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The Effect of Kinesio Tape on Muscle Strength During Standing Long Jump Performance

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Abstract

For over two decades, Kinesio tape has been used to improve athletic performance and as a therapeutic method. However, its effect on muscle strength remains debatable since the research was not conclusive in this area. Therefore, the purpose of this study was to evaluate the immediate effect of Kinesio tape on the Gastrocnemius muscle strength during standing long jump performance (SLJ). Thirty recreationally active healthy young adults, all males (n=30) age 22.3 ± 1.3 years, height 172.6 ± 5.6 cm, weight 63.8 ± 12.6 kg, were recruited from Umm Al-Qura University students to participate in this experiment. During two visits, each participant performed 6 standing long jumps (SLJ), three while taped. A paired sample t-test was conducted to evaluate the differences. A significant difference was found between the pre- and post-taping means with 80% of the participants improving their performance while taped. This result supports the claim that Kinesio taping can improve muscle strength when applied from the muscle origin to its insertion. In addition, the results highlight the immediate impact of Kinesio tape on muscle function and performance.

Keywords*:(Kinesio Tape, Immediate Effect, Standing Long Jump, Muscle Strength, Gastrocnemius Muscle)*

Introduction:

In sports, taping is commonly used by physiotherapists and athletes as an injury prevention method and as a treatment for various injuries. The primary purpose of most tapes is to improve proprioception and, by extension, lower the risk of injury (Garcia-Muro et al., 2010). Those purposes depend mainly on the features of the tape and its application.

Kinesio taping is a form of therapeutic taping created in the 1970s by a Japanese chiropractor named Kenso Kase (Williams et al., 2012). However, worldwide recognition began when it was widely used in the 2008 Olympic Games held in Beijing, China. It's different from other forms of rigid tape due to its elasticity, which allows for extension up to 140% of its initial length, providing less mechanical limitation of movement (Bassett et al., 2010; Thelen et al., 2008). Its thickness is intended to be similar to that of the epidermis of human skin, as it was designed to simulate that layer (Kase et al., 2003).

In addition to enhancing proprioception by means of constant cutaneous afferent stimulation to the skin, Kinesio tape is also known to improve joint function, stimulate sensory mechanisms, decrease pain as a result of reduced neurological activation, increase blood and lymph circulation to the area by means of lifting fascia and soft tissue, realign fascia tissue function by normalizing muscle tension, and improve muscle function (Hsu et al., 2009; Kase et al., 2003). Despite the debate surrounding their genuine merit, a variety of practitioners are familiar with the qualities and applications of these tapes and may utilize them as needed (Alexander et al., 2008; Castro-Sánchez et al., 2012; Garcia-Muro et al., 2010; Kase et al., 2003; Thelen et al., 2008). This is true regardless of the plausibility and effectiveness of employing these tapes, as they are intended to be used in tandem with regular physical therapy, modalities, and therapeutic exercises (Kase et al, 2003).

Furthermore, muscle performance can be enhanced with the use of Kinesio tape by stimulating the contraction of weak or otherwise dormant muscle groups (Lemos et al., 2015). KT increases the amount of motor units recruited during muscle contraction by tensioning the skin, which enhances communication with mechanoreceptors (Kase et al., 2003). That was proven in several studies that reported enhanced muscle strength with KT for a variety of muscle groups (Altas et al., 2021; Anandkumar et al., 2014; Buke & Unver, 2020; El Gendy et al., 2017; Kim & Kim, 2016; Lee et al., 2010; Lemos et al., 2015; Öztürk et al., 2016; Yam et al., 2019). However, many other studies failed to find any significant differences in muscle strength when comparing KT applications with other types of taping methods or a placebo (Csapo & Alegre, 2015; Cai et al., 2016; De Hoyo et al., 2013; Karahan et al., 2017; Kırkaya & Kaçoğlu, 2020; Limmer et al., 2020; Mak et al., 2019; Nakajima & Baldridge, 2013; Nunes et al., 2013; Vercelli et al., 2012; Wong et al., 2012).

