

Kinesio Taping reduces disability and pain slightly in chronic non-specific low back pain: a randomised trial

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Question: Does Kinesio Taping reduce disability, pain, and kinesiophobia in people with chronic non-specific low back pain? **Design:** Randomised trial, with concealed allocation, assessor blinding, and intention-to-treat analysis. **Participants:** Sixty adults with chronic non-specific low back pain. **Intervention:** The experimental intervention was Kinesio Taping over the lumbar spine for one week; the control intervention was sham taping. **Outcome measures:** The following outcomes were measured at baseline, immediately after the week with the tape *in situ*, and four weeks later: Oswestry Disability Index, Roland-Morris Low Back Pain and Disability Questionnaire, pain on a 10-cm visual analogue scale, Tampa kinesiophobia scale, trunk flexion range of motion, and the McQuade test of trunk muscle endurance. **Results:** At one week, the experimental group had significantly greater improvement in disability, by 4 points (95% CI 2 to 6) on the Oswestry score and by 1.2 points (95% CI 0.4 to 2.0) on the Roland-Morris score. However, these effects were not significant four weeks later. The experimental group also had a greater decrease in pain than the control group immediately after treatment (mean between-group difference 1.1 cm, 95% CI 0.3 to 1.9), which was maintained four weeks later (1.0 cm, 95% CI 0.2 to 1.7). Similarly trunk muscle endurance was significantly better at one week (by 23 sec, 95% CI 14 to 32) and four weeks later (by 18 sec, 95% CI 9 to 26). Other outcomes were not significantly affected. **Conclusion:** Kinesio Taping reduced disability and pain in people with chronic non-specific low back pain, but these effects may be too small to be clinically worthwhile. **Trial registration:** ACTRN12612000402842. [Castro-Sánchez AM, Lara-Palomo IC, Matarán-Peñarrocha GA, Fernández-Sánchez M, Sánchez-Labraca N, Arroyo-Morales M (2012) Kinesio Taping reduces disability and pain slightly in chronic non-specific low back pain: a randomised trial. *Journal of Physiotherapy* 58: 89–95]

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Introduction

Low back pain has been a major public health burden for many years, responsible for substantial work disability and elevated healthcare costs. Around 70–80% of adults in the general population are believed to experience at least one episode of low back pain at some time in their lives (Walker et al 2004). Chronic low back pain produces mobility restriction, long-term disability, and quality of life impairment and is one of the main causes of work absenteeism (Anderson 1999, Frymoyer and Durett 1997, Ryan et al 2009, Waxman et al 2008). Given its high prevalence, low back pain is considered an important public health problem in many countries and is associated with considerable direct and indirect costs (Cost B13 working group 2006). Estimates of the prognosis of chronic low back pain are based on a limited number of studies. The likelihood of being pain-free 12 months after the onset of chronic low back pain is only 42% (Costa et al 2009), so there is an urgent need for more effective treatments of this condition (García et al 2011).

Numerous treatments for low back pain have been studied, including educational programs (Engers et al 2008), chiropractic therapy (Walker et al 2010), kinesiology (Eardley 2010), exercise (Smeets 2009, Taylor et al 2007,

UK Trial BEAM team 2004), health coaching (Iles et al 2011), spinal manipulative therapy (Assendelft et al 2004), medication (Roelofs 2008), and electrotherapy (Djavid et al 2007, Khadilkar et al 2008). Some of these treatments are recommended by the European Guidelines for the Management of Chronic Lower Back Pain, including exercise and educational or cognitive-behavioural programs to encourage activity (Cost B13 working group 2006). Other guidelines also support these interventions, among others (NICE 2009).

Kinesio Taping, developed by Kenzo Kase in the 1970s, is a technique that has been used in the clinical management of

What is already known on this topic: Chronic low back pain restricts mobility, causes long-term disability and impairs quality of life.

