Taping combined with Back School in patients with chronic low-back pain: Randomized controlled trial

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Abstract

Introduction: Seventy to eighty-five percent of the population suffers low-back pain. It has been proved that the Spine School programs are effective to treat chronic low-back pain. Taping could be useful for pain decrease and muscle function normalization. The aim of this study was to evaluate short- and long-terms effectiveness of taping combined with Spinal School in the treatment of chronic low-back pain.

Materials and Methods: Randomized controlled clinical trial. The experimental group used tape ("taping") and attended Spinal School, whereas the control group only entered the Spinal School. At the beginning and at the end of the treatment, we recorded pain on the visual analogue scale, flexibility using the Modified Finger Tip-to-Floor Test, and function using the Roland Morris Disability Questionnaire. Only at the beginning we evaluated depression using the Beck Depression Inventory.

Results: We included 220 patients; only 42 in the experimental group and 33 in the control group completed the treatment. Pain's delta between the first and the fifth sessions did not show differences between both groups, regardless of time (p=0.329). There were no differences between groups in depression, function (p=0.75) and flexibility (p=0.20) either.

Conclusion: Taping combined with Spinal School in comparison with treatment based exclusively on Spinal School did not prove to be more effective to decrease pain and increase function and flexibility in patients with chronic low-back pain.

Key words: Taping; chronic low-back pain; Spine School; exercise therapy; flexibility; depression

Level of Evidence: I

Conflict of interests: The authors have reported none.

Resumen

Introducción: El 70-85% de la población general sufre dolor lumbar. Se ha demostrado que los programas de Escuela de Columna son eficaces para el tratamiento de la lumbalgia crónica. El *taping* podría ser útil para disminuir el dolor y normalizar la función muscular. El objetivo de este estudio fue evaluar la eficacia a corto y a largo plazo del *taping* combinado con la Escuela de Columna en el tratamiento de la lumbalgia crónica.

Materiales y Métodos: Ensayo clínico controlado aleatorizado. El grupo experimental utilizó cinta (*tape*) y realizó Escuela de Columna, y el grupo de control solo realizó Escuela de Columna. Al comienzo y al final del tratamiento, se registraron el dolor con la escala analógica visual, la flexibilidad con el *Modified Finger Tip-to-Floor Test* y la funcionalidad con el *Roland Morris Disability Questionnaire*. Sólo al inicio se midió la depresión con el *Beck Depression Inventory*.

Resultados: Se incluyeron 220 pacientes, solo 42 del grupo experimental y 33 del grupo de control completaron el tratamiento. El delta de dolor entre la primera y la quinta sesión no mostró diferencias entre los grupos, independientemente del tiempo (p = 0,329). Tampoco hubo diferencias entre los grupos en las determinaciones de depresión, funcionalidad (p = 0,75) y flexibilidad (p = 0,20).

Conclusión: El *taping* combinado con Escuela de Columna comparado con el tratamiento exclusivo de Escuela de Columna no resultó más eficaz para disminuir el dolor, aumentar la funcionalidad y la flexibilidad en los pacientes con lumbalgia crónica.

Palabras clave: Taping; dolor lumbar crónico; escuela de columna; terapia de ejercicios; flexibilidad; depresión.
Nivel de Evidencia: I

Introduction

Seventy to eighty-five percent of the general population suffer low-back pain sometime in their lives, and can develop recurrent events.[1] Most of the patients get recovered within the first six or eight weeks, but 5-15% do not improve and can develop long-term physical disability.[2]

Chronic low-back pain is defined as pain below the rib edges and above the gluteal folds, with or without lower limbs referred pain and lasting for ≥3-months.[1] This condition represents an important health issue due to the disability it causes and the high costs of treatments.[3]

Since 2005, the Department of Kinesiology at the Acute Care Hospital "Dr. Juan A. Fernández" has developed a Spine School (SS) program as kinesio treatment of chronic low-back pain.