The standing long jump (SLJ) test is a valuable indicator of lower extremity muscular strength, and it is being widely used since it is convenient, time-efficient, and requires little resources (Castro-Pineros et al., 2010). During jumping activities, several muscle groups contribute significantly to the performance, one of which is the gastrocnemius muscles (Bobbert et al., 2011; Wu et al., 2010). Hence, the purpose of this research was to examine the immediate effect of KT on the Gastrocnemius muscle strength during SLJ performance in an attempt to increase knowledge about the benefits of KT in athletic performance.

Methods:

Participants

Thirty healthy young adults, all males (n=30), participated in this experiment. Untrained recreationally active subjects were recruited using advertisements on the Umm Al-Qura campus from a general population of undergraduate students. All participants were screened upon recruitment for injuries and Kinesio tape knowledge. Participants with any injuries, especially to the lower extremities, in the last 6 months were excluded from the experiment. Also, any participant who identified the Kinesio tape as a performance enhancement method was excluded.

All participants read and signed an informed consent, and they were naive to the purpose of the experiment. All participants were instructed to wear athletic shorts and shoes during the experiment, and they were asked to shave the taping area before coming to the testing location.

Procedures

The participants were asked to visit the laboratory on two separate occasions, in which they performed three standing long jumps each visit. Each subject started by performing a 5-minute warm-up on a stationary bike at a medium intensity level, followed by a 2-minute seated rest. The instructions given to the subjects were standardized. They were asked to begin the jump with bent knees and swing their arms to maximize their jump. A line drawn on a hard surface served as the starting line and the jump length was determined using a measuring tape from the starting line to the closest body part that touched the ground.

During their first visit, all participants performed three standing long jumps (SLJ) without KT, with 2-minute seated rests between jumps. All attempts were recorded on a data collection sheet and the average of the three pre-tape jumps was calculated. After 24 hours, a second visit took place, which started with the same warm-up procedure. After the warm-up, all participants had their Gastrocnemius muscles taped using a Y-shape (KT) with 15% to 25% tension starting from the muscle origin to its insertion, covering the entire Achilles tendon. The participants, then, performed another three jumps with the same instructions as before and with a 2-minute seated rest between jumps. All data was collected on the data sheet and the average score was calculated. In addition, the sheet was used to collect all participants' demographic information.

Statistical Analysis

A paired sample t-test was conducted to evaluate the differences between the means in the SLJ for the pre-tape and post-tape jumps. Statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS) with a predetermined significance threshold of 0.05. Furthermore, a comprehensive examination of the demographic characteristics of the subjects was conducted.

Results

Participants

Thirty undergraduate male students at Umm Al-Qura University participated in this experiment. The average age, height, and weight of the subjects were 22.3±1.3 years, 172.6±5.6 cm, and 63.8±12.6 kg, respectively (Table 1).

(Table 1)

The participants' demographic information

Variables	*N*	*Minimum*	*Maximum*	*Mean and SD*
Age	***30***	***21 y***	***26 y***	***22.33±1.348***
Height	***30***	***165 cm***	***185 cm***	***172.57±5.649***
Weight	***30***	***43 kg***	***96 kg***	***63.83±12.608***
Valid N (listwise)	***30***			

Data mean ± SD and range, BMI (kg/m^2) = Body Mass Index.

The average of the three standing long jumps (SLJ), both with and without tape, was calculated. A paired-sample t-test was conducted to compare the mean score of the standing long jump (SLJ) without tape to the mean score with tape. The average SLJ score in the without-tape condition was found to be 191.63 cm, with a standard deviation of 20.73. Conversely, the average SLJ score in the taped condition was determined to be 195.03 cm, with a standard deviation of 21.38. A statistically significant difference was seen between before and after taping the muscle (t=-6.023, p=0.00) (Table 2).

