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Original article

# Short term effects of kinesiotaping on acromiohumeral distance in asymptomatic subjects: A randomised controlled trial

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ABSTRACT

*Objectives:* The first aim of this study was to investigate whether kinesiotaping (KT) can increase the acromiohumeral distance (AHD) in asymptomatic subjects in the short term. The second aim was to investigate whether the direction of kinesiotaping application influences AHD.
*Background:* In recent years, the use of KT has become increasingly popular for a range of musculoskeletal conditions and for sport injuries. To date, we are unaware of any research investigating the effect of kinesiotaping on AHD. Moreover, it is unknown whether the direction of kinesiotaping application for the shoulder is important.
*Methods:* Forty nine participants were randomly assigned to one of three groups: kinesiotaping group 1 (KT1), kinesiotaping group 2 (KT2) and sham kinesiotaping (KT3). AHD ultrasound measurements at 0° and 60° of shoulder elevation were collected at baseline and immediately after kinesiotape application.
*Results:* The results showed significant improvements in AHD after kinesiotaping, compared with sham taping. The mean difference in AHD between KT1 and KT3 groups was 1.28 mm (95% CI: 0.55, 2.03), and between KT2 and KT3 was 0.98 mm (95% CI: 0.23, 1.74). Comparison of KT1 and KT2 groups, which was performed to identify whether the direction of taping influences the AHD, indicated there were no significant differences.
*Conclusion:* KT increases AHD in healthy individuals immediately following application, compared with sham kinesiotape. No differences were found with respect to the direction in which KT was applied.


## 1. Background

Maintenance of the subacromial space in the shoulder girdle is crucial for normal shoulder function. The subacromial space can be assessed by measurement of the acromiohumeral distance (AHD), which is the distance between the most cranial part of the humeral head and the acromion. Reduced AHD occurs when the humeral head migrates superiorly with inadequate external rotation, and correlates with shoulder impingement severity (Desmeules et al., 2004; Mayerhoefer et al., 2009; Matsuki et al., 2012) and rotator cuff disease (Seitz and Michener, 2011). The measure of AHD can also be used to identify patients who are most likely to benefit from active rehabilitation for shoulder impingement (Desmeules et al., 2004) or surgical repair of the rotator cuff (Saupe et al., 2006). In asymptomatic individuals, reduced AHD during shoulder abduction correlates with scapular dyskinesia (Silva et al., 2010) and may therefore be a useful pre-symptomatic indicator of subacromial impingement.

AHD can be measured by radiography or magnetic resonance imaging (Saupe et al., 2006), although ultrasonography is a less expensive tool that has additional benefits (Azzoni et al., 2004; Desmeules et al., 2004). For example, real-time ultrasonography enables the radiologist to measure AHD in different degrees of shoulder elevation or rotation (Michener et al., 2003). This approach has been used to detect subacromial space narrowing in young athletes as an early sign of shoulder impingement (Girometti et al., 2006).

In recent years, the use of a therapeutic taping technique known as kinesiotaping has become increasingly popular for a range of musculoskeletal conditions and for sport injuries. For those with

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rotator cuff tendinopathy and shoulder impingement, kinesiotaping has been found to improve self-reported outcomes such as pain and disability (Thelen et al., 2008; Hsu et al., 2009; Kaya et al., 2011). However, the mechanism of action of kinesiotaping is currently unknown and no studies have used diagnostic imaging to obtain quantitative measures of the effect of kinesiotape on the AHD. We hypothesize that kinesiotaping increases the AHD.

The primary aim of this study was to investigate whether kinesiotaping can increase the AHD. We chose to examine this initially in asymptomatic subjects to investigate the mechanism of action of kinesiotaping in the absence of pain. A secondary aim was to investigate whether the technique of kinesiotaping application influences any effects on the AHD.

## 2. Method

### 2.1. Design: randomised controlled trial

#### 2.1.1. Participants

We recruited sixty-two participants, who volunteered from the student body of the Health Sciences School at Malaga University (Spain), and were screened for inclusion between January and March 2012. To be included, participants had to meet all of the following criteria: (i) no shoulder pain in the previous month, (ii) no previous shoulder surgery, (iii) negative Neer test: pain $\leq$3/10 when the upper limb is elevated in the plane between flexion and abduction with prevention of scapular rotation (Neer, 1983), (iv) no painful arc with shoulder flexion or abduction (pain $\leq$3/10 on a visual analogue scale), (v) between 18 and 40 years of age, (vi) AHD $\geq$7 mm with arm at their side and (vii) able to provide informed, written consent. Exclusion criteria were as follows: (i) presence of a skin injury or condition on the shoulder that would contraindicate the use of KT, (ii) refusal to participate once the conditions of the study were known. Forty-nine participants were enrolled into the study (Fig. 1).