What this study adds: In people with chronic non-specific low back pain, Kinesio Tape applied for one week reduces disability and pain, although these effects may be too small to be considered worthwhile. Trunk muscle isometric endurance also improved. Only the effects on pain and isometric endurance were maintained four weeks later.

people with chronic back pain. The tape, which is attached to the skin, is thinner and more elastic than conventional tape. It can be stretched to 120–140% of its original length, producing a lesser mechanical restraint and less restriction of mobility than conventional tape. Four beneficial effects have been claimed for Kinesio Taping: normalisation of muscular function, increase in lymphatic and vascular flow, reduction in pain and contribution to correcting possible joint misalignments (Kase et al 2003, Kase et al 1996), although the extent to which these mechanisms contribute to any clinical effects is unknown. Although some clinicians have commenced using Kinesio Taping for a wide range of conditions, many of the studies reporting its benefits have used potentially biased research methods, such as uncontrolled case reports. A search of the Physiotherapy Evidence Database (PEDro) website identified 12 randomised trials involving Kinesio Taping, two of which involved patients with low back pain. In one of these, Kinesio Taping was part of a complex intervention, so its contribution to the treatment effect could not be determined (Adamczyk et al 2009). In the other, people with chronic low back pain were randomly allocated to: Kinesio Taping of the lumbar spine changed every third day; 30 min of supervised exercise three times per week; or a combination of these two interventions (Paolini et al 2011). All groups showed reductions in pain and disability over the 4-week intervention period. Between-group comparisons of final data show no statistically significant differences between groups. This suggests that Kinesio Taping may have similar acute effects as exercise for chronic low back pain, although more precise estimates are required. Furthermore, the study did not establish the efficacy of Kinesio Taping over no taping. Therefore we conducted a trial to examine the effect of Kinesio Taping alone in this population.

In this study of people with chronic non-specific low back pain of mechanical aetiology, we compared the short-term effects of Kinesio Taping *versus* placebo tape application to the lumbar spine. The research questions for this study were:

1. Does one week of Kinesio Taping treatment have beneficial effects on disability, pain, kinesiophobia, range of motion, and trunk muscle endurance in people with chronic non-specific low back pain of mechanical aetiology?
2. Is there any residual effect of Kinesio Taping on these outcomes four weeks after the treatment period?

Method

Design

We performed a randomised trial with concealed allocation, assessor blinding, and intention-to-treat analysis. People with chronic non-specific low back pain were recruited from those referred for therapy at the Almeria University Health Science School Clinic in Spain. Participants were invited to attend a baseline examination visit, during which demographic data, the location and nature of the pain, and baseline measures of the study outcomes were recorded. Participants were instructed to take no analgesic or anti-inflammatory drugs for three days before this visit. After eligibility was confirmed and baseline measures were recorded, participants were randomly assigned to receive Kinesio Taping (experimental group) or a placebo Kinesio Tape application (control group) over the lumbar spine. Concealed allocation was performed by using a computer-

generated randomised table of numbers created before the data collection by an investigator not involved in the assessment or treatment of the participants. Individual sequentially numbered index cards with the random assignment were folded and placed in sealed opaque envelopes. On the day after the initial examination, the envelope allocated to the participant was opened by a second investigator. This investigator, who was a certified Kinesio Tape practitioner, proceeded with the treatment according to the group assignment, and was therefore responsible for applying the tape to all participants. Participants were blinded to the treatment allocation and had no previous experience of Kinesio Taping. Participants wore the tape for one week. Outcomes were measured at the end of that week and four weeks later. Assessors were also blinded to each participant's treatment allocation. During the treatment and follow-up periods, medication use was not restricted and was not recorded.

Participants

To be eligible for inclusion in the trial, participants were required to have had low back pain for at least 3 months, to be aged between 18 and 65 years, to score of four or more on the Roland-Morris Low Back Pain and Disability Questionnaire at randomisation (UK Trial BEAM team 2004), and to not achieve flexion-relaxation in the lumbar muscles during trunk flexion (Neblett et al 2003). Exclusion criteria were clinical signs of radiculopathy, lumbar stenosis, fibromyalgia, spondylolisthesis, previous spinal surgery or Kinesio Tape therapy, corticosteroid treatment in the previous two weeks, and central or peripheral nervous system disease.

