

**EFFICIENCY OF KINESIO TAPING IN  
PREVENTION AND REHABILITATION OF  
SPORT INJURIES**

**EFIKASNOST KINEZI TRAKA U  
PREVENCIJI I REHABILITACIJI  
SPORTSKIH POVREDA**

**SUMMARY**

*Kinesio Tape is becoming more widely used in sports physiotherapy and for postural rehabilitation. Many professional athletes use the tape to support injured, fatigued, or overused muscles. The tape's construction is unique, featuring a highly elastic property that engages both the muscles and fascia. It is claimed that KT supports injured muscles and joints and helps relieve pain by lifting the skin and allowing improved blood and lymph flow. The aim of this review was to evaluate, using meta-analysis, the effectiveness of KT in the treatment and prevention of sports injuries. Electronic databases including SPORTDiscus, Scopus, MEDLINE, ScienceDirect and sports medicine websites were searched using keywords 'kinesio taping/tape'. The efficacy of KT in pain relief was trivial given there were no clinically important results. There were inconsistent ranges of motion outcome results, with at least small beneficial results seen in two studies, but trivial results in two other studies across numerous joint measurements. There was a likely beneficial effect for proprioception regarding grip force sense error, but no positive outcome for ankle proprioception. KT had some substantial effects on muscle activity, but it was unclear whether these changes were beneficial or harmful. In conclusion, there was little quality evidence to support the use of KT over other types of elastic taping in the management or prevention of sports injuries. KT may have a small beneficial role in improving strength, range of motion in certain injured subjects and force sense error compared with other tapes, but further studies are needed to confirm these findings.*

**Key words:** sport medicine, kinesitherapy, recovery, atrophy

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## INTRODUCTION

Taping is widely used to prevent injury to athletes (Thelen, Dauber & Stonerman, 2008). Kinesio tape, invented by Kenzo Kase in 1996, is a new application of adhesive taping (Liu, Chen, Lin, Huang & Sun, 2007). It is claimed that KT supports injured muscles and joints and helps relieve pain by lifting the skin and allowing improved blood and lymph flow (Kahanov, 2007). Tape is used to treat anything from headaches to foot problems and everything in-between. Examples include rehabilitation from sports injuries, carpal tunnel syndrome, lower back strain/pain (subluxation, herniated disc), knee and shoulder conditions, and many more (Lim, Park & Bae, 2013).

According to the KT training manual (Kase & Wallis, 2002), KT is highly stretchable (up to 75% of its original length) and its working mechanism is based on the taping direction and tension. Kase described KT applications for both “muscle facilitation” and “muscle inhibition” technique. KT applying from the muscle origin to insertion with stronger tension i.e. 50-75% of its original length may enhance muscle contraction (Kase, K., Wallis & Kase, T. 2003). On the contrary, muscle contraction may be reduced by applying KT from the muscle insertion to origin with weaker tension i.e. 15%-25% of its original length (Kase, K., Wallis & Kase, T. 2003).

There are many proposed benefits of KT including proprioceptive facilitation (Halseth, T., McChesney, J.W., DeBeliso, M., Vaughn, R. i Lien, J. 2004; Jaraczewska & Long, 2006; Riemann & Lephart, 2002), muscle facilitation (Hammer, 2006), reduced muscle fatigue, reduced delayed-onset muscle soreness (Nosaka, 1999), pain inhibition (Kahanov, 2007; Kneeshaw, 2002), enhanced healing such as reducing oedema, improvement of lymphatic drainage and blood flow (Kase, Hashimoto & Tomoki, 1998; Kinesio Holding Corporation, 2008; Lipinska, Sliwinski, Kiebzak, Senderek & Kirenko, 2007; Zajt-Kwiatkowska, Rajkowska-Labon, Skrobot, Bakula & Szamotulska, 2007).

Furthermore, Dr. Kenzo Kase claimed that one of the effects of KT is to increase muscle strength (Kase, K., Wallis & Kase, T. 2003). KT can facilitate muscle activity through concentric pull of the fascia, if applied from muscle origin to it's insertion (Hammer, 2006). KT can be applied literally on every human joint or muscle. However, there is no enough evidence which would advocate the use of KT in the treatment and rehabilitation after injuries. Limited number of studies, concerning the use of KT, show that KT might be use in order to enhance functions of human locomotion. In addition, KT can help in reducing pain, then, increasing stability and proprioception in patients with acute dislocation of patella, stroke, pain in joints and in states of trunk dysfunction.

