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Effect of Kinesio® taping on static and dynamic balance after anterior cruciate ligament reconstruction: A randomized controlled trial

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1. Introduction

Anterior cruciate ligament (ACL) rupture is one of the most common knee injuries among athletes (Evans and Nielson, 2022). ACL reconstruction is, in general, the solution for the rupture of ACL; the torn ligament is replaced with a tissue graft from another surrounding functional structure of the knee (Rochmania et al., 2012). The functional changes that occur after ACL reconstruction comprise deficits of muscle power, functional performance, joint proprioception, and balance (Ageberg, 2002). Evidence shows that even several months after a successful ACL reconstruction subjects still present motor control changes, influencing knee functionality (Furlanetto et al., 2016).

Kinesio Taping (KT), which consists of the application of elastic adhesive bands to the skin (Oliveira et al., 2016), is frequently used in orthopedics, sports medicine, and neurological rehabilitation (Choi et al., 2016). It is used in several areas of physiotherapy to relieve pain (Nadali et al., 2014; Pamuk and Yucesoy, 2015), promote postural correction, stimulate muscle function (Cortesi et al., 2011; Lee et al., 2016; Scarborough et al., 1999), enhance gait (Choi et al., 2016; Lee et al., 2016, Yang et al., 2015), and improve balance (Bernardelli et al., 2019, Khalili et al., 2022). Despite being a technique commonly used during sports practice and in the rehabilitation of musculoskeletal and sport injuries, KT has little and insufficient evidence supporting its use to improve balance and postural control, particularly after a major musculoskeletal injury/surgery such as ACL reconstruction (Gholami et al., 2020). Moreover, only a few studies assessed the effect of KT in patients undergoing ACL reconstruction (Balki et al., 2016, Boguszewski et al., 2013; Laborie et al., 2015). Collectively, they evaluated the effects of the KT on the range of knee motion, oedema (Balki et al., 2016; Boguszewski et al., 2013), muscle strength (Balki et al., 2016), and pain (Balki et al., 2016; Boguszewski et al., 2013; Laborie et al., 2015).

It is accepted that KT stimulates proprioception through cutaneous receptors by altering somatosensory information (Tamburella et al., 2014), which consequently increases the cortical excitability of the cortical motor areas of cerebral cortex (Oliveira et al., 2016). However, it is not known whether it influences balance and postural control after ACL reconstruction. We will test the application of KT for 24 h, to determine whether KT could be used to maximize balance and postural control during the rehabilitation process or when resuming sport practice to decrease the risk of re-injury. Thus, the purpose of this study was to assess the effects of KT on balance and postural control among young adults with ACL reconstruction.

2. Methods

2.1. Study design

In this single blinded, randomized controlled trial, conducted between September and October 2019, participants were randomly allocated to an experimental group, a placebo group, or a control group. The experimental group received a KT application, the placebo group received a placebo intervention (ie, an inert KT application), while the control group did not receive any intervention. The randomization was performed in a concealed fashion using opaque, sealed envelopes. The

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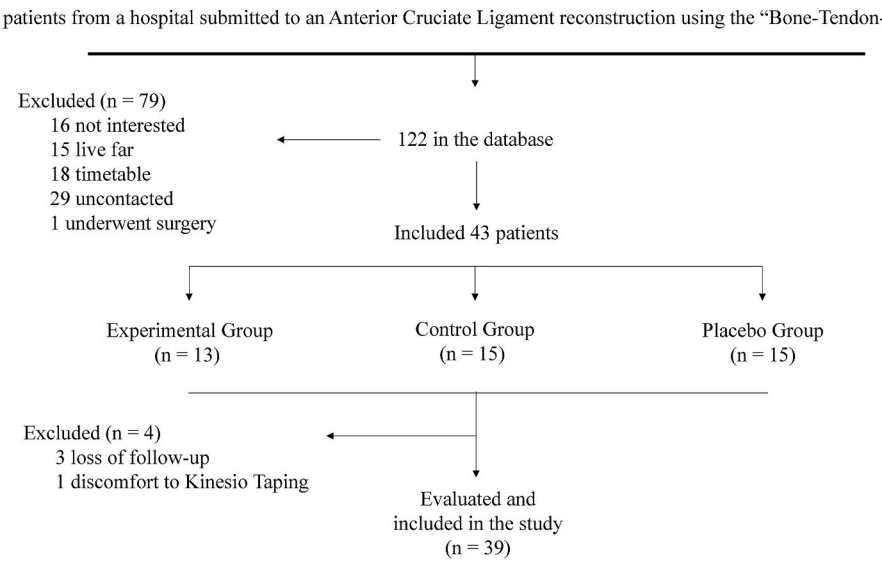

Fig. 1. Flow diagram of the patients.

