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EFFECTS OF KINESIOTAPE ON LOWER LIMBS  
– A SYSTEMATIC LITERATURE REVIEW

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## TITLE OF THE THESIS

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The purpose of this thesis was to collect information of the effectiveness from the use of kinesiotape on lower extremities. The thesis data collection was conducted in a form of a systematic literature review. In addition the thesis includes basic information from kinesiotaping in general which is important to get familiarized before going more in depth in the review. There is also basic information from the stages of a review to give an understanding to the reader of the method used in the review.

The review was done according to the three main stages of systematic literature review: the planning, making of the review and reporting the results and making suggestions for further investigation. The methodological quality of the studies were assessed according to the PEDro scale and demanded to receive 6/10 or more points to be included in the review. Studies published until 15.2.2013 were included as that was the date the database search was done.

Five studies were included in the review from which two were concerning patellofemoral pain syndrome, another two quadriceps muscle performance and one concerning post stroke plantar flexor spasticity. The studies mainly investigated the immediate effects of kinesiotape and showed no significant improvements with the use of the tape. In the end of the thesis are suggestions for further investigation that is needed.

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## 1 INTRODUCTION

Kinesiotaping is a fairly new concept for most people, even though it has been founded 1979 by a Japanese chiropractic Kenzo Kase. There amount of studies done concerning kinesiotape seems to be raising all the time, but so far there is not that much evidence based data to back up the theories given as the effects of kinesiotape. The visibility of kinesiotape in media used by athletes is probably a big reason for its raising popularity. Kinesiotaping is also spreading all the time into health care providers around Finland as a growing treatment method as it can be used for big variety of different sorts of clients.

I got interested in kinesiotaping after going to thru the basic taping course and since that I have had interested on its affects, I have also clinical experience from the use of kinesiotape which has raised the curiosity towards the taping method more. Due to the fact that there is existing knowledge even though the amount seemed to be strongly limited it seemed to be useful to make a systematic review based on the existing information available. The more specific subject for the thesis in the form of the research questions was chosen as the effect on the lower extremities and the effects on healing process was created since there was not a review done regarding the matter in the knowledge of the author of this thesis.

The thesis provided information which can be used when assessing the effectiveness of kinesiotape. The review is repeatable and as it offered only the information from five studies repeating the study in the future is necessary to get more reliable information concerning the matter.

## 2 KINESIO TAPING

### 2.1 Brief history of kinesiотaping

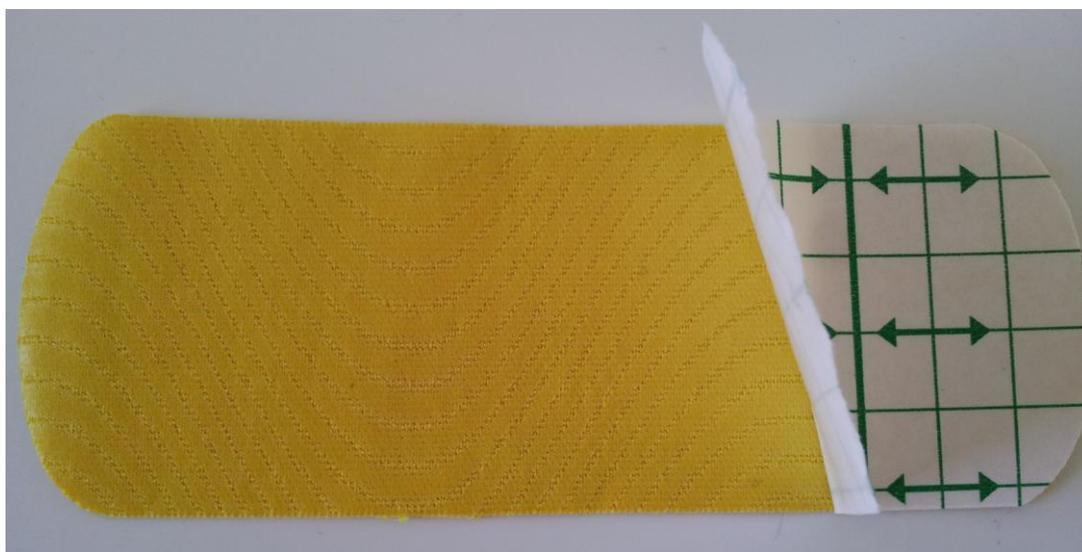
The roots of kinesiотaping go back to 1970's in Japan. The taping method was founded 1979 by chiropractic Kenzo Kase who had spent years for testing the elastic breathable cotton tape. Kase also brought his own brand Kinesio Tex tape® on market at the same time, nowadays there are plenty different brands of kinesiотape available and they are available to anyone almost anywhere. Kase found that myofascial pain could be relieved and the range of motion of painful joints improved by getting movement to the superficial tissues. With kinesiотape that effect can be prolonged to affect also after treatment. Kase's aim was a product that gives support without restricting like conventional sports tape does and in addition he also aimed for the product to benefit the actual healing process. The use of the tape first started spreading in Japan and by athletes kinesiотape got its real exposure in Seoul summer Olympics at 1988. After that it has been spreading more and more all the time and also beyond athletes to health care professionals use with all kinds of patients with different disabilities. (Kåla & Kataja 2011, 8; Website of authentic kinesio UK 2013; Website of kinesio® 2013)