These information come from series of studies and pilot studies thereby representing lower levels of clinical evidence. It seems that KT might be useful toll in rehabilitation and treatment of injured anthletes, but there is no enought studies to confirt that statement.

## METHODS

Cochrane Collaboration review methodology (literature search, assessment of study quality, data collection of study characteristics, analysis and interpretation of results, recommendations for clinical practice and further research) was used to evaluate the effectiveness of KT in the treatment and prevention of sports injuries. Electronic data bases including SPORTDiscus, Scopus, MEDLINE, ScienceDirect, and sports medicine websites were searched using keywords ‘kinesio taping/tape’. Of the 96 articles sourced ten studies

were used for meta-analysis using the following inclusion/exclusion criteria: (i) the article reported data for effect of KT on a musculoskeletal outcome (e.g. pain, range-of-motion, proprioception); (ii) the article had a KT group and a comparison group (e.g. KT applied without tension, placebo taping, no taping); and (iii) the full version was available in English. The quality of the ten papers that met our inclusion/exclusion criteria was assessed based on the following key components of the methodological quality: (i) randomization of subject allocation; (ii) blinding of subjects; and (iii) blinding of all assessors. These criteria have been identified as being fundamental in reducing bias in clinical trials. For the ten studies included, data were extracted including participants' characteristics, study design, methodological quality, interventions, outcome measures and results (see table I).

A number of outcome measures were used to evaluate the effectiveness of KT, including strength, pain, range of movement, proprioception and muscle activity. We analyzed all statistically significant results reported within the ten studies, and made clinical inferences regarding the true value of their effects in a manner outlined by Batterham and Hopkins. Results that were not reported as being statistically significant were also assessed (where sufficient data were provided), and any results found to be of benefit in our analysis are discussed within the following sections.

## RESULTS

An overview of details of the ten studies metaanalysed are summarized in table I. Tables II and III summarize the reported positive statistical results of KT, and our interpretation of the magnitudes of the effects and their clinical importance. Eight studies reported a statistically significant positive outcome for at least one outcome measure.

**Table I.** *Characteristics of studies which studied the effectiveness of kinesio taping (KT) on strength, pain, range of motion (ROM), proprioception or muscle activity*

Study	Study quality	Study aim	Study design	Subject characteristics
Thelen, Dauber i Stonerman, 2008	4	Effect of KT vs sham treatment on pain and ROM	Randomized, blinded clinical trial	Control group: 20-2y, 17 M, 4 F. Experimental group: 21 -2y; 19 M, 2 F. All patients clinically diagnosed with rotator cuff tendonitis/impingemnt
GonzaLez-Iglesias et al., 2009	4	Effect of KT vs sham treatment on neck pain and cervical ROM in individuals with acute whiplash-associated disorders	Randomized, blinded clinical trial	Control group: 32-7y; 10 M, 10 F. Experimental group: 33 -6y; 10 M, 11 F. All patients reported neck pain as a result of a motor accident
Hsu et al., 2009	3	Effect of KT vs placebo taping on kinematics, muscle activity and strength of the scapular region in baseball players with shoulder impingement	Randomized crossover, pre- and post-test repeated measures design. Examiners were blinded	17 amateur baseball players with shoulder impingement: 23-3y
Chang et al., 2010	3	Effect of KT vs placebo and notaping on maximal grip strength and force sense of healthy collegiate athletes	Randomized, blinded repeated measures design with single group	21 healthy collegiate athletes: 21-3y
Vithoulka et al., 2010	2	Effect of KT vs placebo and notaping on quadriceps strength	Randomized repeated measures design	20 healthy nonathlete F: 27-4y