(Table 2)

Paired Sample Test

Measurements	*Mean*	*N*	*Std. Deviation*	*Mean Differences*	*T*	*Sig.*
Pre-taping	***191.63***	***30***	***20.732***	***3.4***	***6.023***	***0.000***
Post-taping	***195.03***	***30***	***21.381***			

***Statistically significant differences between groups**
Values are means ± SD.
p<0.00.

After applying the KT, 24 participants (80%) showed an increase in jumping distance, whereas 5 participants (17%) decreased their jumping score, and only 1 participant (3%) jumped the same distance.
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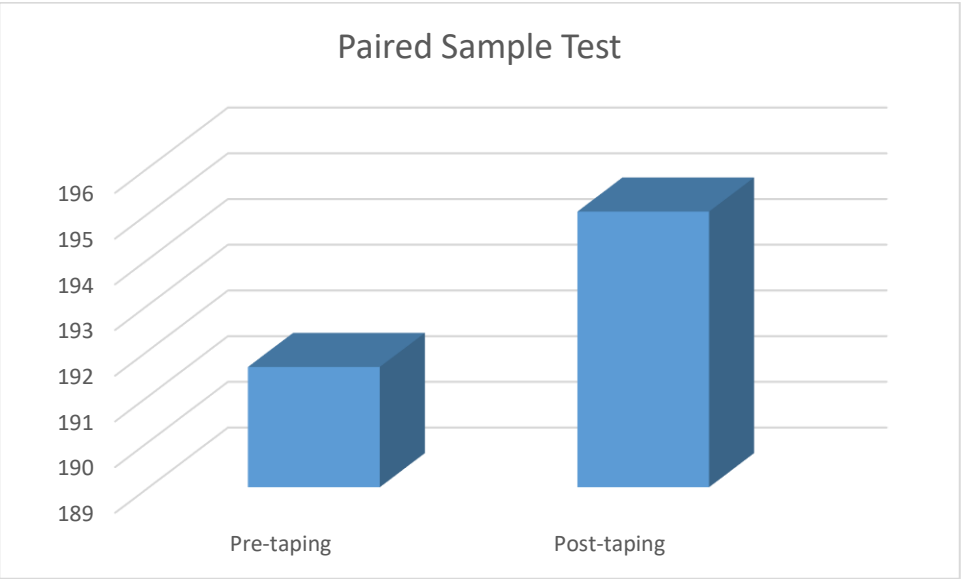
Figure (1)
Paired Sample Test



Discussion

This study was designed to investigate the immediate effect of KT on the Gastrocnemius muscle strength during SLJ performance for young adults. The results of this study support the claim that KT improves muscle strength when applied properly. The participants in this study were healthy male college students, despite the fact that the KT handbook states that "it is designed to inhibit the activity in either an over-used or over-stretched muscle, which already has decreased stimulus." These findings are consistent with a number of studies in which muscle strength was improved. Despite the current surge in popularity of KT, there is a dearth of empirical information regarding its efficacy in enhancing muscular function. The inquiry over whether certain KT procedures can enhance the development of significant muscle strength has been a subject of ongoing debate in recent years. Advocates of the method argued that positioning the KT tape at the muscle's point of genesis would lead to a notable enhancement in muscle strength. While the explanation of the underlying physiological principles was not sufficiently persuasive, it is suggested that cutaneous stimulation, specifically targeting type 2 mechanoreceptors located deep within the dermis, may lead to greater activation of motor units and consequently result in an enhancement of muscular strength (Csapo & Alegre, 2015). The level of tape tension applied in kinesiology taping (KT) varies depending on the desired outcome. According to the literature (Kase et al., 2003), different levels of tape tension are recommended for various therapeutic effects. For myofascial effects, a tape tension ranging from 0% to 10% is suggested. Muscle inhibition can be achieved with a tape tension of 10% to 15%, while muscle facilitation requires a tension of 15% to 25%. Correction of musculoskeletal imbalances is typically achieved with a tape tension of 25% to 35%. For ligament-tendon correction and mechanical correction techniques, a tape tension of 50% to 75% is recommended. Lastly, mechanical correction and ligament correction techniques call for a tape tension of 75% to 100%. It is important to note that a 5-cm section of tape with 0% tension should be applied at both the beginning and end of the tape application. The effects of tape on maximal grip strength and key pinch strength in healthy volunteers were studied by Donec et al. (2012) The researchers employed the KT technique, applying it from the point of muscle attachment to its insertion while maintaining a tension range of 15% to 25%. It was observed that there was an increase in key pinch strength following a duration of 30 minutes, whereas maximum grip strength exhibited an increase after a subsequent duration of one hour. No significant differences were identified between the placebo and control groups, as reported by the authors (Donec et al., 2012). In the present investigation, the Kinesiology Tape (KT) was utilized with a tension range of 15% to 25% in order to induce muscular facilitation.

