Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 186 (2015) 618 – 623

Procedia
Social and Behavioral Sciences

5th World Conference on Learning, Teaching and Educational Leadership, WCLTA 2014

Kinesio Taping Use in Prevention of Sports Injuries During Teaching of Physical Education and Sport

Ladislav Pyšný[a]*, Jana Pyšná[a], Dominika Petrů[a]

The Faculty of Education, Jan Evangelista Purkyně University in Ústí nad Labem, Czech Republic

Abstract

Kinesio taping is very useful method in the last few years that affects not only prevention and treatment of many musculoskeletal system disorders but it improves sports performance also. This paper presents new scientific knowledge about the possibilities of the use Kinesio tapes during the teaching physical education and sport. Every teacher, but also student of physical education and sport, should know the basics for positive effects of this issue. Kinesio taping application in the prevention of sports injuries of the musculoskeletal system are frequently encountered during the teaching of this field of study.

Peer-review under responsibility of Academic World Education and Research Center

Keywords: Kinesio taping, teaching, physical education, sport, injury

1. Introduction

During their studies of Physical Education and Sport at Faculties of Education in the Czech Republic, students must demonstrate rather excellent physical abilities and skills in a number of subjects. Activities implemented in the teaching are based on requirements of specific sports and there is always a high possibility of a sport injury. Both physical education teachers and students could use Kinesio taping method not only to improve the progress of acute and chronic sports injuries but also to prevent musculoskeletal injuries from happening and to improve performance. Based on the reason mentioned above Kinesio tapes should become a common part of teaching any subjects focused on first aid, sports medicine and physiotherapy. Physical activity could, in some cases, excessively burden the soft structures of musculoskeletal system. The most common cause we can mention is a movement which is realized mainly:

* Ladislav Pyšný. Tel.: +00420 475 28 3230
E-mail address: ladislav.pysny@ujep.cz

Peer-review under responsibility of Academic World Education and Research Center
doi:10.1016/j.sbspro.2015.04.039

- with maximum repeated effort,
- in an unsuitable environment,
- when there is an existing disorder of statics and dynamics of burdened joints,
- as a repeated activity of already overburdened tissues,
- with inadequate nutrition and hydration of structures of musculoskeletal system,
- when taking certain doping substances such as anabolic androgenic steroids.

The result in the development of chronic sports injuries are traumatized soft tissues, accompanied by inflammatory changes in muscles, tendons and ligaments, tendon sheaths, joint capsules or periosteum. The encountered difficulties evolve usually for several weeks and are typical for their hidden manifestations, when instead of an intensive pain we usually find only a feeling of pressure, tension and stiffness. The resulting damage does not usually force athletes to stop their physical activity, but gradually leads to certain changes, which are typical for their long-term and relatively adverse progress of treatment (de Vos, Weir, van Schie, Verhaar, Weinans, & Tol, 2010; Platts-Mills & Hunold, 2013; Wei-Ling, Yi-Fen, & Wen-Yin, 2012). If we use endurance running as a specific example, we could find a high incidence of chronic inflammatory changes in the lower extremities (Fredericson & Misra, 2007; Rauh, Koepsell, Rivara, Margherita, & Rice, 2006; Taunton, Ryan, Clement, McKenzie, Lloyd-Smith, & Zumbo, 2002). In the knee area a typical formation of patellofemoral syndrome known as "runner's knee" or patellar tendinitis known as "jumper's knee" and some forms of bursitis could occur. In the shank and foot area we could find a presence of medial tibial stress syndrome and frequent injuries of Achilles tendon (Alfredson, 2003; Järvinen, Kannus, Maffulli, & Khan, 2005; Maffulli, Sharma, & Luscombe, 2004; Zafar, Mahmood, & Maffulli, 2009). For example de Vos et al. (2010) found out that up to 52% of endurance runners hurt their Achilles tendon sometime during their career.