Intervention

The participants attended the Almeria University Health Science School Clinic to have their allocated taping applied. The tape^a used in this study was waterproof, porous, and adhesive, with a width of 5 cm and thickness of 0.5 mm. The experimental group received a standardised Kinesio Tape application in sitting position. Four blue I-strips were placed at 25% tension overlapping in a star shape over the point of maximum pain in the lumbar area. Strips were applied by pressing and adhering the central part before the ends (Figure 1A). The placebo group received a sham Kinesio Tape application, consisting of a single I-strip of the same tape applied transversely immediately above the point of maximum lumbar pain (Figure 1B). Participants in both groups were advised to leave the tape *in situ* for 7 days. The practitioner applying the tape was careful to ensure that the rest of the treatment consultation was exactly the same for both groups.

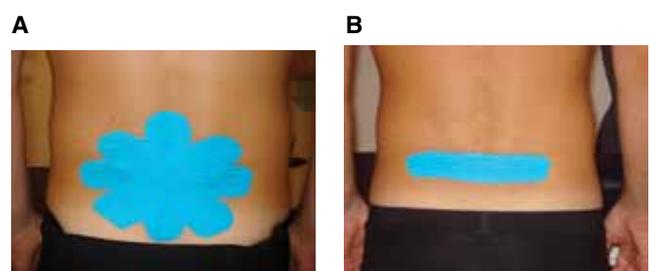


Figure 1. Kinesio Tape placement in experimental patient (A) and sham Kinesio Tape placement in placebo patient (B).

Outcome measures

Disability was measured using two questionnaires. The Oswestry Disability Index contains ten items related to limitations in daily life activities, rating each on a 0–5 point scale; the points are added together and converted into a percentage (Fairbank and Pynsent 2000). Oswestry scores may be categorised as: minimally disabled (0–10%), moderately disabled (20–40%), severely disabled (40–60%), crippled (60–80%), or bedbound (80–100%) (Fritz and Irrgang 2001). The Roland-Morris Disability Questionnaire is the other self-administered disability measure. It is scored on a 24-point scale, where 0 represents no disability and 24 represents severe disability (Roland and Morris 1983).

Pain was recorded by the participant using a 10-cm visual analogue scale, where 0 represented no pain and 10 represented unbearable pain.

Fear of movement and of reinjury were measured using the 17-item Tampa Scale for Kinesophobia. Each item is rated on a 4-point Likert scale ranging from 'strongly disagree' to 'strongly agree'. This measure has good internal consistency, test-retest reliability, responsiveness, concurrent validity, and predictive validity (Miller et al 1991).

Trunk flexion range of motion was measured with a Fleximeter^b, which is attached to the body and determines the range of motion on an angular scale using a gravitational mechanism. The range of back flexion movement was measured with the patient in orthostatic position with their knees extended and arms crossed across the thorax. The fleximeter was positioned laterally in the thoracic region at breast height (García et al 2011).

Isometric endurance of the trunk muscles was measured in seconds using the McQuade test, in which the participant holds their trunk isometrically off the floor until fatigue (Cantarero-Villanueva et al 2011, McGill et al 1999).

Data analysis

People with low back pain typically rate an improvement of 6 points on the Oswestry scale as at least 'moderately' better (Fritz and Irrgang 2001) and this has therefore been considered a 'worthwhile effect' (Lewis et al 2011, Iles et al 2011). Therefore, we sought a difference of 6 points on the Oswestry scale. A total of 54 participants would provide 80% power to detect a difference between groups of 6 points on the modified Oswestry scale as significant at a two-sided significance level, assuming a standard deviation of 7.7 points (Cleland et al 2009). To allow for 10% loss to follow-up, we increased the sample size to 60.

Baseline demographic characteristics are reported with descriptive statistics. Separate 2-by-3 mixed-model analyses of variance (ANOVAs) were used to examine treatment effects (dependent variables), with group (experimental or control) as between-subject variable and time (baseline, immediate post-treatment and at 1 month follow-up) as within-subject variable. The change in each group at each time point is reported as a mean with standard deviation. The effect of the intervention at each time point is reported as a mean between-group difference in change from baseline, with 95% confidence interval. The hypothesis of interest was the group-by-time interaction at an *a priori* alpha level of 0.05. Analysis was by intention to treat.