Yoshida i Kahanov, 2007	2	at maximum concentric and eccentric isokinetic exercise Effect of KT vs no-taping on trunk flexion, extension and lateral flexion	Randomized crossover, pre- and post-test repeated measures design	30 healthy subjects: 27-6y; 15 M, 15 F
Fu et al., 2008	2	Effect of KT vs no-taping on muscle strength in quadriceps and hamstring	Muscle strength assessed in three conditions (without KT, immediately after application of KT and 12 h after taping with tape still in situ). Randomized order of three conditions	14 healthy college athletes: 20-1y; 7 M, 7 F
Halseth et al., 2004	2	Effect of KT vs no-taping on ankle proprioception (reproduction of joint position sense)	Randomized repeated measures design	30 healthy subjects: 18-30 y; 15 M, 15 F
Lee, Yoo and Lee, 2010	2	Effect of KT vs no-taping on grip strength	Randomized repeated measures design	40 healthy subjects: 23-2y; 20 M, 20 F
Slupik et al., 2007	1	Effect of KT vs no-taping on bioelectrical activity of vastus medialis muscle	Non-randomized control trial	27 healthy subjects: 23 -4y; 15 M, 12 F

a Study quality was ranked 1–4 where the larger number indicates better quality: 4 = controlled experimental study, with randomization of subject allocation, plus blinding of subjects and assessors; 3 = controlled experimental study, with randomization of subject allocation, and blinding of subjects but not assessors; 2 = controlled experimental study, with randomization of subject allocation, but no blinding of subjects or assessors; and 1 = controlled experimental study that lacked randomization of subject allocation and blinding of subjects and assessors.

b Age data in years are presented as mean – standard deviation or ranges where stated

F = female; M= male

**Table II.** *The effects of kinesio tape on range of motion*

Study	Outcome measure	Treatment comparison	Reported positive outcome	Smallest beneficial difference
Thelen, Dauber i Stonerman, 2008	ROM	KT vs placebo treatment	19.1±10.8° (pain-free shoulder abduction; day 1)	15° increase
GonzaLez-Iglesias et al., 2009	ROM	KT vs placebo treatment	6.6±1.1° (cervical flexion immediate post)	9.6° increase
			7.4±1.8° (cerv. flexion 24h)	9.6° increase
			8.2±1.7° (cerv. Extension immediate post)	7.0° increase
			8.5±2.0° (cerv. extension 24h)	7.0° increase
			5.4±1.3° (cerv.right lateral flex.immediate post)	5.9° increase
			5.8±1.5° (cerv.right lateral flex. 24h)	5.9° increase
			3.1±1.9° (cerv.left lateral flex.immediate post)	9.1° increase

			2.3±1.9° (cerv.left lateral flex. 24h 24h)	9.1° increase
			5.5±1.5° (cerv.right rotation immediate)	7.6° increase
			6.1±1.8° (cerv.right rotation 24h)	7.6° increase
			5.2±1.4° (cerv.left rotation immediate)	6.7° increase
			4.1±1.5° (cerv.left rotation 24h)	6.7° increase
Hsu et al., 2009	ROM	KT vs placebo treatment	1.1±0.7° (posterior tilt at 30° humeral elevation)	1.2° increase
			1.2±0.8° (posterior tilt at 60° humeral elevation)	1.2° increase
Yoshida i Kahanov, 2007	ROM	KT vs no taping	17.8±14.8 cm (trunk flexion)	6.37 cm (10% increase no taping)

**KT** = kinesio tape; **ROM** = range of motion; **Cerv.** = cervical

**Table III.** *The effects of kinesio tape on pain, proprioception, strength and muscle activity*

Study	Outcome measure	Treatment comparison	Reported positive outcomes	Smallest beneficial difference
GonzaLez-Iglesias et al., 2009	Pain	KT vs placebo treatment	0.9±0.2 (NPRS immediate post-treatment) 1.1±0.3 (NPRS 24 h post-treatment)	2-point reduction 2-point reduction
Chang et al., 2010	Proprioception	KT vs placebo treatment	2.5±2.1 kg 3.3±2.7 kg	0.44 kg 0.84 kg
Hsu et al., 2009	Strength	KT vs placebo treatment	1.2±1.0 kg (handgrip strength change)	0.70 kg
Lee et al., 2010	Strength	KT vs no taping	2.9±2.4 kg (handgrip strength change in males) 1.6±1.3 (handgrip strength change in females)	1.6 kg 1.04 kg
Vithoulka et al., 2010	Strength	KT vs placebo treatment	1.96±4.9 Nm (quadriceps peak torque at 60°/s during eccentric exercise) 9.88±7.3 Nm (quadriceps peak torque at 60°/s during eccentric isokinetic exercise)	7.52 Nm 8.33 Nm
Fu et al., 2008	Strength	KT vs no-taping	3.2±1.7 kg/m (peak torque during concentric contraction of the quadriceps at 180°/s)	2.12 kg/m
Hsu et al., 2009	Muscle activity	KT vs placebo treatment	14.2±11.7 (increase in lower trapezius muscle activity at 60-30° humeral elevation) 23.0±19.8% (decrease in	10% change 10% change

			upper trapezius muscle activity at 90-120° humeral elevation)	
Slupik et al., 2007	Muscle activity	KT vs no-taping	54±1.2% (increase in <i>vastus medialis</i> activity at 24h)	10% change
			22±1.1%(increase in <i>vastus medialis</i> activity at 72h)	10% change