When dealing with chronic inflammatory changes in the musculoskeletal system it is of course very important to determine the cause which led to the injury and which we must remove. The treatment that follows uses along with an appropriate physical stimulation and some protective equipment also an intensive application of regenerative substances, anti-inflammatory medication, enzyme therapy, effects of shock waves and injections of own plasma and blood platelets (e.g. Cerciello, Beitzel, Howlett, Russell, Apostolakos, Beth et al., 2013; de Vos, et al., 2010). Unfortunately, these medical treatments could be used only by a doctor or a physiotherapist. There is, however, another method which is quite suitable for dealing with these problems (e.g. García-Muro, Rodríguez-Fernández, & de-Lucas, 2010; Jung-hoon & Won-gyu, 2012a,b) which could be, after obtaining some specific knowledge, used by an individual with no medical education. This method is called Kinesio taping.

2. Effects of Kinesio taping

The method of Kinesio taping has its origins in Japan in the 70s of the last century. Since then it has been used by doctors not only in sports medicine but also in other medical disciplines /for example Pediatrics and Neurology in the Czech Republic/ (Filipčíková, Bezdičková, Pastucha, Ripplová, Dobiáš, Blažková et al., 2013). The main reason for using Kinesio tapes is prevention and treatment of musculoskeletal system in particular. In some cases, however, it could improve performance of athletes.

Kinesio taping is a very good method when dealing with musculoskeletal system damages, such as various types of enthesopathy, bursitis, contusions, sprains, joint instability or deformity. The general principle is to activate the affected area, to remove arising pathological changes and subsequent restoration of physiological functions. For example, when chronic muscle damage occurs, a local pain arises, muscle tension increases and a liquid accumulates. An increasing pressure from oedema simultaneously reduces blood flow and supports the development of ischemia. By applying Kinesio tapes we could reduce the pressure and stimulate some receptors and nerve endings in a particular area in order to increase blood flow of damaged tissues and reduce oedema. When using Kinesio taping, we could mention especially these positive effects (Briem, Eythörsdöttir, Magnúsdóttir, Pálmarsson, Rúnarsdöttir, & Sveinsson, 2011; Castro-Sánchez, Lara-Palomo, Matarán-Peñarrocha, Fernández-Sánchez, Sánchez-Labraca, & Arroyo-Morales, 2013; Chen, Hong, Lin, & Chen, 2008; Thelen, Dauber, & Stoneman, 2008):

- refreshes the required blood and lymph circulation resulting in reduced amount of inflammatory substances,

- reduction of excessive irritation and optimization of stimulation of certain receptors (free nerve endings, Valter-Pacini and Ruffini corpuscles) followed by an appropriate response in the central nervous system with reducing pain and speeding the healing of damaged parts of musculoskeletal system,
- required stimulation of certain receptors and appropriate corrections of joint function will cause positive modifications of the motion formula with better motion range and increased joint stability,
- Kinesio tape optimizes athlete "psyche".

The findings of recent studies show that the evaluation process of positive treatment effects is not unambiguous. When a damage of musculoskeletal system occurs Kinesio taping highly likely reduces the perception of pain (e.g. Freedman, Brody, Rosenthal, & Wise, 2014; Hajimirrahimi, Naseri, Amiri, & Fakhari, 2014) could positively influence processes that lead to a muscle fatigue (Álvarez-Álvarez, García-Muro San José, Rodríguez-Fernández, Güeita-Rodríguez, & Waller, 2014).

When evaluating the effect of Kinesio taping on athlete's performance we must state that findings of a majority of studies proved no improvement what so ever. The research studies focused on possible positive improvement that could increase a muscular strength. The results did not bring any evidence of improvement and did not even reveal any physiological changes which would support this assumption (de Almeida Lins, Neto, de Amorim, de Brito Macedo, & Brasileiro, 2013; Donec, Varžaityté, & Kriščiūnas, 2012; Fratocchi, Di Mattia, Rossi, Mangone, Santilli, & Paoloni, 2013; Hsiao-Yun, Kun-Yu, Jau-Jia, Chih-Feng, & Chun-Hou, 2010; Tieh-Cheng, Wong, Yu-Cheng, Wu, Shih-Wei, & Yin-Chou, 2008; Wong, Cheung, & Li, 2012). We can assume that wide using of Kinesio taping by sports athletes to support their performance /for example during last Olympic Games and European Football Championship/ is very likely affected only by psychological help /placebo effect/ of this technique (Vercelli, Sartorio, Foti, Colletto, Virton, Ronconi et al., 2012). In spite of this, further studies focused on the possible influence of Kinesio taping on a specific physical activity are needed.