### 2.2 Features and effects of kinesiотape in theory

Kinesiотape is made from cotton which makes it breathable and more skin friendly than ordinary tapes. The tape is made to mimic the human skin in the stretching abilities as well as in the thickness of the tape. The glue of the tape is put in a wavy shape which helps humidity to restrain from the skin which makes it more skin friendly and non-allergic than ordinary tapes. The tape is attached to a paper from the glue side of it and on the roll it has been pre-stretched 10%. The glue on the tape is activated by warmth and that is why the tape is to be stroked after it is attached to skin. One tape can be worn for several days, also shower and swimming are allowed since the tape stays on even if it gets wet. Kinesiотape needs to be cut for the correct shape and length needed and the ends of the tape should be always rounded by cutting to make it hold better on the skin. Kinesiотape is made to stretch to allow full range of motion

of joints at the same time as the tape gives guidance and support. (Kåla & Kataja 2011, 10; Website of authentic kinesiio UK)

There are five main effects and they are: improvement of circulation, relief of pain, muscle function improvement, joint support and segmental influence. Depending on your source the names vary and also some sources divide the techniques into six different categories. Improvement of circulation is a result of the tapes skin lifting effect. When the tape is applied correctly this technique makes the skin fold which makes space between the skin and the muscle and decreases the pressure and increases the circulation. Effect of kinesiotape on pain relief can be explained in two levels. Spinal level: direct inhibition of the pain stimulus to the interneurons at spinal level according to the gate control theory by Melzack and Wall. Supraspinal level: inhibition of efferent neurons from the reticular formation which are influenced by the thick-fibered system. (Pijnappel H. 2011, 16). Improvement of muscle function effect thru the mechanoreceptors and the effect depends on which way the tape is put. Activating tapes are put from origin to insertion and non-activating tapes the opposite way. More detailed information in the section concerning the taping techniques of the thesis. Joint support is divided into two according to Pijnappel. Proprioceptive stimulation which means that the tape improves the sense of movement because of change in balance of various muscle groups and causes a positive effect on joint function. Mechanical support with kinesiotape is given by stretching the tape to its maximum to give passive support to the joint. The stretched tape gives permanent stimulation to the skin receptors and therefore gives a feeling of support. Segmental influence is achieved by affecting organs thru the skin and fascia. It has been seen to effect for example on stomach- and menstrual pain. (Kåla & Kataja 2011, 16-17; Pijnappel 2011, 15-18; Website of authentic kinesiio UK 2013)



**Fig. 1** The glue underneath the paper that is attached to the skin. The glue is put on a wavy shape to enhance breathability of the tape and thru that avoid skin irritation.

### 2.3 Taping techniques

Kinesiotaping is divided into five different techniques. These techniques are muscle technique, fascia technique, posture improving technique, lymphatic technique and combination tapings. These techniques differ in different matter such as the amount of stretch on the tape and how and where it is put. In all techniques the ends of the tape should be rounded to make sure it attaches the skin properly, the tape ends also known as anchors should be always put to the skin without any stretch on them. More specific details of how the tape is used is explained under the headlines of each taping technique. (Kåla & Kataja 2011, 16)

### 2.3.1 Muscle taping

Muscle taping with the use of kinesiotape is meant to affect the muscle tone. The direction where the tape is pulling defines whether it is activating the muscle or inactivating. Activating tapes are put from origin to insertion whereas inactivating tapes the opposite from insertion to origin. These principles cannot be explained fully with mechanical reasons but when the tape is put from origin to insertion the stretch of the tape activates mechanoreceptors towards origin and improves the muscle activation. Using the muscle technique the actual tape is not stretched more than 10-15%. Instead the tissue taped is stretched when the tape is placed on the skin. The tape is put 1-2 cm from the origin all the way to 1-2 cm over the insertion or vice versa depending on the effect wanted. The stretch of the tissue and the elastic tape makes folds on the skin where the tape is. The folds make room between the skin and tissues underneath and that enhances or normalizes the blood and lymphatic circulation on problem areas. It also stimulates the muscle tissues mechanoreceptors whose function is to guide the muscle to function properly and activate the body to proprioceptive which means the normal functioning of the body. (Kåla & Kataja 2011, 18)



**Fig. 2** Tapings to inhibit (right thigh) and facilitate (left thigh) the quadriceps muscle done similarly to the study from Vercelli et al that was included in the review.

