycle: A Case Study

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ABSTRACT
This study utilized a 14-day application cycle of Kinesio tape which is a longer version of the current application period with the goal to extend the effect of the treatment on the immediate effect on perceived pain, pain free range of motion, overhead squat analysis, and the athlete's perceived performance. Kinesio Tape was applied to the athlete for five days, and then removed for a two-day rest period and then repeated. Pre/post-assessments consisted of an overhead squat analysis, pain free range of motion of the hip, knee, and ankle, perceived pain, and perceived performance. There was a significant increase in pain free range of motion for two of the eight joint actions assessed [left hip internal rotation ($p=0.03$) and left ankle plantarflexion ($p<0.01$)]. Furthermore, participants significantly improved their overhead squat assessment score from pre (5.4±1.8) to post (3.5±1.8) Kinesio Taping ($p<0.01$). Lastly, participants reported a significantly lower level of perceived pain ($p<0.01$) and a significantly higher level of perceived performance ($p<0.01$) after the usage of Kinesio Tape.

KEYWORDS: Kinesio Tape ; Overuse Injuries ; Lower Extremities ; Rrehabilitation

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INTRODUCTION

Overuse injuries occur when repetitive stress is applied to a muscle, tendon, or bone, ultimately resulting in microtraumatic damage when adequate time to heal or repair has not been allotted [1]. Nearly 50% of injuries presenting to pediatric sports medicine practices are related to overuse. Several body malalignments of the lower extremities can predispose young athletes to overuse injuries. These malalignments can contribute to tracking abnormalities of the patella, stress injuries, and other chronic conditions of the hip, knee, and ankle particularly for athletes that participate in running activities [2].

There are a few different treatment options for overuse injuries depending on the severity. General guidelines for treating overuse injuries is rest, modified or scaled down physical activity regimen, medication, and physical therapy [3]. Conservative treatment for overuse injury requires the affected area to be rested and occasionally kept non-weight bearing or splinted [4]. However, this treatment must be balanced with the significant known side effects of immobilization. Immobilization should not be employed, and care should be used to avoid placing the muscle in a shortened position. Passive motion should be employed as early as pain allows [5]. Student athletes' time is divided between being sedentary (for class) and high intensity exercise for their sport. A rehabilitation technique that can last longer than one day and assist the athletes' healing in non-training or competitive circumstances would reduce injury healing time and assist in preventing further injury [6].

Kinesio Taping has become popular since its major showing in the 2008 Olympics. It was designed to promote positive physiological effects on several body systems, which include: circulatory/lymphatic [7-8], neural [9-10], muscular [11-12], as well as the joints [13-14]. Kinesio Tape is usually applied over muscles to reduce pain and inflammation [15-16], relax overused tired muscles [17-18], and to support muscles in movement [19-20] on a 24 hour/day basis. Current research in Kinesio Taping has shown beneficial effects on posture [21] decrease acute injury healing time [22-23], and shown positive effects on tendonitis [24-25].

While these studies have shown promising positive effects on healing and pain management, all have stated that there needs to be more research into the long-lasting effects on motor skills and functional performance over a longer

period [26]. Of all the published research articles related to Kinesio Tape (KT), none examined the athletes' perceived effectiveness of KT on their healing time and performance. This study utilized a 14-day application cycle of Kinesio tape which is a longer version of the current application period with the goal to extend the effect of the treatment on the immediate effect on perceived pain, pain free range of motion, overhead squat analysis, and the athlete's perceived performance

MATERIALS AND METHODS

This study was conducted on student athletes at a small private university that had been identified by a certified athletic trainer as diagnosed with overuse injury of the lower extremity on a voluntary basis. To be eligible for this study, a student athlete must have been diagnosed with an overuse injury such as Achilles tendonitis, medial tibial stress syndrome (MTSS or more commonly, shin splints), iliotibial band syndrome, patellar tendonitis, or plantar fasciitis.

Participants

There were four (40%) females and six (60%) males that participated in the study (n=10). Seven of the respondents indicated that they had not attended a rehabilitation session and three of them indicated that they did attend a session. With respect to sport, one (10%) played basketball, three (30%) played football, and six (60%) were on the track and field team. Seven (70%) of the respondents reported that they were in season while three (30%) of them reported that they were in the off-season.

Procedures

Functional movement analyses are commonly performed to evaluate the risk of developing a knee or lower extremity injury and have been used as common practice for athletic trainers, physical therapists, and exercise physiologists. Conclusions are then made about muscle strength, flexibility, and activation during these screenings based upon observed movement patterns. Lower extremity movement screenings are commonly used to assess dynamic postural alignment and identify individuals at high risk for injury [27]. For this study, an Overhead Squat Analysis was used to analyze functional movement in the participants. With the exception of the toe out movement pattern characteristic, results showed that the Overhead Squat Test is a reliable tool for identifying faulty movement patterns [28].

Pain-free active Range of Motion (ROM) was measured via the use of a Universal Goniometer. Active ROM is movement of a joint provided entirely by the individual performing the exercise. In clinical practice the amount of pain relief, assessed by pain-free active ROM, is often considered as a measure of the efficacy of treatment [29]. For this study, the following areas were measured for pain free active ROM: Hip Internal Rotation, Hip External Rotation, Hip Flexion, Hip Extension, Knee Flexion, Knee Extension, Ankle Dorsiflexion, and Ankle Plantarflexion.