When we evaluate the effects of Kinesio taping on a specific physical activity with a damaged part of musculoskeletal system of an athlete, the results are quite different. Most of the studies focused on evaluation of performance confirm improvement of the damaged part. For example Yin-Hsin, Wen-Yin, Hsiu-Chen, Wendy and Yi-Fen (2009) discovered improved function and increased muscle activity in the area of shoulder blade with subacromial decompression /impingement syndrome/ of baseball players and Hajimirrahimi et al. (2014) proved that functional and mechanical correction have a significant effect on functional performance of football athletes with chronic ankle instability.

3. Techniques of Kinesio taping

We can use basic and correction techniques. Basic techniques are usually used for inhibition or stimulation of a muscle. If a muscle is acutely overburdened we seek for its inhibition. We usually attach Kinesio tape with a slight tension about 15% - 25% of the maximum extension from the painful area of a muscle insertion to the beginning of a muscle. With a weakened muscle we seek for its stimulation. We attach Kinesio tape again with a slight tension about 15% - 35% of a maximum extension but from a beginning of a muscle to its insertion. In both cases the muscle should be in its maximum extension. Correction techniques are often used when dealing with damaged musculoskeletal system (Kase, Hashimoto, & Okane, 1996; Kase & Stockheimer, 2006; Kase, Wallis, & Kase, 2003):

- mechanical correction is used to maintain or restore physiological motion or its position,
- tendon/fibrous correction is used to appropriately stimulate relevant receptors and thus positively influence function of the central nervous system and optimize muscle tension of the area,
- functional correction is used to support or, on the other hand, to limit the range of movement,
- fascial correction is used to improve a slipperiness of fascia against other tissue,
- spatial correction is used to help with relieving effect in the area of oedema and pain,
- lymphatic correction supports lymphatic function /tape attached to the damaged area reduces compression of lymphatic lanes/.

The best way to apply Kinesio tape is on a degreased skin without hair. Before using it we cut the corners to extend durability and its life /corners peel off quite quickly/. We can peel the Kinesio tape off the back paper, but

tearing its back paper and applying the tape afterwards is a better way. We shouldn't touch the glue on the inner side of the back paper. Kinesio tape consists of several parts. We always start with the anchor, which is a part about 2.5-5.0 cm long /up to 10 cm in correction techniques/. We always apply the anchor without tension in a neutral position, usually from the muscle insertion or from the beginning of the damaged muscle. The end of the Kinesio tape is also about 2.5-5.0 cm long and is also applied with no tension. Between the anchor and the end of the Kinesio tape is a part called "base". The base, with its tension, creates a "medical zone" of the tape. The material is highly elastic which allows it to create the effect of compression or decompression, depending on the type of application. We can use several types of force of therapeutic tension. From a very light /0% - 10%/ to a strong tension /75% - 100%/. Sometimes we can apply Kinesio tape straight from the back paper. This technique called "paper-off tension" is frequently used in vertebrogenic algic/painful syndrome, where the attached tape has a compressive tension about 10% - 15% in its whole length (Kase, 2003; Kase, Tatsuyuki, & Tomoki, 2003). After application of every part of the tape, it is appropriate to "iron" it by fast friction do increase adhesion of the tape /the glue is thermo sensitive/. Kinesio tapes usually stick to skin perfectly 20 - 30 minutes after application and can be used for a several days. When Kinesio tape is needed for a longer time, it is recommended to have 24 - 48 hours break between each application which is necessary for the damaged area to regenerate (Kase, Tatsuyuki, & Tomoki, 2003).