SSs stem from the Swedish school developed by Zacrhisson and Forsell in 1969, which is aimed at decreasing low-back pain and stopping recurrence. SSs are theoretical-practical group classes whose contents and duration vary and that are supervised by a physiotherapist.[4,5] The theoretical component includes information about spinal anatomy and biomechanics, injury mechanisms, identification of risk factors and prevention by environmental adjustments and ergonomic behavior. The practical component is all about a program of relaxation, flexibility and stabilization exercises, and exercises aimed at strengthening related structures at low-back level.[6,7]

Even though SS programs have proved to be effective for the treatment of chronic low-back pain because they decrease pain and improve function in the short term,[4,5] some patients do not get to experience improvement. In this context, different studies have showed that those who suffer chronic low-back pain are at higher risk of developing depression, and this can be one of the causes that prevent them from improving.[8,9]

Neuromuscular taping is a technique based on adhesive elastic bandages originally developed in Japan by Kenzo Kase, which imitate the elastic properties of the skin.[10,11] It has been suggested that taping techniques could be useful for the treatment of low-back pain due to their effects on pain decrease and normalization of muscle function.[12] Along these lines, Paoloni et al.[13] carried out a randomized controlled clinical trial in patients with low-back pain, with the aim of assessing taping effectiveness as compared to a program of exercises and a program of exercises plus taping. The research variables were pain, disability and function, which were evaluated immediately and at one-month follow-up. The authors conclude that taping techniques had immediate effects on pain decrease and improved function in the three groups, showing statistical significance in the group that only developed a program of exercises.

Likewise, Castro Sánchez et al. carried out a randomized controlled clinical trial in which they applied low-back taping techniques in the experimental group and plain taping (placebo) in the control group. They found that at week one, taping caused a 1.1 cm pain decrease on the 10 cm visual analogue scale (VAS) and 1.2 marks function improvement (0.4-2.0 95%CI) in the Roland Morris Disability Questionnaire.

According to the statistics at our Department, the SS program routinely applied decreases pain and improve function in patients with chronic low-back pain. This program is carried out by kinesiologists trained in the technique developed by Kenzo Kase; this is why taping techniques on the low-back area could represent an additional therapeutic device offered by this program. However, we do not know if in combination with SSs they provide patients with greater benefits.

The aim of this study was to assess the effectiveness of taping techniques in the short and long terms in combination with the SS program as evaluated by the following results variables: pain, flexibility and function.

Materials and Methods

We carried out a blind evaluator randomized controlled clinical trial. The patients that were included were referred by the Acute Care Hospital "Dr. Juan A. Fernández" Departments of Orthopedics, Internal Medicine, Neurosurgery and Neurology to undergo SS treatment at the Department of Kinesiology at the aforementioned hospital, from December 2012 to January 2014. We included male and female patients, >18 years-old, medically stable and diagnosed as chronic low-back pain, i.e. pain lasting more than three months,[1] what includes patients with low-back pain, lumbosciatic pain, sciatic pain, lumbocrural pain, spondylolisthesis, low back canal stenosis and scoliosis of idiopathic origin or secondary to low-back osteoarthritis or spinal disc disease with no motor involvement and negative Lasegue. All of them signed the informed consent.

We excluded patients with acute or sub-acute low-back pain, rheumatoid conditions, spondylolysis, vertebral fracture, vertebral tumors, acknowledged gynecologic or urological disease, spinal surgery and hip arthroplasty, and also patients treated otherwise for the same condition, pregnant women, patients with psychiatric diagnosis, and addicts to drugs or alcohol, because these ones could be confusing factors at the time of evaluating pain and depression. Moreover, we excluded those patients who were not willing to participate in the protocol, those unable to understand the delivered questionnaires during evaluation, and those already treated with taping techniques.

All the patients had been referred to undergo the SS program and were randomly divided into two groups at first evaluation. The experimental group was allocated to the "taping" group, whereas the control group just entered the SS.

The SS program consists of a theoretical class and five group practical activities, supervised by a physiotherapist. Its goal is to provide patients with tools aimed at decreasing low-back pain and improving function. In the theoretical class, the focus is on basic concepts about spinal anatomy, spinal biomechanics, the pathophisiology of the main conditions, the most frequent injury mechanisms and risk factors identification, together with prevention by means of environmental adjustments and ergonomic behavior.[4,5] Practical classes are aimed at doing relaxation, stabilization and stretching exercises, as well as strengthening and mobilization of the structures involved in chronic low-back pain; they were given on a weekly basis and lasted for one hour.