Strong research evidence suggests that one's perception of ability or self-confidence is the central mediating construct of those achievement strivings [30]. So being able to gauge one's own perceived performance during a treatment process will assist the practitioner in the correct treatment path. To identify Perceived Performance within this study, a Likert-Type Rating Scale was used for pre-assessment, using the following question and rating: Since I have been injured, my performance has gotten: Much Better, Somewhat Better, Better, No Difference, Somewhat Worse, Much Worse. The question was slightly modified for the post-assessment, Since completing my treatment, my performance has gotten: Much Better, Somewhat Better, No Difference, Somewhat Worse, Much Worse.

This case study used participants in a 14-day application cycle of Kinesio Tape to assist in the treatment and healing of overuse injuries of the lower extremities in collegiate athletes. The research team consulted with the university athletic trainers on a daily basis identifying athletes with possible chronic overuse injuries of the lower extremities, such as: Achilles tendonitis, MTSS, iliotibial band syndrome, patellar tendonitis, and plantar fasciitis. Once an athlete with overuse injury was identified, the participant was considered eligible for the study.

The pre-assessment included: overhead squat analysis, perceived pain (0-10 Numeric Pain Rating Scale), pain free range of motion of the hip, knee, and ankle by use of Universal Goniometry, and perceived performance using a Likert-Type Rating Scale. After the pre-assessment, Kinesio Tape was applied to the athlete by the research team for a period of five days. The Kinesio Tape was then removed for a two-day rest period and then reapplied for another five days followed by a two-day rest period.

After the 14-day trial period, a post-assessment was conducted identical to the pre-assessment. The results of the post-Tape assessment were compared to those from the pre-assessment to determine the measured and perceived impact of Kinesio Tape.

Kinesio Tape Application

Initial application of Kinesio Tape included three application techniques. All participants received a Circulatory/Lymphatic Correction application as the first Kinesio tape application, using the "Fan Cut," "Basket Weave," or "Web Cut" techniques respectively depending on location of their overuse injury. After the Circulatory/Lymphatic Correction was applied the second layer of Kinesio Text Tape was applied using the Inhibition technique to relax the overused muscle. Lastly, a Functional Correction technique was used to assist in the movement or limit the motion, depending on the issue, over the affected joint. An Inhibition technique was used using an "I Strip", "Y Strip", or "X Cut." In some instances, a Mechanical Correction was used instead of a Functional Correction to maintain full and functional active range of motion during time of required activity.

Second application of Kinesio Text Tape included two to three application techniques. All participants received a Functional Correction, to limit the active range of motion (AROM) of the injured muscle(s). A Facilitation technique was used, using "I Strip", "Y Strip", or "X Cut" around 25% tension of the Kinesio Text Tape.

Statistical Analyses

Descriptive Statistics were utilized to describe the demographic data. Dependent t-tests were utilized to determine the differences between the pre and post testing assessments (alpha = .05).

RESULTS

The athletes' pain free range of motion was measured pre and post Kinesio Taping via goniometry for the following joint actions on both the right and left sides: Hip internal rotation, hip external rotation, hip flexion, hip extension,

knee flexion, knee extension, ankle dorsiflexion, and ankle plantarflexion. Dependent t-tests revealed that there was a significant increase in pain free range of motion for the left internal hip rotation ($p=0.03$) and left ankle plantarflexion ($p<0.01$) after Kinesio Taping. No other significant differences were found in pain free range of motion for the aforementioned joint actions.

Athletes rated their perceived pain on a 0-10 scale pre and post Kinesio Taping (0 = no pain; 10 extreme pain). A dependent t-test revealed that athletes reported a significantly lower perceived pain score from pre (6.8±1.1) to post Kinesio Taping (1.4±1.0) ($p<0.01$).

In addition, athletes performed an overhead squat analysis. Each criterion for the overhead squat was awarded a point value based upon the successful completion of the criterion. If athletes passed a criterion, they were awarded a score of zero (0). If athletes failed to meet a criterion, they were awarded a score of one (1). Point values were added for each athlete pre and post Kinesio Taping. A dependent t-test revealed a significantly lower (i.e. better) overhead squat score from pre (5.4±1.8) to post (3.5±1.8) Kinesio Taping ($p<0.01$).

Lastly, athlete's perceived performance was assessed on a 5-point scale (1=poor performance, 5=highest level of performance) pre and post Kinesio Taping. A dependent t-test revealed a significant increase in perceived performance from pre (2.0±0.5) to post (4.4±0.5) Kinesio Taping ($p<0.01$).

CONCLUSION

This study utilized a 14-day application cycle of Kinesio tape which is a longer version of the current application period with the goal to extend the effect of the treatment on the immediate effect on perceived pain, pain free range of motion, overhead squat analysis, and the athlete's perceived performance. Through the implementation of a 14-day application cycle of Kinesio Tape, it was found to assist in increasing perceived performance while decreasing pain in athletes with overuse injuries, without limiting their physical activity levels or decreasing time spent practicing. The prolonged use of Kinesio tape not only assisted in the improvement of athletes perceived performance but also in correcting movement compensating as discovered in the Overhead Squat Analysis.

With these positive findings this research may be turned into a protocol for assisting with reducing time off from their sport due to overuse injuries. This will be extremely beneficial as student athletes' time is divided between being sedentary (for class) and their required attendance in a high intensity exercise regime. This can be used in conjunction with a rehabilitation program to assist in reducing pain while taking part in sport-related activities. It may also decrease the occurrence of future movement compensation-based injuries due to the prolonged application effect on correcting movement adaptations found with the overhead squat analysis.

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AUTHORS' CONTRIBUTIONS

The participation of each author corresponds to the criteria of authorship and contributorship emphasized in the Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals of the International Committee of Medical Journal Editors. Indeed, all the authors have actively participated in the redaction, the revision of the manuscript, and provided approval for this final revised version.

COMPETING INTERESTS

The authors declare no competing interests with this case.

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