### 2.3.2 Fascial taping

This technique is aiming purely for pain relief. The tissue is guided to a painless direction with the tape using 30-60% stretch. First the problematic area needs to be examined to see how to put the tape in others words, where is the painless direction that is the direction the tape is put to pull. More than one tape can also be put as the so called “pain flower” is a common tape to be used. In that specific taping the painful area is in the middle of the taping and tapes are put to cross each other all stretched from the middle and pulling to the middle making a lifting effect on the tissue.

(Kåla & Kataja 2011, 66)

### 2.3.3 Posture taping

The basic principle is to guide a joint to a normal position, for example if there is a client with shoulders pushed forward. The tape activates the proprioceptors and pulls the joint into the position wanted. In these tapings the tape is stretched 80-100% which makes it real firm and it can also limit the joint going into wrong positions. When putting the tape the joint is first put into the ideal position by the client with manual guidance from the professional doing the taping.

(Kåla & Kataja 2011, 74)

### 2.3.4 Lymphatic taping

The lymphatic taping technique aims for reducing swelling and activating the lymphatic system. The tape is cut to make 1cm wide strips that are placed according to the lymphatic system longitudinally, wavy or crossing each other over the treated area. The tape itself is not stretched but the tissue is stretched to make 10-15% stretch. When the tissue gets back to its normal position it lifts the skin and releases the pressure underneath. Reduced pressure opens the lymphatic system and the fluid gets all the way to terminus and back to the blood circulation.

(Kåla & Kataja 2011, 94)

### 2.3.5 Combination taping

Combinations of these tapings can be used whenever the professional sees there is more benefit on multiple tapes on the affected area. There can be different techniques used on different muscles within one problematic area.(Kåla & Kataja 2011, 100)

## 2.4 Contraindications

According to Pijnappel (2011) there are not many contraindications for kinesiotape. When treating patient by using kinesiotape following situations need more in dept examination and observation. If the client has a skin disease the use of kinesiotape is not forbidden but recommended to use at least a small test tape to see how the skin reacts. Acute non specified injuries as well as tape and glue allergies are considered to be contraindications for the use of kinesiotape. Undiagnosed swelling or thrombosis, the tape could dislodge the clot. During the first and the last third of pregnancy, mainly large tapings on the thoracic spine area are recommended not to be used. (Kåla & Kataja 2011, 14; Pijnappel 2011, 46)

## 3 SYSTEMATIC LITERATURE REVIEW

### 3.1 General about systematic literature review

Literature reviews are compiled information packages from a specific area with precise defining. Systematic literature reviews use systematic methods with a view in order to minimize bias and aim to identify all studies made in the area (Cochrane handbook for systematic reviews). They are normally done as an answer to a question or a problem. These questions are called research questions. Systematic literature review is just one of many literature review types. All literature reviews demand there to be existing researches made relating to the subject. The more systematic approach in a review makes it more valuable and useful for practical work on health care. (Leino-Kilpi 2007, 2; Website of The Cochrane collaboration, handbook 2013)

Systematic literature review is divided into three main stages. Planning, making of the review and reporting. These three stages can be divided in smaller stages but these three are roughly the main ones that are being used. In the planning stage the researcher is viewing already existing material, defining the need of the review and making a research plan. The research plan includes the research questions and there

are to be 1-3 questions. Without the research questions it is not possible to find answers to the research problem. Defining the research questions is advised to be done according to the PICO-model. In This model all the letters have a meaning: “P = patient or population, I = intervention under investigation, C = the comparison of interest and O = the outcomes considered most important in assessing results” (Pudas-Tähkä, Axelin 2007, 47.). Even if the systematic literature review comes out without proper answers to the research questions it is not a failure. It still gives the important knowledge that there is not enough research done on the specific matter. Then the methods to make the review are chosen. Choosing databases that are used and terms used for the database search. When choosing the research material used for the review a specific inclusion and exclusion criteria is drawn and they can be focused for participants, intervention, outcomes or design. The search is a critical step in a systematic literature review, mistakes during the search phase can lead into unreliable or false results and that is why it is recommended to make the database search with A professional on that specific area. The search strategy must also be recorded precisely in order to make the review repeatable. (Johansson 2007, 5-6; Pudas-Tähkä, Axelin 2007, 47-50; Website of NYU, health science libraries 2013)

In the second stage the researcher gathers the material from the databases and exceeds according to the study plan. The researcher also analyses the material according to the research questions and the quality of the research. Another step is to synthesize the research results all together. A specific recording from all stages is important factor of a relevant and successful review. The last stage is to report the results and making of conclusions and suggestions according to those results. (Johansson 2007, 6-7)

### 3.2 The research questions

In this systematic review the research questions where:

1. What are the main effects of the use of kinesiotape in lower limbs?
2. Does the usage of kinesiotape fasten the healing process?

### 3.3 Search strategy and selection of studies

The database search was done 15.2.2013. The search terms used were “kinesio tape”, “kinesio taping”, “kinesiotape” and “kinesiotaping”. The terms were separated with Boolean operator OR. As an exception in Pedro database the search was done separately with each term and the results counted together after taking the identical results from different search terms away. The search was not specified any more than the terms referring to the tape to ensure the maximum amount of studies. The databases used were Cinahl, Ovid, PubMed, Pedro and Science direct. The search operator was put to search the terms from the whole text. In addition the text needed to be in English language and the full text needed to be available.