The scheme applied in every practical activity was put forward as follows: 1) relaxation posture combined with exercises of diaphragmatic breathing, 2) pelvic control, 3) CORE stability exercises, 4) analytical exercises of lower limbs and trunk stretching, and 5) guidelines for the patient to complete exercises at home.[15,16]

The primary results variables were: pain, flexibility and function, which were set at the beginning and at the end of the treatment. Moreover, at the beginning we recorded the following data: age, sex, depression, job, pain in the lower limbs, referred pain, use of pain killers, and exercise, which was defined as any exercise taken three times a week for at least 30 minutes non-stop.

Pain was determined by the VAS; flexibility, by the MFTF (Modified Finger Tip-to-Floor Test); disability, by the RMDQ (Roland Morris Disability Questionnaire), and depression, by the BDI (Beck Depression Inventory).

Patients were initially evaluated by a kinesiologist (E1), while random allocation was performed by another professional (E2), who also telephoned patients to start treatment. At the beginning of every session, E2 taped the patients in the experimental group. Then, treatment was continued by E1, who evaluated pain using the VAS before and after the session in both groups to check the immediate or short-term therapeutic effects. Once the fifth session had ended, a final evaluator (E3) who was neither the one who had evaluated the patients at the beginning of the study nor the one that had allocated them to the different groups assessed the patients again. On the other hand, patients were invited to participate in a group theoretical class given by E2.

Taping application

At the beginning of every session, the skin on the area about to be treated was cleansed with alcohol; if the patient had hair on the application area, this one was shaved, so as to get optimal tape adherence.[10]

For taping application we measured the distance between the sacrum and the tenth thoracic vertebra on the patient, who was sitting and bending his or her trunk forward. We cut two I-shaped bands smoothing its angles. We applied the proximal (cephalic) anchorage with no tension, asking the patient that he or she bends forward again with sideways rotation of the spine towards the opposite side of the application area, and we applied the tape with paper off tension (pre-tension=10 to 15%). Afterwards we applied the distal (caudal) anchorage with no tension either. We rubbed the tape for acrylic adhesive activation (Figure 1).[10]

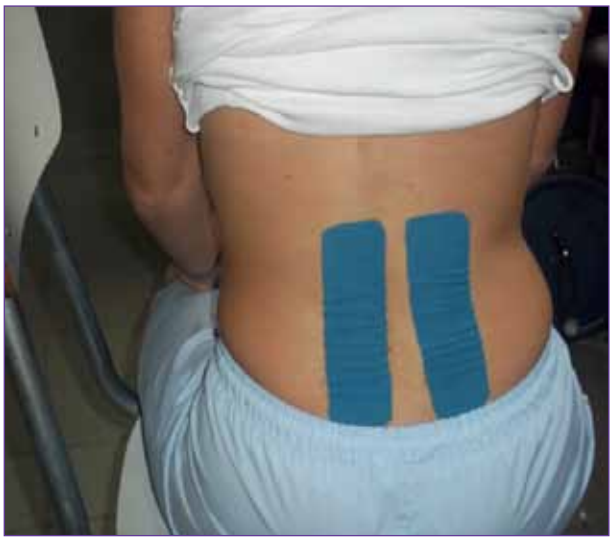

Figure 1. Patient with tapes on.

The patient took the tape off at day five. We advised them to take it off anyway if, within these five days, he or she showed taping adverse effects (irritation, local redness, discomfort, itching). Moreover, we gave them a brochure with information about the tape, recommendations for tape use and guidelines to the way of removing it.

Evaluation tools

The BDI is a self-administered questionnaire for depression evaluation that has proved to be trustful and useful in patients with chronic low-back pain.[17-19] The total score comes out of the addition of the 21 items, with a possible maximum of 63 marks, which conveys the greatest depression the patient can suffer. Within this range there are six possible categories determined by the results of the questionnaire. Its Spanish version has the psychometric characteristics that are necessary for the questionnaire to be used in Argentina.[19]

The RMDQ is a self-administered questionnaire which is trustful, valid and specific to evaluate disability in different spinal conditions. It consists of 24 Yes-or-No questions about daily activities. The total score comes out of the addition of the answers (with one mark given to Yes and cero marks given to No). The greatest possible score is 24 (very serious disability). We consider a 2.5 marks decrease to be a significant minimal difference.[20,21]

The VAS, used to evaluate pain intensity, is a 100 mm-line with marks at the extremes, where 0 mm represents the minimum and, 100 mm, the maximal degree of pain. Patients stated the degree of the pain they were feeling leaving a mark somewhere on the line. We measured the distance between 0 and the patient's mark. We considered a 20 mm-decrease in pain as a statistically significant change.[22,23]