KT = kinezi traka; NPRS = numerička skala za rejtiranje bola

## DISCUSSION

Kinesio taping is a technique which uses the application of an elastic adhesive tape on the skin. KT is manufactured with elastic cotton which can be stretched from 120 to 140% its original length. It is used to pressurize the skin to affect the somato--sensory system under the areas where the tapes are applied (Kase & Wallis, 2002). Compared with conventional tape, it is suggested that KT allows a greater range of motion and can be worn for longer periods of time without the need for reapplication (Kase & Wallis, 2002). The proposed benefits of KT include facilitating joint and muscle realignment by strengthening weakened muscles (Kase & Wallis, 2002), improving circulation of blood and lymph by increasing the interstitial space between the skin and underlying connective tissues (allowing for increased circulation of both venous and lymphatic fluid), (Kase & Wallis, 2002) decreasing pain through the reduction in pressure on nociceptors, repositioning subluxed joints by relieving abnormal muscle tension, helping to return the function of fascia and muscle (Kase & Wallis, 2002), and increasing proprioception through the stimulation of cutaneous mechanoreceptors. KT can be applied literally on every human joint or muscle. However, there is not enough evidence which would advocate the use of KT in the treatment and rehabilitation after injuries. Limited number of studies, concerning the use of KT, show that KT might be used in order to enhance functions of human locomotion. In addition, KT can help in reducing pain, then, increasing stability and proprioception in patients with acute dislocation of patella, stroke, pain in joints and in states of trunk dysfunction.

It is claimed that KT reduce pain by stimulation of sensitive neural pathways, i.e. by increasing afferent feedback information. The proposed mechanism in which KT reduce pain is by reducing afferent impulses which come from nociceptors. In addition, KT lifts the skin thereby decreasing the pressure on mechanoreceptors of skin. From 10 assessed studies, only the study of (González-Iglesias, Fernández-de-las-Peñas, Cleland, Huijbregts & Gutiérrez-Vega, 2009) reported statistically significant results for a measurement of pain. They noticed significant reduction of pain on a numerical pain rating scale (NPRS) in the KT group versus the sham treatment group for patients with acute whiplash-associated disorders.

One of proposed mechanism by which KT can increase range of motion is by increase of blood flow into the skin area which is covered with tape; physiological change which facilitate initiation of muscle movement. Additional theory is that fear is associated with intensity of pain in patients and so the application of KT provides sensory feedback that reduces fear of movement and thus increases range of motion (González-Iglesias, Fernández-de-las-Peñas, Cleland, Huijbregts & Gutiérrez-Vega, 2009). Thelen, Dauber & Stoneman (2008) assessed the range of pain-free shoulder abduction in patients diagnosed with rotator cuff impingement, defining a clinically meaningful change as a 15° increase. Our clinical conclusion from these statements is that KT may have at least a small, useful short-term effect on the range of motion for certain joints in injured patients. Study of (González-Iglesias, Fernández-de-las-Peñas, Cleland, Huijbregts & Gutiérrez-Vega, 2009) assessed cervical motion in six directions both immediately post treatment and 24-hours post-treatment. They

concluded that KT had a trivial effect on cervical range of motion for the vast majority of cervical motions, both acutely and 24-hours post-treatment.