Results

Flow of participants through the trial

Eighty consecutive individuals with chronic non-specific low back pain were screened for eligibility between September 1 2010 and June 30 2011. Sixty people satisfied these criteria, agreed to participate, and were randomised into the experimental (n = 30) or control (n = 30) group. Figure 2 depicts a flow diagram of the participant recruitment, reasons for ineligibility, and losses to follow-up. The groups had similar baseline demographic characteristics (presented in Table 1) and were comparable on the baseline application of the outcome measures (presented in the first two columns of Table 2).

Compliance with the trial method

All participants received the taping to which they had been randomly allocated. One participant in the control group was lost to follow-up before the assessment at one week so data were unavailable. All other data were collected and analysed as intended. At the end of the study, all participants were asked if they were aware of whether their group allocation was to the experimental or the control group. All participants confirmed that they were unaware of their group assignment. Participants were not asked to guess the group to which they had been allocated.

Effect of intervention

Group data for all outcomes for the experimental and control groups are presented in Table 2. Individual data are presented in Table 3 (see eAddenda for Table 3).

At the end of the one-week period with the tape *in situ*, there were statistically significant improvements on both of the measures of disability. The Oswestry Disability Index improved by 2 points in the experimental group but worsened by 2 points in the control group (between-group difference 4 points, 95% CI 2 to 6). However, the difference between the groups was not statistically significant four weeks later. Similarly, the Roland Morris Disability Questionnaire showed a significant benefit after the one-week taping period (between-group difference 1.2 points, 95% CI 0.4 to 2.0), but the difference was no longer statistically significant four weeks later.

At the end of the one-week period with the tape *in situ*, pain improved significantly more in the experimental group than in the control group, with a mean between-group difference of 1.1 cm (95% CI 0.3 to 1.9). This benefit was maintained four weeks later, with a mean between-group difference of 1.0 cm (95% CI 0.2 to 1.7).

Fear of movement as measured by the Tampa Scale for Kinesophobia did not show any statistically significant difference between the groups at one week or four weeks later. The initial improvement in trunk flexion range of motion was 3 degrees greater in the experimental group, which was of borderline statistical significance (95% CI 0 to 5). This effect was not maintained four weeks later (mean between-group difference 0 degrees, 95% CI -3 to 3).

Trunk muscle endurance improved significantly after the week of taping and this benefit was maintained four weeks later. The McQuade test increased by 13 seconds in the experimental group but worsened by 9 seconds in the