The MFTF is an easy, safe and quick test for patients who suffer low-back pain. It measures spinal total forward mobility in the patient standing on his or her two feet. We asked the patient to stand with no shoes on a 20 cm-height platform, both feet together, and that he or she bends forward as much as possible keeping knees, upper limbs and fingers fully extended. Using a measuring tape we determined the vertical distance between the tip of the right middle finger and the upper edge of the platform. We considered this distance to be positive when the patient could not reach the platform, and we consider it negative when he or she went beyond. We carried out this evaluation twice and averaged the two results.[18,24]

This clinical trial was assessed and endorsed by the Hospital Ethical Committee.

Statistical analysis

The size of the sample that is required for 90% power for a bilateral 0.05 alpha mistake is 67 individuals in each group. To decrease the beta mistake due to losses, to the n total amount we should add 50%.

The numeric variables with symmetric distribution were conveyed as average and standard deviation (SD), whereas those with asymmetric distribution were conveyed as median and range. Nominal variables were conveyed as percentages.

We used the Student test for inter-group comparison and inferential analysis of variables age, VAS evaluation, flexibility and function.

We used the Student test, the Mann-Whitney test and the median for the inter-group comparison of the numeric variables, and the Pearson's chi square test for the comparison of the categorical variables.

For the time and group (intra-group and inter-group) contrast of the hypothesis test for the VAS main variable we carried out the variance analysis in a design of repeated measures that included two factors: treatment at two levels, taping plus SS and just SS, and time at five levels (5 sessions) as second factor.

For inter-session analysis we chose the sessions whose differences were the most statistically significant ones. These ones were S1, S2, S4 and S5.

We evaluated the treatment/time interaction, simple effects and main effects.

We considered a $p<0.005$ value to be statistically significant. We used the statistical program SPSS v17.

Results

Three hundred and forty patients were referred to the Department of Kinesiology for SS treatment. The patients that were excluded were: 26 who did not understand the questionnaires, two because of their neurologic disease background, 21 who suffered acute pain, 10 who were under 18 years old, 23 who had undergone spinal surgery, 16 who had undergone abdominal or gynecological surgery, nine with psychiatric diagnosis, two who had undergone

hip replacement, one pregnant woman, two who suffered rheumatoid conditions, three who had received taping techniques, and five who refused to sign the informed consent.

Only 220 patients met the inclusion criteria and were randomly allocated to the experimental and the control groups. In the experimental group remained 115 patients out of whom only 42 received the five sessions, whereas in the control group remained 105 patients out of whom only 33 received all the sessions. There were no disregarded patients (Figure 2, Table 1).

As Table 1 shows, there are no statistically significant differences between the two groups' baseline values. Age average was 46.12 years old (12.97 SD) in the experimental group, and 48.64 years old in the control group (16.67 SD) (p=4.41); female/male ratio was 50%/50% in the first group, and 47.1%/52.9% in the second group (p=0.79); pain at the time of evaluation was 6.03 cm (2.87 SD) in the experimental group, and 5.19 cm (2.91 SD) in the other group (p=0.18); median baseline MFTF in the experimental group was 13.38 cm (-15-+39 range) and, in the control group, it was 11.50 cm (-13-+42) (p=0.75); baseline RMDQ was 10.52 (5.67 SD) in the experimental group, and 9.45 (4.59 SD) in the control group (p=0.28); 66.7% of the patients in the experimental group and 58.8% of them in the control group suffered pain in their lower limbs apart from low-back pain (p=0.48); 59.5% in the first group and 58.8% in the second group attended the theoretical class (p=0.95); 59.5% of the patients in the first group and 67.6% of the patients in the second group (p=0.46) had a job; at the time of the evaluation, only 21.4% in the first group and 26.5% in the second group did exercise (p=0.6), whereas 42.9% and 29.4%, respectively, used pain killers (p=0.22).

Median differences in the VAS between the first and the fifth sessions were -1.45 cm (-7, 7-9.1) in the experimental group and -1.7 cm (-10-4) in the control group. There is pain decrease in both groups; the expected significant minimal difference, however, was not reached.

Average function differences between the first and the last sessions were -2.80 (4.36) in the experimental group and -2.48 (4.33) in the control group. This way, function improved in both groups and statistical significance in the minimal difference was reached.