According to the findings of Kase et al. (2003) the direction in which the KT is applied can either stimulate or inhibit muscle activation. The utilization of tape, applied from the muscle's insertion to its origin, may result in motor neuron inhibition. This inhibition is believed to occur through the

stretching of the Golgi tendon organ, which is situated in the insertion region of the muscle. The tape's elastic retraction property is thought to contribute to this effect. Conversely, when the tape is applied from the muscle's origins to its insertion, it is hypothesized to induce muscle spindle reflex contraction (Słupik et al., 2007). In our investigation, we implemented a taping technique that involved applying tape from the origin to the insertion site in order to induce muscular facilitation. The theoretical framework posits that KT has the potential to enhance the activity of motor neurons when applied to stimulated skin mechanoreceptors (Yeung & Yeung 2016). Taping is utilized to offer sensorimotor feedback, which has been reported by patients to result in symptom alleviation and enhanced stability of the corresponding joint. The suppleness of KT ensures both skin compatibility and enhanced ease of movement. Consequently, the observed outcomes include reduced discomfort, enhanced or diminished muscle strength, and an expanded range of motion.

Diverse outcomes were derived from the investigations examining the impact of KT treatment on muscular strength. The treatment of KT on knee extensors resulted in an enhancement of peak torque in healthy individuals (Yeung & Yeung 2016). In a separate investigation, the utilization of KT was found to enhance leaping performance and increase knee extension peak torque at a velocity of 180°/s in both the dominant and non-dominant limbs (Aktas & Baltaci, 2011). Aktas and Baltaci (2011) proposed that the application of KT for mechanoreceptor stimulation may yield tactile enhancements and contribute to the enhancement of muscular function in individuals without any underlying health conditions. Karatosun et al. (2019) conducted a study to investigate the impact of Kinesio taping (KT) on the quadriceps and hamstring muscles in a sample of 20 individuals who were in good health. The research findings indicated that the application of KT yielded notably superior outcomes in terms of the initial peak torque and overall work of the flexor muscles immediately following the application, as well as at the 24-hour and five-day post-application intervals (Karatosun et al., 2019). Consistent with their investigation, we observed an instantaneous enhancement in peak torque and total work subsequent to the administration of KT.

In recent years, there has been widespread utilization of KT, not only for the purpose of enhancing athletic performance but also for augmenting the physical capabilities of those who are in good health (Bayrakci et al., 2008). The study conducted by Mostert-Wentzel et al. (2012) aimed to investigate the impact of kinesiology tape (KT) on the explosive muscle strength of the gluteus maximus in male athletes. A considerable increase in muscle strength was found in the group that received the KT application, specifically 30 minutes following the intervention. Consistent with this discovery, our study observed an augmentation in muscle strength following a 30-minute treatment of KT. Applications conducted using the KT method elicit a skin elevation in the targeted area, resulting in an expansion of subcutaneous tissues. Consequently, these applications contribute to the alleviation of pain in the affected muscles and joints while simultaneously enhancing blood and lymphatic circulation (Williams et al. 2012). Csapo and Allegre (2015) conducted a comprehensive analysis of 19 studies that investigated the impact of Kinesio taping (KT) on muscle strength. It was observed that eight of the trials demonstrated a statistically significant enhancement in muscle strength while employing KT. In contrast, a total of 11 investigations indicated that there was no statistically significant distinction observed between the placebo or control groups (Csapo & Alegre, 2015). It has been postulated that KT may enhance the rate of muscle strength gains by exerting a concentric force on the fascia, hence potentially eliciting muscle contractions (Morris et al., 2013; Williams et al., 2012). In an alternative theoretical framework, it has been proposed that KT may impact muscle strength through its facilitative effect on muscle activation (Kase et al., 2003; Kim & Shin, 2017). While the existing literature presents mixed findings on the impact of KT on muscle strength, it is necessary to conduct a more comprehensive study using a larger sample size in order to ascertain the potential benefits of KT. Moreover, some research has indicated that the use of KT does not have an impact on muscle strength. In their study, Keenan et al. (2017) found no statistically significant difference in shoulder muscle strength between people with subacromial impingement syndrome who received placebo taping and those who did not. In their study, Buke and Unver (2020) found that tape did not lead to meaningful change. However, a statistically significant result was observed in the trunk muscles of female athletes after a 48-hour period. The measurements were conducted at a time interval of 30 minutes in order to ascertain that the activation of KT in our investigation is distinct from that observed in the study conducted by Buke and Unver (2020) It was hypothesized that the attainment of KT activation may require a designated temporal parameter.