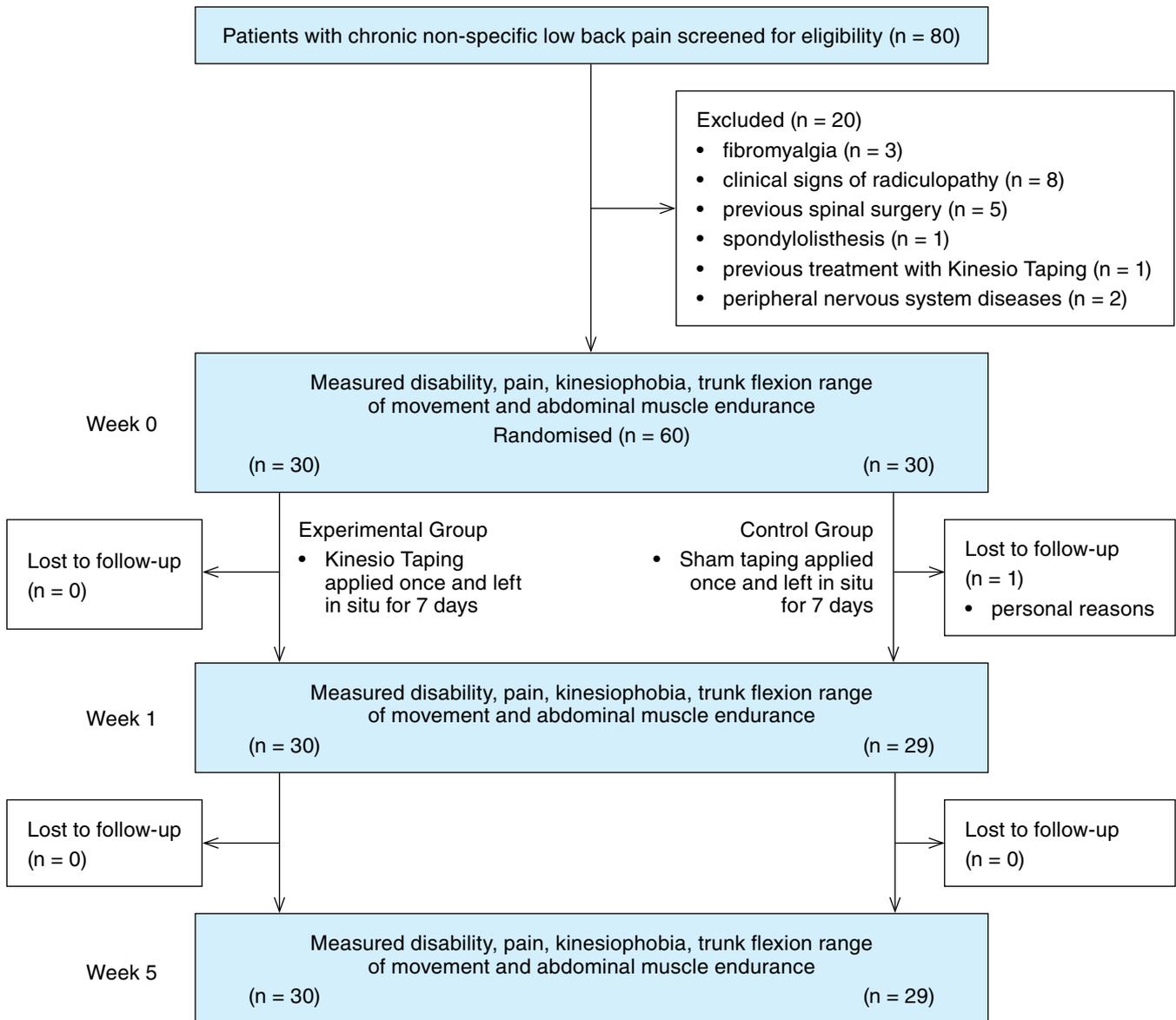


Figure 2. Design and flow of participants through the trial.

control group (between-group difference 23 seconds, 95% CI 14 to 32). Four weeks later, the between-group difference was 18 seconds in favour of the experimental group (95% CI 9 to 26).

Discussion

In this study of people with chronic non-specific low back pain, significantly greater reductions in disability and pain were obtained immediately after treatment by the participants who received genuine Kinesio Taping than by those who received a sham application. The functional endurance of the trunk muscles was also substantially improved after the application of the taping for one week. The range of trunk flexion showed borderline improvement but fear of movement was not improved by the taping. The benefits of the week-long taping intervention on pain and trunk muscle endurance were maintained at a similar

magnitude four weeks later, but the other outcomes did not show significant effects when reassessed four weeks after the treatment.

People with low back pain typically rate an improvement of 6 points on the Oswestry scale as at least ‘moderately’ better (Fritz and Irrgang 2001) and this has therefore been considered a ‘worthwhile effect’ (Lewis et al 2011). Some authors recommend an even higher threshold (Ostelo and de Vet 2005). Our estimate of the effect of the taping on disability measured on the Oswestry scale did include 6 points at the upper confidence limit. However, the best estimate was that the Oswestry score is only improved by 4 points by the taping, and it is possible that the average effect is as low as 2 points. Our estimate of the effect of taping on the Oswestry score and its confidence limits is relatively small in comparison to the range of possible scores on the Oswestry Disability Index (0 to 100) and in comparison to

Table 1. Baseline characteristics of participants who completed the study.