Median differences in flexibility between the initial evaluation and the last session was -4.50 (-27-5.5) in the experimental group and -2.5 (-32-26.5) in the control group. In both groups, flexibility improved.

At the time of evaluating intra-group and inter-group VAS main variables, we detected no interaction between treatment and time (p=0.846). On the other hand, there were statistically significant differences in VAS through time in both groups (p<0.01) (Table 2).

There were no statistically significant differences between both groups in pain's delta between the fifth (S5) and the first (S1) sessions, regardless session time (p=0.329).

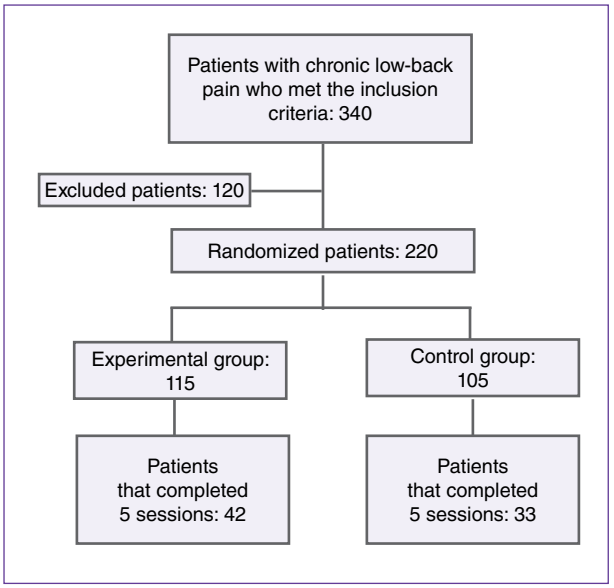

Figure 2. Diagram of the sample flow.

Table 1. Patients' baseline characteristics

	Experimental Group	Control Group	p
Age	46.12 (12.97)**	48.64 (16.67)**	0.41
Sex	Female 50%	Female 47.1%	
	Male 50%	Male 52,9%	0.79
VAS evaluation	6.03 (2,87)**	5,19 (2,91)**	0.18
Baseline MFTF	13.38 (-15-39)*	11,50 (-13- 42)*	0.75
Baseline MRDQ	10,52 (5.67)**	9,45 (4.59)**	0.28
Referred pain	Yes 66.7%	Yes 58,8%	
	No 33.3%	No 41.2%	0.48
Theoretical class	Yes 59.5%	Yes 58.8%	
	No 40.5%	No 41,2%	0.95
Job	Yes 59.5%	Yes 67.6%	
	No 40.5%	No 32.4%	0.46
Exercise	Yes 21.4%	Yes 26.5%	
	No 78.6%	No 73.5%	0.6
Pain killers	Yes 42.9%	Yes 29.4%	
	No 57.1%	No 70.6%	0.22

*Median (range minimal and maximal values) ** Average (standard deviation)
VAS= Visual analogue scale, MFTF = *Modified Finger Tip-to-Floor Test*, RMDQ = *Roland Morris Disability Questionnaire*.

Table 2. Contrast test

Contrast test		
Factor	**F**	**p**
Time per group	0.038	0.846
Time	15.83	0.00

F= Anoval statistical test of repeated measures

At the time of comparing average differences in function between both groups, there was no statistical significance (p=0.75).

At comparing flexibility between both groups, there were no statistically significant differences (p=0.20).

Pain decrease tendency is similar in both groups. In Figure 3 there is a remarkable decrease in pain at the beginning and at the end of the treatment, and there is a plateau effect between the second and the fourth sessions.

Discussion

This study sought to contrast if taping techniques combined with SS show different effects in comparison with the treatment exclusively based on SS. We found that persons with chronic back pain improved both in the experimental and the control groups, and that pain decreased whereas function and flexibility improved. Function improvement, however, was the only variable that showed changes statistically significant.

Contrarily to other studies, we decided not to apply placebo to the patients with chronic low-back pain since the *European Guideline for the Management of Chronic Low-Back Pain* recommends carrying out programs of exercises together with educational components.[5] For this reason, not to give the treatment recommended by such guidelines would not be ethical.