As exception for the search, Science directs search results have referrals for studies without full text but they were excluded in the very beginning, there also was a study concerning animals and that was also excluded. 29 articles made it through the first phase into abstract reading stage, from which 18 full texts was to be read and given points according to the PEDro scale that can be found from the appendices in the end of the thesis. PEDro is an abbreviation of the full name physiotherapy evidence database free online. It has over 24,000 studies and all the studies in the PEDro websites are classified with the PEDro scale. The PEDro scale classifies studies getting 6/10 or more points to be moderate to high quality which was also set as a limit for inclusion in the systematic literature review on this thesis. The points on PEDro scale and databases of which the articles were chosen to the review can be seen in table 1. ([www.perdo.org.au](http://www.perdo.org.au))

**Table 1. Articles, databases from which they were found and point on the PEDro scale.**

<u>The name of the article</u>	<u>Database:</u>	<u>Points on pedro scale:</u>	<u>Results confirmed on PEDro</u>
Aytar et al. (2011)	pedro	7\10	Yes
Kuru, Yaliman & Dereli (2012)	ovid	7\10	No
Vercelli et al. (2012)	ovid	7\10	No
Almeida Lins et al. (2012)	Science Direct	6\10	No
Karadag-Saygi et al. (2010)	pedro	7\10	Yes

### 3.4 Inclusion and exclusion criteria

A study was included or excluded with the following criteria:

1. The was wanted as *full text without a fee*.
  - Free full text option was chosen in the search of the databases.
2. The study had to get 6/10 points or more in the Pedro scale.
  - That being the limit given in the websites for a moderate to high quality study ([www.pedro.org.au](http://www.pedro.org.au)).
3. The study needed to concern only humans.
4. The study needed to concern kinesiotape used on lower limbs.
5. The study setting was to be a controlled study.

## 4 RESULTS OF THE LITERATURE REVIEW

Results of the review are written separately from each article. Each of them include all the needed information to get the idea from the interventions and the results without going to detailed information. If there is a need for more information the full article is advised to be read. The knowledge chosen by the author of the thesis includes

the participant information, interventions and the effect of the intervention in other words the results from each study. The section 5 includes the discussion from the results of the review put together.

Aytar et al. (2011) investigated the effects of kinesiotape on pain, strength, joint position sense and balance on persons suffering from patellofemoral pain syndrome. Twenty-two female subjects participated in the study and they were randomly divided into two groups, kinesiotape group and a placebo tape group. The participants mean age was  $24.1 \pm 3.2$  years, two participants dropped out during the study. Outcome measures of quadriceps muscle strength, joint position sense, static and dynamic balance and pain were taken before and 45-minutes after tape applications. Measurements of quadriceps muscle strength and joint positions sense were measured with an isokinetic dynamometer, balance was assessed with a Kinesthetic Ability Trainer (KAT) and pain was measured by Visual Analog Scale (VAS).

As results neither group showed no statistical improvements in joint position sense or pain, whereas both groups showed statistically significant improvements in quadriceps muscle strength and static and dynamic balance with the difference of quadriceps strength improving only in one of the two tested joint angles in the placebo tape group whereas the kinesiotape groups showed improvements in both tested joint angles of the knee. As a total result the study showed kinesiotape not to be an effective treatment method compared to placebo tape with patients suffering from patellofemoral pain syndrome.

Kuru, Yaliman & Dereli (2012) compared the effects of kinesiotape and electrical stimulation in patients with patellofemoral pain syndrome. Thirty participants (26 females and 4 males) with the mean age of  $32.9 \pm 12.2$  years were randomly divided into two equal sized groups. In addition to the treatment given (kinesiotape or electrical stimulation) both groups got the same exercise program to follow alongside the treatment. All participants had individual treatment sessions 3-times a week for 6 weeks under the instruction of a certified physiotherapist, they were also instructed to do exercises on non-treatment days and that was monitored with a daily log. There were two assessments performed, in the start of treatments and at the end 6 weeks after starting the treatments. During the first session Visual Analog Scale (VAS) was

used to collect data for the starting point. Also manual muscle tests were done for knee extension according to the British Medical Research Council's standards. The knee function was assessed with Kujala Patellofemoral Score questionnaire. The study also used three functional tests triple-jump, step and knee flexion to measure the functional outcomes. Generic health related quality of life was with a Turkish version of SF-36 questionnaire.

Both study groups showed a significant decrease in pain (VAS) and improvements in pre- and post-treatment results in knee extension strength, Kujala scores, functional knee flexion and triple-jump. In the tests mentioned just above no significant differences were seen in between group comparison. The final step test showed significant improvements within-group in the kinesiotape group, no significant differences were found in between the two groups. SF-36 questionnaire scores were not significantly different between groups, both groups still showed improvements compared to the baseline, all the points were not significantly improved but still showed improvements. The study showed that the effects of kinesiotape and electrical stimulation are similar in the treatment of patellofemoral pain syndrome. The study lacked a control group only treated only with the physical exercise program, now the study showed just that kinesiotape nor the electrical stimulation is not superior compared to the other one in the treatment of patellofemoral pain syndrome.