Characteristic	Group	
	Exp (n = 30)	Con (n = 29)
Age (years), mean (SD)	50 (15)	47 (13)
Gender, n female (%)	21 (70)	19 (66)
Mild acute complaints in past 2 yrs, n (%)	21 (70)	20 (69)
Difficulty falling asleep, n (%)	14 (47)	10 (34)
Pain disturbs sleep, n (%)	9 (30)	7 (24)

Exp = experimental group, Con = control group

the baseline scores of the study participants, which ranged from 22 to 35. Similarly, our estimate of the effect of the taping on the Roland-Morris score at one week – an improvement of 1.2 points (95% CI 0.4 to 2.0) – is below the minimum clinically worthwhile effect of 2.5 to 5 points, which has been derived for this outcome from people with non-specific low back pain for at least 6 weeks (Beurskens et al 1996). Therefore, our estimates of the average effect of the taping on disability may not be considered worthwhile by typical patients with chronic non-specific low back pain.

The effect of the taping on pain was also relatively small. Our best estimate of the effect (ie, an improvement of 1.2 cm on a 10-cm VAS) was below the minimum clinically worthwhile effect of 2 cm (Hagg et al 2003), although the upper limit of the 95% CI did reach this threshold. Although the effect on pain was mild, it was long-lasting, being sustained for four weeks after the end of the therapy. The mechanism by which one week of taping would cause a long-lasting reduction in pain is not clear. Perhaps the week of taping engendered a greater confidence in the participants to remain active despite their pain. Perhaps the taping gave the participants a greater awareness of the back while moving, thus preventing movements that were detrimental to the healing of the affected lumbar tissues.

Although the effects were small, the intervention is quick to apply, is maintained *in situ* for one week, and does not require ongoing commitment of time and effort, as do some other physiotherapy interventions (eg, exercises). Therefore, some patients may consider that the costs and inconvenience involved are small and that a combination of small reductions in pain and disability may make taping worthwhile overall.

The borderline effect on lumbar flexion range of motion is interesting. Kinesio Taping on the lower trunk increased active lower trunk flexion range of motion in healthy subjects (Yoshida and Kahanov 2007). Although various mechanisms were postulated to explain this, some of which could apply in our participants, we must also consider that the mild reduction in pain could explain the greater range in our participants. The mild analgesic effect may also explain the greater performance of the trunk muscles on the McQuade test. Unfortunately, we did not record whether pain or fatigue was the limiting factor for participants

Table 2. Mean (SD) for all outcomes for each group, mean (SD) difference within groups, and mean (95% CI) difference between groups.

Outcome	Groups						Difference within groups				Difference between groups ^a			
	Baseline		Week 1		Week 5		Week 1 minus baseline		Week 5 minus baseline		Week 1 minus baseline		Week 5 minus baseline	
	Exp (n = 30)	Con (n = 29)	Exp (n = 30)	Con (n = 29)	Exp (n = 30)	Con (n = 29)	Exp	Con	Exp	Con	Exp	Con	Exp	Con
Oswestry Disability Index (0 to 70) ^a	28 (3)	29 (3)	26 (3)	31 (6)	27 (6)	26 (3)	-2 (2)	2 (6)	-1 (1)	-2 (6)	-4 (-2 to -6)	1 (-1 to 3)		
Roland-Morris Disability Questionnaire (0 to 24) ^a	10.9 (2.1)	9.8 (2.9)	9.5 (2.1)	9.6 (3.0)	8.6 (3.0)	9.8 (2.2)	-1.4 (1.3)	-0.2 (1.7)	-1.1 (0.8)	-1.2 (3.1)	-1.2 (-2.0 to -0.4)	0.1 (-1.0 to 1.3)		
Pain visual analogue scale (0 to 10) ^a	5.6 (1.8)	5.4 (1.3)	4.2 (1.4)	5.1 (1.4)	5.6 (1.4)	4.7 (1.4)	-1.4 (1.3)	-0.3 (1.8)	-0.9 (1.3)	0.1 (1.6)	-1.1 (-0.3 to -1.9)	-1.0 (-0.2 to -1.7)		
Tampa Scale for Kinesiophobia (17 to 68) ^a	41 (3)	39 (5)	39 (4)	38 (4)	38 (4)	39 (3)	-2 (1)	-1 (2)	-2 (1)	2 (2)	-0.7 (-1.5 to 0.2)	-0.1 (-0.9 to 0.7)		
Trunk flexion range of motion (degrees)	94 (7)	90 (9)	98 (7)	92 (11)	94 (8)	97 (7)	5 (2)	2 (7)	4 (2)	4 (8)	2.6 (0.0 to 5.2)	-0.1 (-3.1 to 2.8)		
McQuade test of trunk muscle endurance (sec)	41 (18)	49 (19)	54 (16)	39 (20)	39 (18)	49 (17)	13 (4)	-9 (25)	8 (2)	-9 (23)	23 (14 to 32)	18 (9 to 26)		