Hsu, Chen, Lin, Wang & Shih (2009) investigated the effect of KT on shoulder kinematics in baseball players with shoulder impingement syndrome. The KT group had statistically significant improvements in scapular orientations compared with the placebo group for posterior tilt at 30° and 60° of humeral elevation, but no other measures of scapular orientations or displacements were statistically significant. Measurements at 30°, 60° and 90° of posterior tilt of the scapular were also possibly beneficial in our analysis, despite being reported as statistically no significant by the authors. Our analysis found trivial or unclear differences for the 19 other measurements of scapular orientations. No beneficial effects were inferred for any of the 24 scapular displacement measurements, with possibly harmful effects found for eight measurements. KT may have beneficial effects on improving scapular kinematics in subjects with shoulder impingement syndrome, but only for specific degrees of humeral elevation. Overall, the effect of KT is likely to be trivial, or even possibly harmful for certain measurements, and therefore would not be recommended for use in treatment of shoulder impingement syndrome. Yoshida & Kahanov (2007) assessed the effects of KT on trunk flexion, extension and lateral flexion in 30 healthy patients, using a randomized crossover design. There were positive changes for trunk flexion with a mean increase of 17.8 cm in the KT condition. However, the taping effect was not addressed given the comparison was a no-taping condition. The changes in lower trunk extension and lateral flexion were both nonsignificant, but the authors did not report specific p-values or confidence limits for us to make inferences about the magnitude of these results. The effect of KT on range of motion remains unclear because of the limited number of studies on a variety of joints, and the conflicting results. The beneficial effects of KT in the higher quality study conducted by (Thelen, Dauber & Stoneman, 2008), suggested KT may have at least a small, useful short-term effect on the range of motion for certain joints in injured cohorts. Beneficial effects were reported for cervical extension and right lateral flexion in patients with acute whiplash-associated disorders (González-Iglesias, Fernández-de-las-Peñas, Cleland, Huijbregts & Gutiérrez-Vega, 2009) and for certain aspects of scapular kinematics (Hsu, Chen, Lin, Wang & Shih, 2009). Regarding all these statements, we would not recommend the use of KT for the enhancement of range of motion in injured patients. In healthy patients there was at least a small beneficial effect for trunk flexion, as recorded in the study of (Yoshida & Kahanov, 2007). However, given that placebo tapes were not used, we are not sure whether KT are useful or not comparing to traditional taping method.

It is proposed that KT may enhance muscle strength by initiating the concentric contraction of fascia which in turn stimulate, i.e. increase muscle contraction. KT might pull the skin or myofascia underneath the skin which helps release the tightened area of muscles and improve the flexibility (Lee J-H., Yoo & Lee K-S., 2010). In addition, KT may facilitate muscle activity and improve muscle alignment which can contribute to marginal increases in muscle strength (Hsu, Chen, Lin, Wang & Shih, 2009). Four of the ten studies reported positive outcomes in measures assessing strength. Study of (Lee J-H., Yoo & Lee K-S., 2010) evaluate effect of KT on handgrip strength in 40 healthy subjects. Handgrip strength was significantly higher for both males and females when KT was applied to the flexor muscles of the dominant hand compared with the no-taping condition. Both results were calculated to be likely beneficial in our analysis, however, as there was no placebo taping condition, these results should be treated with caution.

Vithoulka, Beneka, Malliou, Aggelousis, Karatsolis & Diamantopoulos (2010) investigated the effects of KT on quadriceps peak torque and reported a statistically significant increase for the KT condition during eccentric assessment. However, the significant differences were with regard to a one-way ANOVA result comparing KT, placebo

tape and no-taping conditions. However, study of Briem, Eythörðsdóttir, Magnúsdóttir, Pálmarrsson, Rúnarsdóttir & Sveinsson (2011), which assessed the effect of KT on the level of activation of the fibularis longus muscle during a “sudden disturbance” of the ankle in 51 healthy athletes, did not find significant alterations in muscle strength. On the other hand Hsu, Chen, Lin, Wang & Shih (2009), reported that KT application provoked a significant increase in the electromyography activity of the lower trapezius muscle during shoulder abduction in 17 athletes, underscoring that they exhibited shoulder impingement syndrome. Similar findings were reported by Firth, Dingley, Davies, Lewis & Alexander (2010), who found no alteration in single-hop distance, in either healthy subjects or those with Achilles tendinopathy, after KT application to the ankle. Hwang-Bo & Lee (2011) analyzed vertical hop height 30 min after KT application to the ankle, in healthy subjects, also finding no significant alteration. With respect to static balance Aytar, Ozunlu, Surenkok, Baltaci, Oztop & Karatas (2011) detected an improvement during KT application to the femoral quadriceps in women with patellofemoral pain syndrome. Few studies have assessed lower limb function and one-footed static balance after KT application, hindering analysis of the real effects of this technique on these variables. In addition, study of Alano, Neto, Amorim, Macedo & Brasileiro (2013) showed that KT application to *m. rectus femoris*, *m. vastus lateralis* and *m. vastus medialis* is not capable of altering lower limb function, one-footed static balance, peak knee extensor torque or activation amplitude of the VL muscle, in healthy women. Moreover, the application of nonelastic adhesive tape over the same area of skin did not significantly change these variables. Study of Fu, Wong, Pei, Wu, Chou & Lin (2008) examined the effect of KT on muscle strength in healthy collegiate athletes. One statistically significant result was reported for the concentric contraction of the quadriceps at 180°/sec at 12 hours after taping, with tape still *in situ*. In contrast, Chang, Chou, Lin, J., Lin, C. & Wang (2010) reported no statistically significant difference in maximal grip strength measured under three conditions (without taping, with placebo taping and with KT) in 21 healthy collegiate athletes. There was also one unclear and eight trivial results for measurements of strength, which preclude a clear conclusion being made. Further studies on similar muscles, and in particular KTs long-term effect on strength gain, warrant investigation.