Vercelli et al. (2012) investigated the immediate effects of kinesiotape application on maximal muscle strength of the dominant leg quadriceps. 36 healthy participants started the intervention from which 34 finished and were taken into account in the analysis. 17 of the participants were males 19 females with the mean age of  $23 \pm 5$  years. All participants were tested with 3 different interventions facilitation taping, inhibition taping, and sham taping for isokinetic peak torque, single-leg triple hop and global rating of change scale with an randomized order under 3 different sessions. Also the non-dominant side was also tested to confirm that systematic error is irrelevant for example due to possible learning effect or muscle soreness.

None of the interventions changed the test results significantly in any direction. The study was in line with previous studies that kinesiotape application does not significantly alter from non-taping condition immediately after application.

Study from Almeida Lins et al. (2013) aimed for analyzing the effects of kinesiotape on the neuromuscular performance of femoral quadriceps, postural balance and lower limb function immediately after application. Kinesiotape was applied according to Kase et al. (2003) to rectus femoris, vastus lateralis and vastus medialis muscles. The participant groups consisted from 60 healthy females with the mean age of  $23.3 \pm 2.5$  years. All participants were tested before and immediately after interventions. Participants were randomly put into groups of 20 persons a kinesiotape group, non-elastic adhesive tape group and a control group. The measured variables in the study were single-hops, triple-hops, postural balance (baropodometry) and peak concentric, peak eccentric and electromyographic activity of vastus lateralis muscle.

Test results showed no significant changes between any of the three groups nor between the initial and final assessment in any of the tested variables. As a conclusion for the study it can be said that kinesiotape applied this way to the quadriceps muscle did not improve the neuromuscular performance of femoral quadriceps, postural balance or lower limb function immediately after application.

Karadag-Saygi et al. assessed the effect of kinesiotape combined with botulinum toxin (BTX-A) in patients with post stroke spasticity in plantar flexors. 20 participants (12 females and 8 males) with hemiplegia after stroke were divided randomly in two groups 3 of them dropped out before 6 months. One group receiving the BTX-A injection and kinesiotape and the other receiving the BTX-A injection and sham tape. Both groups got clinical assessments at 2 weeks and 1,3 and 6 months after starting. In addition both participants had similar exercise program to perform at home. The participants were measured for passive range of motion (ROM) of the ankle joint, ankle plantar flexor muscle tone was evaluated with a modified Ashworth scale, also the step length and gait velocity were measured.

As an exception in results the kinesiotape group showed a significant increase in passive ankle ROM at 2 weeks. Any other measurement showed no significant differences between the kinesiotape group and the sham tape group. The study showed that kinesiotape combined with BTX-A injection offers no superior effect compared to sham tape combined with the same injection in treating spasticity in hemiplegic patients.

**Table 2. PICO-model from the articles included in the review.**

<b>Authors</b>	<b>Population</b>	<b>Intervention</b>	<b>Comparison</b>	<b>Outcome measures</b>
<b>Aytar et al (2011)</b>	22 female participants with PFPS over 6 months divided to KT (n.12) and PKT (n.10)	Y-shaped KT according to Kase's kinesiotaping manual over quadriceps	Placebo tape with sticking plaster	Quadriceps strength and joint position sense with an isokinetic dynamometer. Balance with KAT. Pain with VAS.
<b>Kuru, Yaliman and Dereli (2012)</b>	30 participants with PFPS over 3 months divided equally for two groups	KT on the knee and quadriceps area together with an exercise program	Electrical stimulation on the knee area together with an exercise program	Pain with VAS. Knee extension strength. Kujala patellofemoral score. SF36 questionnaire. Step, triple-jump and knee flexion for functionality.
<b>Vercelli et al (2012)</b>	36 healthy volunteers tested in a crossed setting for 3 conditions	Inhibiting and facilitating KT application for quadriceps	Sham KT on quadriceps	Isokinetic peak torque. Single-leg triple hop. Global rating of change scale.
<b>Almeida Lins et al (2012)</b>	60 healthy females divided into three groups	KT over vastus lateralis, vastus medialis and rectus femoris muscles	Control group (10-min rest) and non-elastic adhesive tape group	Single-hops. Triple-hops. Postural balance by baropodometry. Peak concentric, peak eccentric and electromyographic activity of vastus lateralis muscle.
<b>Karadag-Saygi et al (2010)</b>	20 participants with post stroke olantar flexor spasticity over 6 months divided equally into two groups	4 strips of KT applied on calf, shin and ankle area according to Kase's kinesiotaping manual together with BTX-A injections	Sham KT on Calf-shin area together with BTX-A injections	ROM of the ankle joint. Ankle plantar flexor muscle tone (modified Ashworth scale). Step length and gait velocity.