Informed written and verbal consent were obtained from all participants before enrolment and baseline demographic and clinical data were collected. The study was approved by The Medical Research Ethics Committee of the Faculty of Nursing, Physiotherapy, Podiatry and Occupational Therapy, University of Malaga and conducted in accordance with the Declaration of Helsinki.

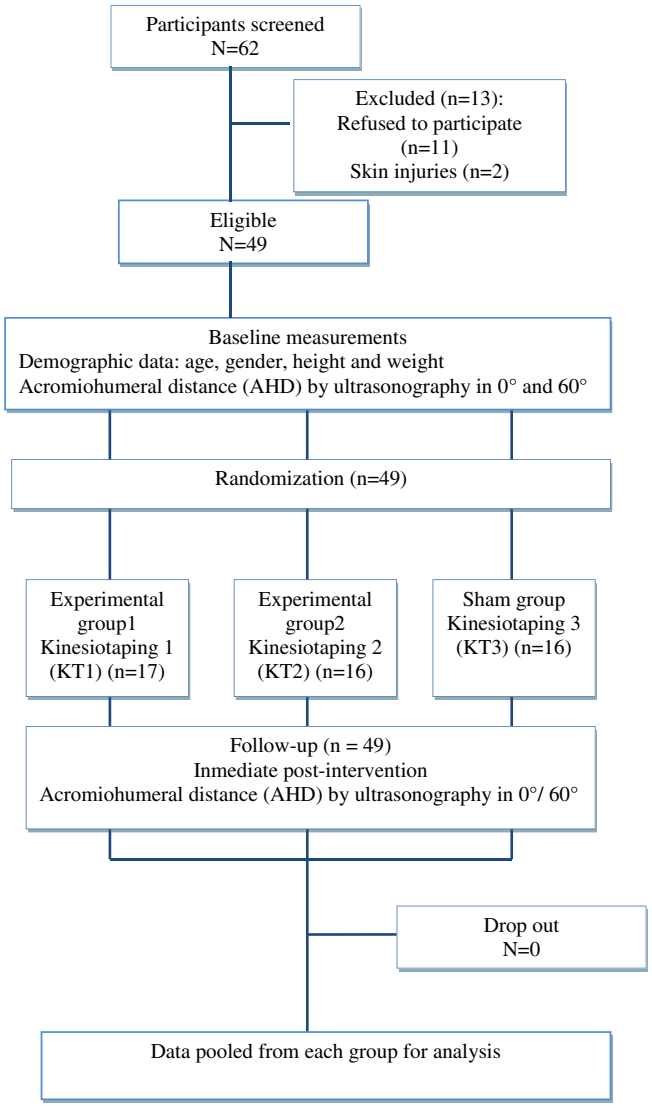


**Fig. 1.** Participant flow diagram.

### 2.2. Procedure

Participants were randomly assigned to 1 of 3 groups using a random-number generator and concealed allocation. Group 1 (KT1) received kinesiotape applied in the traditional manner from anterior to posterior. Group 2 (KT2) received kinesiotape applied from posterior to anterior and group 3 (KT3) received sham kinesiotape. All participants received the kinesiotape application the day after the initial examination by the primary author. Each participant had ultrasound measures of AHD taken before and after the initial kinesiotape application, in 0° and 60° of active shoulder elevation in the scapular plane (Fig. 1).

### 2.3. Taping techniques

All taping was applied by the primary author who has 15 years experience as a musculoskeletal physiotherapist (ALS), to the shoulder of the dominant upper limb of each participant. The skin was first cleaned with alcohol to aid adherence of the tape. Standard 5 cm wide blue k-tape© was used for all taping techniques. The KT1 group received a kinesiotape application. The goal of taping in this group was to facilitate shoulder external rotation in order to increase AHD. A single strip was applied with the subject in erect standing, with the shoulder in maximal external rotation, palm facing forward (Fig. 2). The tape was applied from the coracoid process anteriorly to the superior scapular angle posteriorly, to maintain shoulder external rotation. The tape was stretched to 100% and immediately applied to the skin. Once applied, the adhesion of the tape to the skin was enhanced by rubbing the surface of the tape three times in an anterior to posterior direction.

The KT2 group received an identical treatment to the KT1 group, except that the tape was applied in the opposite direction: from the superior scapular angle to the coracoid process.

The KT3 group received a sham kinesiotaping technique, whereby a single strip was applied in the same place as KT1 and KT2, but without tension and with the shoulder in neutral rather than external rotation (Fig. 2). All tape applications looked similar.

In all groups, kinesiotape was removed by the physiotherapist after outcome data were collected.

### 2.4. Ultrasound measurements

The ultrasound examination of the shoulder was carried out by the second author (SNL). To reduce bias, the assessor was blinded to group allocation. Each participant was issued an identification number, and this was the only information provided to the

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