Conclusion:

In summary, a notable enhancement in muscular strength was instantly found among young adults after applying KT. Hence, it is proposed that applying KT may potentially enhance muscle strength among the general population during SLJ activity. Research employing placebo interventions and diverse taping methodologies among athletes involved in various sporting disciplines has the potential to make valuable contributions to the existing body of scholarly research.

References:

1. **Aktas, G., & Baltaci, G. (2011)**. Does kinesiotaping increase knee muscles strength and functional performance?. *Isokinetics and Exercise Science, 19*(3), 149-155.
2. **Alexander, C. M., McMullan, M., & Harrison, P. J. (2008).** What is the effect of taping along or across a muscle on motoneurone excitability? A study using triceps surae. *Manual therapy, 13*(1), 57-62.

3. **Altaş, E. U., Günay Uçurum, S., & Ozer Kaya, D. (2021).** Acute effect of kinesiology taping on muscle strength, tissue temperature, balance, and mobility in female patients with osteoarthritis of the knee. *Somatosensory & Motor Research, 38*(1), 48-53.
4. **Anandkumar, S., Sudarshan, S., & Nagpal, P. (2014)**. Efficacy of Kinesio taping on isokinetic quadriceps torque in knee osteoarthritis: a double blinded randomized controlled study. *Physiotherapy Theory and Practice, 30*(6), 375-383.
5. **Bassett, K. T., Lingman, S. A. & Ellis, R. F. (2010).** The use and treatment efficacy of kinaesthetic taping for musculoskeletal conditions: a systematic review. *New Zealand Journal of Physiotherapy, 38*(2), 56-62.
6. **Bayrakci Tunay, V., Akyuz, A., Onal, S., Usgu, G., Dogan, G., Teker, B., & Cinar, O. (2008)**. Comparison of the instant effects of Kinesio and McConnell patellar taping on performance in patellofemoral pain syndrome. *Turkish Journal of Physiotherapy Rehabilitation-Fizyoterapi Rehabilitasyon, 19*(3), 104-109.
7. **Bobbert, M. F., Van Der Krogt, M. M., Van Doorn, H., & De Ruiter, C. J. (2011).** Effects of fatigue of plantarflexors on control and performance in vertical jumping. *Medicine and Science in Sports and Exercise, 43*(4), 673-684.
8. **Buke, M., & Unver, F. (2020)**. Effects of Kinesio tape application to trunk isokinetic strength in female participants. *Research in Sports Medicine, 28*(3), 303-313.
9. **Cai, C., Au, I. P. H., An, W., & Cheung, R. T. H. (2016).** Facilitatory and inhibitory effects of Kinesio tape: Fact or fad? *Journal of Science and Medicine in Sport, 19*(2), 109-112.
10. **Castro-Piñero, J., Ortega, F. B., Artero, E. G., Girela-Rejón, M. J., Mora, J., Sjöström, M., & Ruiz, J. R. (2010**). Assessing muscular strength in youth: usefulness of standing long jump as a general index of muscular fitness. *The Journal of Strength & Conditioning Research, 24*(7), 1810-1817.
11. **Castro-Sánchez, A. M., Lara-Palomo, I. C., Matarán-Peñarrocha, G. A., Fernández-Sánchez, M., Sánchez-Labraca, N., & Arroyo-Morales, M. (2012).** Kinesio Taping reduces disability and pain slightly in chronic non-specific low back pain: a randomised trial. *Journal of Physiotherapy, 58(*2), 89-95.