Exp = experimental group, Con = control group. Shaded row = primary outcome, ^asmaller number indicates better outcome

during this test. Another possibility is that the presence of the taping led to greater awareness and, in turn, greater muscular activation around the area during the intervention period. This may have introduced a mild endurance training effect on the trunk musculature.

The precise mechanisms underlying the effect of Kinesio Taping on musculoskeletal pain are not yet clear. Some authors have hypothesised that pain is relieved by Kinesio Taping because sensory modalities operate within interconnecting, intermodal and cross-modal networks (McGlone and Reilly 2010). Others have suggested that keratinocytes may be non-neural primary transducers of mechanical stimuli, probably via a signal transduction cascade mechanism (eg, intracellular Ca^{2+} fluxes) to evoke a response on adjacent C-fibres (Lumpkin and Caterina 2007). Another hypothesis is that the cutaneous stretch stimulation provided by Kinesio Taping may interfere with the transmission of mechanical and painful stimuli, delivering afferent stimuli that facilitate pain inhibitory mechanisms (gate control theory) and pain reduction (DeLeo 2006, Paolini et al 2011). A further possible mechanism by which Kinesio Taping induced these changes may be related to the neural feedback received by the participants, which may improve their ability to reduce the mechanical irritation of soft tissues when moving the lumbar spine (Kase et al 2003). Furthermore, Kase and colleagues (1996) proposed a theoretical framework to explain the decrease in lumbar pain-associated disability observed immediately after Kinesio Taping. They argued that when a muscle is hypertonic, it stimulates Golgi receptors to transmit information to the central nervous system, where inhibitory motor neurons are activated, and that Kinesio Taping application would act by stimulating Golgi receptors to initiate this process.

This is the first study on the application of Kinesio Taping according to the recommendations of Kenzo Kase for low back pain. It used a robust research design and achieved high follow-up. However, the protocol was not registered prospectively. The exclusion criteria were designed to obtain a homogeneous cohort of adults with chronic low back pain. However, this limits the applicability of our results to, for example, older and younger people than those we studied. Another study limitation is that we only investigated the short-term results of Kinesio Taping and cannot draw conclusions on its longer-term effects, which deserve investigation in future randomised clinical trials. Moreover, in clinical practice, therapists may not apply Kinesio Taping alone as an isolated intervention in people with chronic non-specific low back pain. Further research is required on the use of Kinesio Tape in combination with other manual therapies and/or active exercise programs.

In conclusion, individuals with chronic non-specific low back pain experienced statistically significant improvements immediately after the application of Kinesio Taping in disability, pain, isometric endurance of the trunk muscles, and perhaps trunk flexion range of motion. However, the effects were generally small and only the improvements in pain and trunk muscle endurance were observed four weeks after the week with the tape *in situ*. Further research is warranted on outcomes after Kinesio Taping applications for longer time periods and/or in combination with exercise programmes. ■

Footnotes: ^aKinesiology Tape Tem Tex, Asturias-Spain, ^bFleximeter UM 8320-3 RJ Code Research Institute, Brazil

eAddenda: Table 3 available at jop.physiotherapy.asn.au

Ethics: Informed consent was obtained from each participant before entering the study, which was performed in accordance with the Helsinki Declaration (2008 modification) on research projects and with national legislation on clinical trials (Law 223/2004 6 February), biomedical research (Law 14/2007 3 July), and participant confidentiality (Law 15/1999, 13 December). The study was approved by the Ethics And Research Committee of the University of Almeria.

Competing interests: None declared.

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