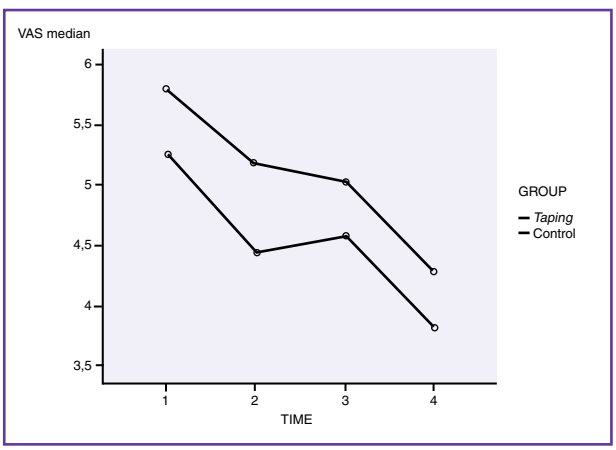

Figure 3. Tendency of pain decrease.

Paolini et al.[13] saw that taping techniques cannot replace exercises in patients with chronic low-back pain since at four-week follow-up, the only group showing significant function improvement (RMDQ) was the one that only did exercise. Contrarily to our results, such authors got a significant decrease in pain right after taping application. They concluded that taping techniques can be considered as a short-term aid to decrease pain because they lower the activation of the paravertebral muscles, as shown by electromyography.

Castro Sanchez et al.,[14] after applying treatment for four weeks in two groups, taping and placebo, found that, similarly to our results, there was pain decrease that did not reach significant minimal effects. As regards function, they did not get statistical significance either; however, we did find statistically significant minimal improvement in function.

According to Gauvin et al.,[25] there is a converse association between low-back pain and trunk forward flexibility. In our group of patients, such association remains—by the end of the treatment, pain decreased and flexibility improved. To check so, we chose the MFTF tool, described by such authors, which is an adaptation of the original method that adds the patient's standing on a stool.

It has been proved that persons with chronic low-back pain run a greater risk of developing depression, and this can be one of the reasons because of which their symptoms do not improve.[8,9] In our study, however, both groups showed similar levels of depression, and this is why it was impossible to look for an association with the results variables.

In a recent study, Shaji et al.[26] compared the effects of a conventional program of physical therapy to those of such program associated with kinesio taping. Although they did not include an educational component and, moreover, the size of the sample, the characteristics of the population and the treatment scheme were not similar to ours, they anyway got similar results, not finding statistically significant differences in terms of pain (VAS), function (RMDQ) and flexibility (Schober).

In a recent systematic revision carried out by Parreira et al.[27], tapping effects were compared to no treatment at all, to placebo, to other procedures, and to taping plus other interventions, in different muscle-skeletal conditions. They analyzed 12 randomized controlled clinical trials of low or very low methodological quality, as stated by the GRADE scale, out of which two were specifically focused on chronic low-back pain. They concluded that kinesio taping did not evidence significant benefits or that these ones were too small to be considered as relevant. Therefore, this group of reviewers does not support kinesio taping for muscle-skeletal conditions. Moreover, they warn against some authors who reveal the benefits of their methods even thought the data they produce do not show significant ones.

The high rate of lost cases is one of our limitations. Similar quitting rates are seen in other studies as well, such as that of Paolini et al.'s[13] In our clinical trial, the reason could be that there is an approximate 28 day-delay since patients are evaluated by a kinesiologist after medical referral until they start the SS program. Other reasons of quitting could be spontaneous improvement or worsening of symptoms. However, percentages of lost cases were similar in both groups and the analysis of results does not show that the experimental group did better than the control group.

Other limitation was not to record the exercises taught at the practical classes that were later done by the patients on their own at home—in the class given by the kinesiologist, patients were encouraged to repeat the same activity at least once a day until the next session.

At the beginning of this study, our aim was to carry out the analysis of the intention-to-treat; it was decided not to do it, however, because there were no differences between both groups in the result variables with the size of the sample (n) reached and, if shorter comparison times are chosen in order to increase n, i.e., if more subjects are included in the study, statistically significant differences are not found. Moreover, it is not advisable to carry out the analysis of the intention-to-treat when lost data are higher than 20%.

Conclusions

Taping techniques combined with SS in comparison with treatment based exclusively on SS did not prove to be more effective to decrease pain and increase function and flexibility in patients with chronic low-back pain. These patients profit from the SS treatment and it is not necessary to add taping because it does not make any difference in neither pain decrease nor function and flexibility increase. In order to extrapolate these results, however, we should continue analyzing subjects until reaching the size of the sample we have put forward.

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