There have been studies documenting a significant effect of the application of white athletic tape to the ankle on ankle proprioception (Karlsson & Andreasson, 1992; Robbins, Waked & Rappel, 1995; Heit, Lephart & Rozzi, 1996; Simoneau, Degner, Kramper & Kittleson, 1997). However, very little research has been done examining the effect alternative tape applications (such as that of Kinesio™ tape) may have on increasing cutaneous afference. Murray & Husk (2001) examined the effect of kinesio taping on ankle proprioception. They concluded that kinesio taping for a lateral ankle sprain improved proprioceptive abilities in non-weight bearing positions in the midrange of ankle motion where ligament mechanoreceptors were inactive. Study of Chang, Chou, Lin, J., Lin, C. & Wang (2010) examined the force sense error in grip strength measurements amongst 21 healthy collegiate athletes. They reported two positive results with respect to proprioception. Halseth, McChesney, DeBeliso, Vaughn, & Lien (2004) also examined the effects of KT on ankle proprioception. The KT group showed no statistically significant change in absolute error for ankle reproduction of joint position sense measurements for both plantar flexion and inversion, when compared to the untapped condition. There were not enough data available for us to make clinical inferences regarding these results.

In order to fully understand the effect of Kinesio tape on proprioception, further research needs to be conducted on other joints, on the method of application of Kinesio™ tape, and the health of the subject to whom it is applied. Further research may provide vital information about a possible benefit of Kinesio™ taping during the acute and sub acute phases of rehabilitation, thus facilitating earlier return to activity participation. It is unclear



what direction of change in muscle activity represents a beneficial effect; a decrease may imply KT is having a supporting effect and the muscle is working more efficiently, while an increase could represent a facilitatory effect and enhanced muscle function (Hsu, Chen, Lin, Wang & Shih, 2009). This is likely to be dependent on the specific muscle being assessed, the selected subjects (healthy or injured subjects) and the taping technique. Study of Lin, Hung & Yang (2011) showed significant changes in EMG activity in the scapular muscles with the application of tape in the asymptomatic group. Proprioceptive feedback was also enhanced with taping. Thus, the mechanisms by which scapular taping can be explained are neuromuscular control as well as proprioceptive feedback factors. Morin, Tiberio & Austin (1997) also found a significant decrease in muscle activity in the upper and middle trapezius region muscle with taping. Slupik, Dwornik, Bialoszewski & Zych (2007) reported a 54% increase in muscle activity of the vastus medialis muscle 24 hours after application of KT. This effect was inferred to be most likely substantial. After 72 hours there was a 22% mean increase, compared with baseline values resulting in an effect we calculated to be very likely substantial.

Changes in muscle activity 10 minutes and 96 hours after KT application were both trivial. However, the order in which subjects were measured under the two conditions (with and without KT) was not performed in a crossover manner, and therefore the order effects were not controlled for. There was no placebo group, and so we were unable to ascertain whether changes were specifically due to KT, or simply the effect of taping alone. As a consequence, the results of this study must be questioned. In the study of González-Iglesias, Fernández-de-las-Peñas, Cleland, Huijbregts & Gutiérrez-Vega (2009) which investigate the impact of KT on muscle activity, KT was associated with a substantial change in muscle activity over specific ranges of humeral elevation. However, the majority of differences were trivial or unclear. Further research is required to determine whether the changes induced by KT were beneficial in the treatment of the injury.