Applied Kinesio tapes may also have different shapes, depending on the type of application. The most commonly used forms are (Kase, Hashimoto, & Okane, 1996; Kase, Martin, & Yasukawa, 2006; Kase, Wallis, & Kase, 2003):

- "I" tape - usually used during acute phase of pain or inflammation,
- "Y" tape - usually used after the acute phase is over instead of "I" tape,
- "X" tape - usually used to bring better tension transferred to both ends,
- "Fan" - usually used for its ability to accelerate the flow of the lymph,
- "Web" - suitable for treating large joints because of its large surface,
- "Donut hole" - usually used to unweight a pressure in the damaged area, with a hole in its center, used for bone spurs,
- "Star" - is created by crossing more "I" tapes or "donut hole" tapes to increase the effect of unweighting the pressure in the centre of the "star".

In recent years, the use of "ready to use" tapes for a certain area and a certain type of injury is increasing and they allow easier application by the athletes themselves (e.g. Pro-Tec Athletics, 2013). Many athletes use many different colors of Kinesio tapes. This principle is based on some Eastern teachings /for example Jin and Jang/ which assign different quality to each color. For example, application of a red tape can therefore cause heat, but it is almost certainly only subjective feeling of athletes. More often, Kinesio taping is becoming a certain part of fashion. We can also find athletes with "new generation" tapes in national colors or trendy prints /such as leopard coat/. In recent years, there is an increasing number of athletes using different types of "web" tapes, sometimes called "cross". These are small 2-3 cm long grids which are attached to the so called "trigger points". The principle of their effects is based on ideas of Chinese acupuncture teaching, according to which there is a flow of energy in our body, under the skin, in the system of meridians and energy paths of vital energy. Some diseases can reportedly lead to disturbances of the energy flow and it is the application of "cross" tape in areas of pain which might eliminate these disturbances. It is not, however, the case of typical techniques of Kinesio taping, which is based on a tension.

4. Conclusion

The latest studies show that Kinesio taping decreases the feeling of pain especially when dealing with chronic sports injury, but highly unlikely can improve performance. If an athlete feels his performance has improved, it is very likely a placebo effect. On the other hand, the use of Kinesio taping can improve performance of certain parts of musculoskeletal system when there is some chronic damage. Thus we can say that not only every Physical education teacher, but also every student of Physical education and sport, should be familiar with the principle of the use of this method. Certain subjects focused on first aid and sports medicine should provide students with necessary information in this problematic field. During their studies, students have to repeatedly demonstrate in numerous subjects, excellent physical abilities and skills and Kinesio taping can decrease the feeling of pain when developing acute and chronic injuries of musculoskeletal system. If students want to use this method to improve their

performance, we must state, that the only effect that will happen is most probably placebo effect. On the contrary, when athletes are having a certain chronic injuries and have to continue with their performance, Kinesio taping can most certainly improve the performance of the damaged part of musculoskeletal system.

References

Alfredson, H. (2003). Chronic midportion Achilles tendinopathy: an update on research and treatment. *Clinical Journal of Sport Medicine*, *22*(4), 727-741.

Álvarez-Álvarez, S., García-Muro San José, F., Rodríguez-Fernández, A. L., Güeita-Rodríguez, J., & Waller, B. J. (2014). Effects of Kinesio® Tape in low back muscle fatigue: Randomized, controlled, doubled-blinded clinical trial on healthy subjects. *Journal of Back and Musculoskeletal Rehabilitation, 27*(2), 203-212.

Briem, K., Eythörsdöttir, H., Magnúsdóttir, R. G., Pálmarsson, R., Rúnarsdöttir, T., & Sveinsson, T. (2011). Effects of Kinesio Tape Compared With Nonelastic Sports Tape and the Untaped Ankle During a Sudden Inversion Perturbation in Male Athletes. *Journal of Orthopaedic & Sports Physical Therapy, 41*(5), 328-335.