Notes: KT = kinesiotape; VAS = visual analog scale; ROM = range of motion; PFPS = patellofemoral pain syndrome; KAT = kinesthetic ability trainer;

## 5 DISCUSSION

The aim of this review was to gather the existing knowledge concerning the use of kinesiotape on lower limbs and also more specifically the effects during a healing process and effects during physical activities. When making conclusions from the review it should be noted that only five studies met all the criteria and were included. Studies from Aytar et al. (2011) and Kuru, Yaliman & Dereli (2012) concerning patellofemoral pain syndrome, studies from Almeida Lins et al. (2012) and Vercelli et al. (2012) concerning kinesiotape used for quadriceps muscles and a study from Karadag-Saygi et al. (2010) concerning the plantar flexor spasticity. Kuru Yaliman & Dereli (2012) investigated the efficacy of kinesiotape compared to the efficacy of electrical stimulation and Aytar et al. (2011) investigated the effects of kinesiotape compared to sham tape, with both having participants suffering from patellofemoral pain syndrome. Almeida Lins et al. (2013) investigated the use of kinesiotape on quadriceps muscle strength, the study was implemented as a crossover trial of three interventions, facilitating, inhibiting and a sham taping. Other study from Vercelli et al. (2012) was comparing kinesiotape to non-elastic adhesive tape and non tape group, this study tested more specifically the lower limb function and postural balance with the tape placed on femoral quadriceps. The last study was from Karadag-Saygi et al. (2010) and investigated the effects of kinesiotape on patients with plantar spasticity after stroke combined with BTX-A injections, and comparing the results to sham taping.

The review was in line with previous reviews from the subject, even though this review was limited to lower limb only instead of the whole human body. The review did not prove kinesiotape to be a superior treatment method for patellofemoral pain syndrome compared to sham tape or electrical stimulation. Aytar et al. (2011) found kinesiotape to improve the quadriceps muscle strength, still they found kinesiotape not to be effective to treat patellofemoral pain syndrome. Kuru, Yaliman and Dereli

(2011) found no difference when studying the kinesiotape compared to electrical stimulation as alternative treatment methods. Study from Akbas, Atay and Yuksel (2011), was excluded from the study because receiving 5/10 on pedro scale, they studied the effects of kinesiotape combined with an exercise program on function, pain and ROM and found no statistically or clinically significant difference compared to a control group with 6-week time period, even though there was a difference in hamstring flexibility still on week three of the intervention. Kuru, Yaliman and Dereli (2011) stated that lack of exercise group only could be considered as deficiency for their study, but chose to leave that out since the testing superiority of kinesiotape compared to electrical stimulation seemed more appropriate since the effect of exercise is already proven. Study from Aytar et al. (2011) only had female participants which is a factor that should also be considered when analyzing the results as well as when planning for new studies. Kuru, Yaliman and Dereli (2011) had mistakenly said that they had 26 females and 4 females which need to be corrected.

The review did not accomplish to support the idea of kinesiotape being able to improve muscle strength during a physical performance. The review included two studies investigating kinesiotape use on quadriceps muscle to improve the performance of a healthy person. Both of the studies included muscle tests and in addition functional tests and the results showed that they could not suggest the use of kinesiotape to improve physical performance before further investigation. Almeida Lins et al. (2012) only had female participants whereas Vercelli et al. (2012) had them almost evenly half and half. The sex is also in these studies something to consider in future studies to see if it matters when analyzing the results. These studies investigated only the immediate effects of kinesiotape on muscle performance and therefore Vercelli et al. (2011) suggested that repeated applications or longer period of application might be necessary to detect changes in muscle strength. Hoyo et al. (2013) study was not included to the study because receiving 4/10 points in pedro scale tested kinesiotape on the rectus femoris muscle of soccer players in a crossover study and found no statistically significant improvements compared to non-taped condition and was well in line with studies included in the review. Hoyo et al. (2013) also investigated only the immediate effects.

Karadag-Saygi et al. (2010) a study concerning of treating plantar spasticity with kinesiotape combined with BTX-A injections. The only difference between kinesiotape and sham tape group was in hamstring flexibility, two weeks after starting the interventions, later on the different settled to the same stage with both groups and no differences were seen between kinesiotaping and sham taping. Karadag-Saygi et al. (2010) stated that there were only few studies made about the effects of taping in this condition, the author of this thesis also made the same conclusion. They also mentioned that similar findings have been made in all studies and according to that knowledge it seems that the positive effects comes from the BTX-A injection and therefore a study with a group without the injection should be implemented to see the real effect of the alternative treatment method, which in this case would be kinesiotaping. As limitations Karadag-Saygi et al. (2010) mentioned a small sample size being the major one. Another mentionable was the lack of control of the amount of participant working individually according to their exercise programs, those limitations should be thought thru and implemented better in future studies.