12. **Csapo, R., & Alegre, L. M. (2015).** Effects of Kinesio® taping on skeletal muscle strength—A meta-analysis of current evidence. *Journal of Science and Medicine in Sport, 18*(4), 450-456.
13. **De Hoyo, M., Álvarez-Mesa, A., Sañudo, B., Carrasco, L., & Domínguez, S. (2013).** Immediate effect of Kinesio taping on muscle response in young elite soccer players. *Journal of Sport Rehabilitation, 22*(1), 53-58.
14. **Donec, V., Varžaitytė, L., & Kriščiūnas, A. (2012).** The effect of Kinesio Taping on maximal grip force and key pinch force. *Polish Annals of Medicine, 19*(2), 98-105.
15. **El Gendy, M. H., Ahmed, N. S., & Ali, R. R. (2017)** Effect of shoulder versus forearm extensor Kinesio-tape on hand grip strength in normal subjects. *International Journal of Therapies and Rehabilitation Research, 6*(5) 16-24.
16. **Garcia-Muro, F., Rodríguez-Fernández, Á. L., & Herrero-de-Lucas, A. (2010).** Treatment of myofascial pain in the shoulder with Kinesio taping. A case report. *Manual Therapy, 15*(3), 292-295.
17. **Hsu YH, Chen WY, Lin HC, Wang WT, Shih YF. (2009)**. The effects of taping on scapular kinematics and muscle performance in baseball players with shoulder impingement syndrome. *Journal of Electromyogr Kinesiol, 19*(6):1092-1099.
18. **Karahan, A. Y., Yildirim, P., Kucuksarac, S., Ordahan, B., Turkoglu, G., Soran, N., ... & Zinnuroglu, M. (2017)**. Effect of Kinesio taping on elbow muscle strength in healthy individuals: A randomized trial. *Journal of Back and Musculoskeletal Rehabilitation, 30*(2), 317-323.
19. **Karatosun, H. S., Demir, H. M., Atalay, Y. B., & Cetin, C. (2019).** Does KinesioTape application to thigh muscles affect muscle strength, proprioception and jumping on the following days? *Journal of the Romanian Sports Medicine Society, 15*(2), 3112-3119.
20. **Kase K, Wallis J, Kase T. (2003)** Clinical therapeutic applications of the Kinesio taping method (2nd edition). Tokyo, Japan: Ken Ikai Co. Ltd.
21. **Keenan, K. A., Akins, J. S., Varnell, M., Abt, J., Lovalekar, M., Lephart, S., & Sell, T. C. (2017)**. Kinesiology taping does not alter shoulder strength, shoulder proprioception, or scapular kinematics in healthy, physically active subjects and subjects with Subacromial Impingement Syndrome. *Physical Therapy in Sport,* 24, 60-66.
22. **Kim, J. Y., & Kim, S. Y. (2016).** Effects of Kinesio tape compared with non-elastic tape on hand grip strength. *Journal of Physical Therapy Science, 28*(5), 1565-1568.
23. **Kim, M. K., & Shin, Y. J. (2017).** Immediate effects of ankle balance taping with kinesiology tape for amateur soccer players with lateral ankle sprain: a randomized cross-over design. Medical Science Monitor: *International Medical Journal of Experimental and Clinical Research,* 23, 5534-5541.
24. **Kirkaya, I., & Kaçoglu, C. (2020).** Investigation of Immediate and Delayed Effects of Bilateral Forearm Kinesio-Taping on Maximal Hand Grip Strength in Female Volleyball Players. *Journal of Educational Issues, 6*(2), 443-450.