Castro-Sánchez, A. M., Lara-Palomo, I. C., Matarán-Peñarrocha, G. A., Fernández-Sánchez, M., Sánchez-Labraca, N., & Arroyo-Morales, M. (2013). Kinesio Taping reduces disability and pain slightly in chronic non-specific low back pain: a randomised trial. *Journal of Physiotherapy, 58*(2), 89-95.

Cerciello, S., Beitzel, K., Howlett, N., Russell R. P., Apostolakos, J., Beth, M., et al. (2013). The Use of Platelet-Rich Plasma Preparations in the Treatment of Musculoskeletal Injuries in Orthopaedic Sports Medicine. *Operative Techniques in Orthopaedics, 23*(2), 69-74.

Chen, P. L., Hong, W. H., Lin, C. H., & Chen, W. C. (2008). Biomechanics Effects of Kinesio Taping for Persons with Patellofemoral Pain Syndrome During Stair Climbing. *IFMBE Proceedings 21*, 395-397.

de Almeida Lins, C. A., Neto, F. L., de Amorim, A. B. C., de Brito Macedo, L., & Brasileiro, J. S. (2013). Kinesio Taping does not alter neuromuscular performance of femoral quadriceps or lower limb function in healthy subjects: Randomized, blind, controlled, clinical trial. *Manual Therapy, 18*(1), 41-45.

de Vos, R. J., Weir, A., van Schie, H. T., Verhaar, J. A., Weinans, H., & Tol, J. L. (2010). Platelet-rich plasma injection for chronic Achilles tendinopathy - a randomized controlled trial. *The Journal of American Medical Association, 303*(2), 144-149.

Donec, V., Varžaityté, 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.

Filipčíková, R., Bezdičková, M., Pastucha, D., Ripplová, D., Dobiáš, M., Blažková, Z. et al. (2013). Techniky kineziotapingu v neurologii - anatomické aspekty. *Medicína pro praxi, 10*(1), 35-37.

Fratocchi, G., Di Mattia, F., Rossi, R., Mangone, M., Santilli, V., & Paoloni, M. (2013). Influence of Kinesio Taping applied over biceps brachii on isokinetic elbow peak torque. A placebo controlled study in a population of young healthy subjects. *Journal of Science and Medicine in Sport, 16*(3), 245-249.

Fredericson, M., & Misra, A. K. (2007). Epidemiology and Aetiology of Marathon Running Injuries. *Sports Medicine, 37*(4,5), 437-439.

Freedman, S. R., Brody, L. T., Rosenthal, M., & Wise, J. C. (2014). Short-term effects of patellar kinesio taping on pain and hop function in patients with patellofemoral pain syndrome. *Sports Health, 6*(4), 294-300.

García-Muro, F., Rodríguez-Fernández, Á, L., & de-Lucas, Á. H. (2010). Treatment of myofascial pain in the shoulder with kinesio taping. A case report. *Manual Therapy, 15*(3), 292-295.

Hajimirrahimi, L., Naseri , N. Amiri , A., & Fakhari, Z. (2014). Effects of three types of kinesio taping on the performance of male athletes with chronic ankle instability. *Journal of Modern Rehabilitation, 8*(1), 62 - 71.

Hsiao-Yun, Ch., Kun-Yu Ch., Jau-Jia L., Chih-Feng L., & Chun-Hou W. (2010). Immediate effect of forearm Kinesio taping on maximal grip strength and force sense in healthy collegiate athletes. *Physical Therapy in Sport, 11*(4), 122-127.

Järvinen, T. A., Kannus, P., Maffulli, N., & Khan, K. M. (2005). Achilles tendon disorders: etiology and epidemiology. *Foot and Ankle Clinics*, *10*(2), 255-266.

Jung-hoon, L., & Won-gyu, Y. (2012a). Treatment of chronic Achilles tendon pain by Kinesio taping in an amateur badminton player. *Physical Therapy in Sport, 13*(2), 115-119.