In the studies included in the review the effects studied were mainly immediate which can be a reason for the result showing no statistically significant benefits. Based on that, further studies are suggested to be done with a longer period of intervention. In addition there should be a control group included in the study to see the actual benefit of kinesiotape on the issue. This review included studies that had a comparison but lacked on a non-treatment control group to show the true effectiveness of the tape compared to no treatment. The review as it is also should be repeated in the future to gather bigger amount of studies to improve the reliability of the results.

## 6 MY THESIS PROJECT

My thesis as a project started real slow with big problems choosing the subject. Finally I got the process going when I started to simplify my thinking to a way that it is just an assignment as the others. Next I sat down, took all my books concerning physiotherapy on the table and started writing suggestions. With those suggestions I went to see the teacher and the subject was decided there. At that very moment I also decided to keep on to that subject as long as the thesis is done. This all happened in mid-December 2012 and that was what I consider as the starting point of my thesis project.

Systematic literature review was totally unknown term for me when it was first introduced to me by the supervising teacher. I started out with searching for basic information what it is first getting to know the different stages it has by putting them up for me as it was an ordinary assignment. Now I feel like I have a good idea of firstly for what reason, and secondly how systematic literature reviews are made. I started the actual work with the thesis by going according to the three phases that a systematic literature review includes as explained previously in the thesis. For me the first phase was definitely the hardest and the reason for that is simple and in my mind understandable, everything was new for me and demanded lots of work with what came to have the basic knowledge of the work I was actually going to produce. When evaluating the review there are things to consider and one important of them is that this was the first review I have made. I did my background searching, but still there might be mistakes done during the process that I am not aware of, because of the lack of experience. Another point of consideration is that I am not a native English speaker which might have led into misunderstandings at some points even though I understand English fluently. The language was an issue also when reading the articles, there was mistakes done in the articles that I noticed when reading and those mistakes as well as mine, might lead to misunderstandings. In my work I aimed for consistency and quality all the time in order to the review to be repeatable. In addition to that I aimed for recording everything that might be needed in repeating the review since this is a key factor in the making process of a systematic literature review to keep it repeatable.

The amount of studies that was included stayed in five articles. Nevertheless I did not try to make any adjustments to the inclusion criteria to make the number of studies raise. The reason for that was Johansson (2007) stating that even a review that comes out empty gives the knowledge that there is not enough studies done in that area and that makes the results still meaningful. I feel like working like this also simplifies the work in future if this review would be repeated. The amount of quality studies and their result are easy to be compared to the ones in this review.

The thesis also includes basic information concerning kinesiotaping. I felt it is an important to get that knowledge of the method used. The information from kinesiotape is based on referenced knowledge from literature. The knowledge included in this work is gathered by the author of this thesis and includes the important knowledge with pictures to give an idea also to readers that might be totally unaware of what kinesiotape is. The information given from kinesiotape may vary a bit according to the source the information has been gathered from for example as stated previously in the thesis in some sources kinesiotaping method is divided into five major techniques whereas other divide into six techniques. During the making process I have also found that different sources also name them phases bit differently than others. Nevertheless they all aim in the same and this thesis was about does the tape live up to its promises further than the placebo effect.

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### PEDro scale

1. eligibility criteria were specified	no <input type="checkbox"/> yes <input type="checkbox"/> where:
2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received)	no <input type="checkbox"/> yes <input type="checkbox"/> where:
3. allocation was concealed	no <input type="checkbox"/> yes <input type="checkbox"/> where:
4. the groups were similar at baseline regarding the most important prognostic indicators	no <input type="checkbox"/> yes <input type="checkbox"/> where:
5. there was blinding of all subjects	no <input type="checkbox"/> yes <input type="checkbox"/> where:
6. there was blinding of all therapists who administered the therapy	no <input type="checkbox"/> yes <input type="checkbox"/> where:
7. there was blinding of all assessors who measured at least one key outcome	no <input type="checkbox"/> yes <input type="checkbox"/> where:
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	no <input type="checkbox"/> yes <input type="checkbox"/> where:
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by "intention to treat"	no <input type="checkbox"/> yes <input type="checkbox"/> where:
10. the results of between-group statistical comparisons are reported for at least one key outcome	no <input type="checkbox"/> yes <input type="checkbox"/> where:
11. the study provides both point measures and measures of variability for at least one key outcome	no <input type="checkbox"/> yes <input type="checkbox"/> where:

The PEDro scale is based on the Delphi list developed by Verhagen and colleagues at the Department of Epidemiology, University of Maastricht (*Verhagen AP et al (1998). The Delphi list: a criteria list for quality assessment of randomised clinical trials for conducting systematic reviews developed by Delphi consensus. Journal of Clinical Epidemiology, 51(12):1235-41*). The list is based on "expert consensus" not, for the most part, on empirical data. Two additional items not on the Delphi list (PEDro scale items 8 and 10) have been included in the PEDro scale. As more empirical data comes to hand it may become possible to "weight" scale items so that the PEDro score reflects the importance of individual scale items.

