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CLINICAL METHODS

Influence of kinesio tape application direction on peak force of biceps brachii muscle: A repeated measurement study

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KEYWORDS
Kinesio tape;
Physiotherapy techniques;
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Summary *Background:* According to the kinesio tape (KT) method, proximal-to-distal (P-to-D) application of KT should facilitate muscle activity (increase strength), distal-to- proximal (D-to-P) should decrease muscle activity (decrease strength) and applications in other directions should not influence muscle strength.
Objective: To evaluate the influence of KT application direction on peak force of biceps brachii in healthy subjects.
Methods: 16 students participated in a single group repeated measurements study. KT was applied randomly on both anterior arms as follows: no KT; P-to-D; D-to-P; or two horizontal stripes. Peak force of biceps was measured after each application by a blinded investigator.
Results: No difference in biceps peak force was found after evaluating no KT, P-to-D and D-to-P. After the horizontal application, peak force was found statistically significantly higher than in the other conditions.
Conclusions: Traditional assumptions of the KT method, suggesting that P-to-D application stimulates muscle and D-to-P relaxes the muscle, seem to be false. However, we do confirm that applying KT in various directions differently effects muscle strength.

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Introduction

In 1973, a new treatment tool called kinesio tape (KT), an elastic tape, was developed by Dr. Kase. The tape is made out of 100% cotton and has the ability to stretch up to 60% of its original length, similar to the stretching ability of the human skin (Kase et al., 2003). Initially, KT was used mostly for pain and edema reduction. Today, physical therapists, sport physicians, athletic trainer, etc., use KT to improve local blood flow, assist in lymphatic drainage and pain relief, support joint action, facilitate or inhibit muscle activity, and improve proprioception and stability (Huang et al., 2011).

Evidence of KT's effect on muscle strength is controversial. A recent, meta-analysis (Williams et al., 2012) found that 7 out of 10 studies showed a beneficial effect of KT application on muscle strength. Nevertheless, in three isokinetic studies, no significant effect was found when KT was applied to the quadriceps of healthy subjects (Fu et al., 2008; Lins et al., 2013; Vercelli et al., 2012). On the other hand, in a recent study of healthy participants investigating KT application on the biceps brachii (Fratocchi et al., 2013), concentric elbow peak torque significantly increased even when compared to placebo taping.

According to the KT application method (Kase et al., 2003), proximal-to-distal (P-to-D) application of KT should facilitate muscle activity (increase strength), the distal-to-proximal (D-to-P) application should decrease muscle activity (relax the muscle, decrease strength) and applications in other directions should not influence muscle strength at all. Consequently, the horizontal application of KT is occasionally used as a placebo application, determining the influence of KT on muscle strength (Fratocchi et al., 2013). The influence of KT application direction on muscle strength was never directly studied in a controlled experiment.

We believe that it is essential to understand the effect of KT on the musculoskeletal system in normal and pathological conditions in order to perfect KT application. If the KT application can influence the strength of the healthy muscle, it can be used in cases of muscular imbalance, important in the treatment and prevention of musculoskeletal pathology.

Our aim was to evaluate the influence of KT application direction on peak force of biceps brachii in healthy subjects.

Methods

Participants

This was a single group, randomized order, repeated measures, convenience sample study performed at the Department of Physical Therapy, Recanati School for Community Health Professions, Faculty of Health Sciences, Ben Gurion University of the Negev, Beer Sheva, Israel. Physical therapy students were asked to participate. Inclusion criteria consisted of students, males and females, 18—35 years old without known chronic morbidity. Exclusion criteria included: shoulder, elbow or other surgery performed in the upper limbs during the last six months; pregnancy; deep or active scar at the area of tape application; bacterial or fungal infection at the area of tape application and sensitivity to kinesio tape.

Emails were sent to all 1st—3rd year physical therapy students with a short description of the study, its aims and procedures. Sixteen students volunteered and met the inclusion and exclusion criteria. Students have not learned the KT method as part of their curriculum.

The study was approved by the Ethics Committee of the Recanati School for Community Health Professions. Each subject signed an informed consent form prior to commencement of the study.

Basic demographic data were collected using a self-administered questionnaire. Each subject received a KT application (one of three variants) or no application for each arm, randomly set in advance. One researcher performed the KT application and another performed the evaluations of the biceps peak force, blinded to the type of KT application.

Blinding

To ensure the blinding, the KT application was performed by another investigator in a separate room. Before entering the evaluation room and throughout the entire evaluation process, the subjects wore a long sleeve shirt. Subjects were also blinded to the research hypothesis.

Randomization of intervention order

Order of intervention (three types of KT applications or no application) was randomized. Four types of intervention allowed 24 different sequences. Notes, numbered sequentially, were placed in two bowls, one for each arm. Each subject pulled one note from each bowl. The sequences were recorded into the subject's file and were seen only by the researcher performing the intervention.

Three variants of KT application were used (Fig. 1). KT was applied to the subject in a sitting position, with the elbow supinated and slightly bent ($\sim$10 °). Tension of approximately 30% was applied to the tape. The tape was applied on the anterior part of the arm. In the P-to-D direction, a Y-strip was applied to two anchor points on the anterior part of the shoulder; the two tails were positioned around the muscle belly and the distal attachment above the radial tuberosity. In the D-to-P direction, a Y-strip was applied to the anchor, above the radial tuberosity; the two tails were positioned around the muscle belly and two proximal attachment points were placed at the anterior part of the shoulder. The third type of application included two I-stripes of KT applied horizontally to the biceps area.

Peak force evaluation was performed using a hand-held digital dynamometer (MicroFed2 ®, Hoggan Health Industries, West Jordan, UT, USA). A previous study (Schaubert and Bohannon, 2005) found a very high reliability of the MicroFed2 hand-held dynamometer when evaluating knee extension force. In a systematic review of 17 papers researching the hand-held dynamometry correlation with the gold standard isokinetic dynamometry (Stark et al., 2011), the authors found that ease of use, portability, cost and compact size of the hand-held

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