25. **Lee, J. H., Yoo, W. G., & Lee, K. S. (2010).** Effects of head-neck rotation and Kinesio taping of the flexor muscles on dominant-hand grip strength. *Journal of Physical Therapy Science, 22(*3), 285-289.
26. **Lemos, T. V., Pereira, K. C., Protássio, C. C., Lucas, L. B., & Matheus, J. P. C. (2015).** The effect of Kinesio Taping on handgrip strength. *Journal of Physical Therapy Science, 27(*3), 567-570.
27. **Limmer, M., Buck, S., de Marées, M., & Roth, R. (2020).** Acute effects of Kinesio taping on muscular strength and endurance parameters of the finger flexors in sport climbing: A randomised, controlled crossover trial. *European Journal of Sport Science, 20*(4), 427-436.
28. **Mak, D. N., Au, I. P., Chan, M., Chan, Z. Y., An, W. W., Zhang, J. H., ... & Cheung, R. T. (2019).** Placebo effect of facilitatory Kinesio tape on muscle activity and muscle strength. *Physiotherapy Theory and Practice, 35*(2), 157-162.
29. **Morris, D., Jones, D., Ryan, H., & Ryan, C. G. (2013).** The clinical effects of Kinesio® Tex taping: A systematic review. *Physiotherapy Theory and Practice, 29*(4), 259-270.
30. **Mostert-Wentzel, K., Swart, J. J., Masenyetse, L. J., Sihlali, B. H., Cilliers, R., Clarke, L& Steenkamp, L. (2012).** Effect of Kinesio taping on explosive muscle power of gluteus maximus of male athletes. *South African Journal of Sports Medicine, 24*(3), 75-80.
31. **Nakajima, M. A., & Baldridge, C. (2013).** The effect of Kinesio® tape on vertical jump and dynamic postural control. *International Journal of Sports Physical Therapy, 8*(4), 393.
32. **Nunes, G. S., De Noronha, M., Cunha, H. S., Ruschel, C., & Borges Jr, N. G. (2013).** Effect of Kinesio taping on jumping and balance in athletes: a crossover randomized controlled trial. *The Journal of Strength & Conditioning Research, 27*(11), 3183-3189.
33. **Öztürk, G., Külcü, D. G., Mesci, N., Şilte, A. D., & Aydog, E. (2016).** Efficacy of Kinesio tape application on pain and muscle strength in patients with myofascial pain syndrome: a placebo-controlled trial. *Journal of Physical Therapy Science, 28*(4), 1074-1079.
34. **Słupik, A., Dwornik, M., Białoszewski, D., & Zych, E. (2007).** Effect of Kinesio Taping on bioelectrical activity of vastus medialis muscle. Preliminary report. *Ortopedia, Traumatologia, Rehabilitacja, 9*(6), 644-651.
35. **Thelen, M. D., Dauber, J. A., & Stoneman, P. D. (2008)**. The clinical efficacy of Kinesio tape for shoulder pain: a randomized, double-blinded, clinical trial. *Journal of Orthopedic & Sports Physical Therapy, 38*(7), 389-395.
36. **Vercelli, S., Sartorio, F., Foti, C., Colletto, L., Virton, D., Ronconi, G., & Ferriero, G. (2012)**. Immediate effects of kinesiotaping on quadriceps muscle strength: a single-blind, placebo-controlled crossover trial. *Clinical Journal of Sport Medicine, 22*(4), 319-326.
37. **Williams, S., Whatman, C., Hume, P. A., & Sheerin, K. (2012).** Kinesio taping in treatment and prevention of sports injuries: a meta-analysis of the evidence for its effectiveness. *Sports Medicine*, 42, 153-164.
38. **Wong, O. M., Cheung, R. T., & Li, R. C. (2012).** Isokinetic knee function in healthy subjects with and without Kinesio taping. *Physical Therapy in Sport, 13*(4), 255-258.
39. **Wu, Y. K., Lien, Y. H., Lin, K. H., Shih, T. F., Wang, T. G., & Wang, H. K. (2010).** Relationships between three potentiation effects of plyometric training and performance. *Scandinavian Journal of Medicine & Science in Sports, 20*(1), 80-86.
40. **Yam, M. L., Yang, Z., Zee, B. C., & Chong, K. C. (2019)**. Effects of Kinesio tape on lower limb muscle strength, hop test, and vertical jump performances: a meta-analysis. *BMC Musculoskeletal Disorders, 20*(1), 1-12.
41. **Yeung, S. S., Yeung, E. W., Sakunkaruna, Y., Mingsoongnern, S., Hung, W. Y., Fan, Y. L., & Iao, H. C. (2015).** Acute effects of Kinesio taping on knee extensor peak torque and electromyographic activity after exhaustive isometric knee extension in healthy young adults. *Clinical Journal of Sport Medicine, 25*(3), 284-290.