## CONCLUSION

The main purpose of our systematic review was to investigate effectiveness of KT in the treatment and rehabilitation of musculoskeletal injuries. The theory behind the use of KT is that the application of the tape improves lymphatic and blood circulation without restricting ROM and thus decreases pain, inflammation, and recovery times. Kinesio taping is attractive to active patients and high-level athletes looking for a therapeutic edge to improve outcomes, including performance, pain, function, and strength, following musculoskeletal injury.

We have searched electronic data bases including SPORTDiscus, Scopus, MEDLINE, ScienceDirect, and sports medicine websites, by typing keywords 'kinesio taping/tape'. Of the 96 articles sourced ten studies were used for meta-analysis. Two studies investigated sport-related injuries (González-Iglesias, Fernández-de-las-Peñas, Cleland, Huijbregts & Gutiérrez-Vega, 2009; Hwang-Bo & Lee, 2011), and only one investigated injuries in athletes (Hsu, Chen, Lin, Wang & Shih, 2009).

Studies have shown that KT might be used in the prevention and treatment of musculoskeletal injuries (González-Iglesias, Fernández-de-las-Peñas, Cleland, Huijbregts & Gutiérrez-Vega, 2009; Hsu, Chen, Lin, Wang & Shih, 2009; Hwang-Bo & Lee, 2011; Kaya, Zinnuroglu & Tugcu, 2010; Lee, 2015; Mostafavifar, Wertz & Borchers, 2012; Thelen, Dauber & Stoneman, 2008). KT may have a small beneficial effect on strength, force sense error and active range of motion of an injured area, but further clarification is needed (Williams, Whatman, Hume & Sheerin, 2012). There was no substantial evidence to support

the use of KT for improvements in other musculoskeletal outcomes - pain, ankle proprioception or muscle activity (Williams, Whatman, Hume & Sheerin, 2012).

Our systematic review found insufficient evidence for or against the use of KT to improve pain, function, performance following musculoskeletal injury. The number of high-quality, consistent studies available is limited, and this topic therefore warrants further research with higher levels of evidence, larger sample sizes, powered outcomes, and longer follow-up times to show the effect or lack thereof of KT. The implications of our review for current clinical practice are that KT is a safe modality, and that despite the lack of evidence to show a clinical benefit following musculoskeletal injury, the athlete may perceive a beneficial effect following KT application.

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## SAŽETAK

*Kinezi trake se sve više koriste u sportskoj fizioterapiji i posturalnoj rehabilitaciji. Mnogi profesionalni sportisti koriste trake kako bi podržali povređene, izmorene ili prekomerno iskorišćene mišiće. Konstrukcija trake je jedinstvena, ona poseduje visoko elastična svojstva koja angažuju i mišiće i fasciju. Veruje se da KT podržava povređene mišiće i zglobove kao i da oslobađa od bola tako što podiže kožu dozvoljavajući krvni i limfni protok. Cilj ovog preglednog članka je da evaluira, koristeći meta-analizu, efikasnost KT u tretmanu i prevenciji sportskih povreda. Elektronske baze podataka, poput SPORTDiscus, Scopus, MEDLINE, ScienceDirect i sajтови sportske medicine su pretraživani koristeći ključne reči 'kinezi tejpung/trake'. Efikasnost KT u oslobađanju od bola bila je beznačajna s obzirom da nije bilo klinički važnih rezultata. Što se tiče opsega pokreta, dobijeni su neusaglašeni rezultati sa malim korisnim rezultatima, zapaženim u dve studije, mada beznačajni rezultati u druge dve studije za brojne zglobove. Ostvaren je koristan efekat za propriocepciju po pitanju osećaja za grešku u testu sile stiska šake, međutim, nije bilo pozitivnih efekata za propriocepciju skočnog zgloba. KT su ostvarile znatan efekat na mišićnu aktivnost, mada nije jasno da li su te promene bile korisne ili štetne. Da zaključimo, postoji jako malo kvalitetnih dokaza koji bi podržali korišćenje KT, u poređenju sa drugim tipovima elastičnih traka, u upravljanju ili prevenciji sportskih povreda. KT mogu imati malu korisnu ulogu u poboljšanju sile, opsega pokreta kod određenih povređenih subjekata, kao i u poboljšanju osećaja za grešku, u poređenju sa drugim trakama, mada potrebna su dalja istraživanja koja bi to potvrdila.*

**Ključne reči:** *sportska medicina, kineziterapija, oporavak, atrofija*

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