The purpose of the PEDro scale is to help the users of the PEDro database rapidly identify which of the known or suspected randomised clinical trials (ie RCTs or CCTs) archived on the PEDro database are likely to be internally valid (criteria 2-9), and could have sufficient statistical information to make their results interpretable (criteria 10-11). An additional criterion (criterion 1) that relates to the external validity (or "generalisability" or "applicability" of the trial) has been retained so that the Delphi list is complete, but this criterion will not be used to calculate the PEDro score reported on the PEDro web site.

The PEDro scale should not be used as a measure of the "validity" of a study's conclusions. In particular, we caution users of the PEDro scale that studies which show significant treatment effects and which score highly on the PEDro scale do not necessarily provide evidence that the treatment is clinically useful. Additional considerations include whether the treatment effect was big enough to be clinically worthwhile, whether the positive effects of the treatment outweigh its negative effects, and the cost-effectiveness of the treatment. The scale should not be used to compare the "quality" of trials performed in different areas of therapy, primarily because it is not possible to satisfy all scale items in some areas of physiotherapy practice.

#### Notes on administration of the PEDro scale:

- All criteria **Points are only awarded when a criterion is clearly satisfied.** If on a literal reading of the trial report it is possible that a criterion was not satisfied, a point should not be awarded for that criterion.
- Criterion 1 This criterion is satisfied if the report describes the source of subjects and a list of criteria used to determine who was eligible to participate in the study.
- Criterion 2 A study is considered to have used random allocation if the report states that allocation was random. The precise method of randomisation need not be specified. Procedures such as coin-tossing and dice-rolling should be considered random. Quasi-randomisation allocation procedures such as allocation by hospital record number or birth date, or alternation, do not satisfy this criterion.
- Criterion 3 *Concealed allocation* means that the person who determined if a subject was eligible for inclusion in the trial was unaware, when this decision was made, of which group the subject would be allocated to. A point is awarded for this criteria, even if it is not stated that allocation was concealed, when the report states that allocation was by sealed opaque envelopes or that allocation involved contacting the holder of the allocation schedule who was "off-site".
- Criterion 4 At a minimum, in studies of therapeutic interventions, the report must describe at least one measure of the severity of the condition being treated and at least one (different) key outcome measure at baseline. The rater must be satisfied that the groups' outcomes would not be expected to differ, on the basis of baseline differences in prognostic variables alone, by a clinically significant amount. This criterion is satisfied even if only baseline data of study completers are presented.
- Criteria 4, 7-11 *Key outcomes* are those outcomes which provide the primary measure of the effectiveness (or lack of effectiveness) of the therapy. In most studies, more than one variable is used as an outcome measure.
- Criterion 5-7 *Blinding* means the person in question (subject, therapist or assessor) did not know which group the subject had been allocated to. In addition, subjects and therapists are only considered to be "blind" if it could be expected that they would have been unable to distinguish between the treatments applied to different groups. In trials in which key outcomes are self-reported (eg, visual analogue scale, pain diary), the assessor is considered to be blind if the subject was blind.
- Criterion 8 This criterion is only satisfied if the report explicitly states *both* the number of subjects initially allocated to groups *and* the number of subjects from whom key outcome measures were obtained. In trials in which outcomes are measured at several points in time, a key outcome must have been measured in more than 85% of subjects at one of those points in time.
- Criterion 9 An *intention to treat* analysis means that, where subjects did not receive treatment (or the control condition) as allocated, and where measures of outcomes were available, the analysis was performed as if subjects received the treatment (or control condition) they were allocated to. This criterion is satisfied, even if there is no mention of analysis by intention to treat, if the report explicitly states that all subjects received treatment or control conditions as allocated.
- Criterion 10 A *between-group* statistical comparison involves statistical comparison of one group with another. Depending on the design of the study, this may involve comparison of two or more treatments, or comparison of treatment with a control condition. The analysis may be a simple comparison of outcomes measured after the treatment was administered, or a comparison of the change in one group with the change in another (when a factorial analysis of variance has been used to analyse the data, the latter is often reported as a group  $\times$  time interaction). The comparison may be in the form hypothesis testing (which provides a "p" value, describing the probability that the groups differed only by chance) or in the form of an estimate (for example, the mean or median difference, or a difference in proportions, or number needed to treat, or a relative risk or hazard ratio) and its confidence interval.
- Criterion 11 A *point measure* is a measure of the size of the treatment effect. The treatment effect may be described as a difference in group outcomes, or as the outcome in (each of) all groups. *Measures of variability* include standard deviations, standard errors, confidence intervals, interquartile ranges (or other quantile ranges), and ranges. Point measures and/or measures of variability may be provided graphically (for example, SDs may be given as error bars in a Figure) as long as it is clear what is being graphed (for example, as long as it is clear whether error bars represent SDs or SEs). Where outcomes are categorical, this criterion is considered to have been met if the number of subjects in each category is given for each group.