Jung-hoon, L., & Won-gyu, Y. (2012b). Application of posterior pelvic tilt taping for the treatment of chronic low back pain with sacroiliac joint dysfunction and increased sacral horizontal angle. *Physical Therapy in Sport, 13*(4), 279-285.

Kase, K. (2003). *Illustrated Kinesio Taping®.* Tokyo: Ken Ikai Co Ltd.

Kase, K., & Stockheimer, K. (2006). *Kinesio Taping® for Lymphedema and Chronic Swelling*. Tokyo: Ken Ikai Co Ltd.

Kase, K., Hashimoto, T., & Okane, T. (1996). *Kinesio Taping® Perfect Manual*. Tokyo : Ken Ikai Co Ltd.

Kase, K., Martin, P., & Yasukawa A. (2006). *Kinesio Taping® in Pediatrics*. Tokyo: Ken Ikai Co Ltd.

Kase, K., Tatsuyuki, H., & Tomoki, O. (2003). *Kinesio taping perfect manual : amazing taping therapy to eliminate pain and muscle disorders*. Tokyo: Ken Ikai Co Ltd.

Kase, K., Wallis, J., & Kase, T. (2003). *Clinical Therapeutic Applications of the Kinesio Taping® Method*. Tokyo: Ken Ikai Co Ltd.

Maffulli, N., Sharma, P., & Luscombe, K. L. (2004). Achilles tendinopathy: etiology and management. *Journal of the Royal Society of Medicine, 97*(10), 472-476.

Platts-Mills, T. F., & Hunold, K. M. (2013). Increase in Older Adults Reporting Mountaineering-Related Injury or Illness in the United States, 1973–2010. *Wilderness & Environmental Medicine, 24*(1), 86-88.

Pro-Tec Athletics (2013). *Pre-cut Kinesiology Tape.* Retrieved from http://www.pro-tecathletics.com/56978/648232/Knee/Precut-Kinesiology-Tape.html

Rauh, M. J., Koepsell, T. D., Rivara, F. P., Margherita, A. J., & Rice, S. G. (2006). Epidemiology of Musculoskeletal Injuries among High School Cross-Country Runners. *The American Journal of Epidemiology, 163*(2), 151-159.

Taunton, J. E., Ryan, M. B., Clement, D. B., McKenzie, D. C., Lloyd-Smith, D. R., & Zumbo, B. D. (2002). A retrospective case-control analysis of 2002 running injuries. *British Journal of Sports Medicine, 36*(2), 95-101.

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 *Orthopaedic & Sports Physical Therapy, 38*(7), 389-395.

Tieh-Cheng, F., Wong, A. M. K., Yu-Cheng, P., Wu, K. P., Shih-Wei, Ch., & Yin-Chou, L. (2008). Effect of Kinesio taping on muscle strength in Athletes. A pilot study. *Journal of Science and Medicine in Sport, 11*(2), 198-201.

Vercelli, S., Sartorio, F., Foti, C., Colletto, L., Virton, D., Ronconi, G,. et al. (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.

Wei-Ling, Ch., Yi-Fen, S., & Wen-Yin, Ch. (2012). Running injuries and associated factors in participants of ING Taipei Marathon. *Physical Therapy in Sport, 13*(3), 170-174.

Wong, O. M. H., Cheung, R. T. H., & Li, R. C. T. (2012). Isokinetic knee function in healthy subjects with and without Kinesio taping. *Physical Therapy in Sport, 13*(4), 255-258.

Yin-Hsin, H., Wen-Yin, Ch., Hsiu-Chen, L., Wendy, T. J. W., & Yi-Fen, S. (2009). The effects of taping on scapular kinematics and muscle performance in baseball players with shoulder impingement syndrome. *Journal of Electromyography and Kinesiology, 19*(6), 1092-1099.

Zafar, M. S., Mahmood, A., & Maffulli, N. (2009). Basic science and clinical aspects of achilles tendinopathy. *Sports Medicine and Arthroscopy*, *17*(3), 190-197.