KT applications were left in situ for 72 h; participants were measured for static and dynamic balance at baseline, 30 min after KT application, 24h after, after 48h, after 72h, and 10 min after KT removal. The researcher responsible for collecting the data was blinded to the study.

2.2. Participants

One hundred and twenty-two patients who had been submitted to the reconstruction of the ACL using the "Bone-Tendon-Bone" technique with graft of the patellar tendon at a private local hospital were contacted; 79 patients were excluded from the study, as they did not meet the inclusion criteria, did not reply to the contact, or declined to participate in the study (Fig. 1). Hence, 43 participants took part in the present study. Nevertheless, through statistical program G-power for a 95% range and a power of 0.95, for a minimum effect size of 0.25, 38 participants are required.

To be included, participants had to be at least in the 6th week of rehabilitation post-ACL reconstruction, age ≥18 years old, and reconstruction of the ACL using the "Bone-Tendon-Bone" technique with graft of the patellar tendon. The exclusion criteria were as follows: history of lower limb fracture; active muscle injury; skin conditions precluding tape application; neurological disorders; vestibular, visual and/or auditory abnormalities; knee ligamentous injuries prior to ACL rupture; and deep venous thrombosis. The study obtained ethical approval by the Ethics Committee of the hospital (HSMP). All participants provided written informed consent, and all procedures were conducted according to the Declaration of Helsinki.

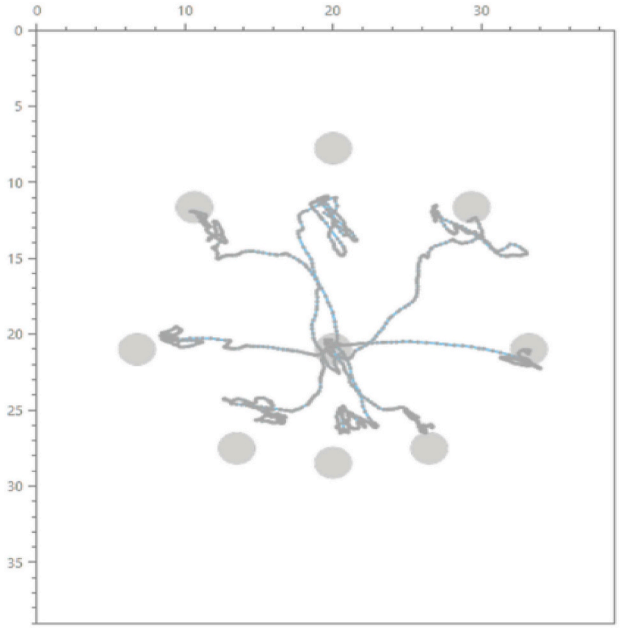

Fig. 2. Example of kinesigram showing the Limit of Stability.

2.3. Static and dynamic balance assessment

Data collection was always performed by the same researcher at the hospital, in a quiet room with controlled noise, temperature, and humidity (Salavati et al., 2009). The static and dynamic balance were assessed using a force platform (PhysioSensing®, Future Technology Portugal) with 1600 sensors distributed over an area of 40 × 40 cm, and frequency acquisition of 100 Hz. The assessment was performed through 3 tests: Single-leg Standing (SLS) with open eyes, SLS with closed eyes, and Limits of Stability (LoS). In order to minimize the learning effect (Cortesi et al., 2011), the 3 tests used were explained and exemplified by the researcher until the participants mentioned that they were aware of all the steps of each test.

2.4. Single-leg standing

The SLS was used as a test to assess the static balance (Flansbjer et al., 2012) and was carried out with open and closed eyes.

The participants were instructed to climb onto the platform where they would stay in unipodal stance using the lower limb submitted to the LCA reconstruction, barefoot and keeping their trunk aligned. A universal goniometer was used to determine the 20° of the knee flexion that was required to perform the test.

During the test, participants remained with their hands on their waist and the support foot was always placed in the same position, i.e., in the center of the platform. The participants kept their head in a neutral position with eyes fixed at a point previously placed on the wall at 2m distance at eye level. The test was performed 3 times, with a resting period of 30 s between the tests to reduce the effect of fatigue.

The aim of these tests was to analyze the variations of sway according to velocity and displacement distance of the center of pressure (CoP). The variables analyzed were: (1) Distance in millimeters of the

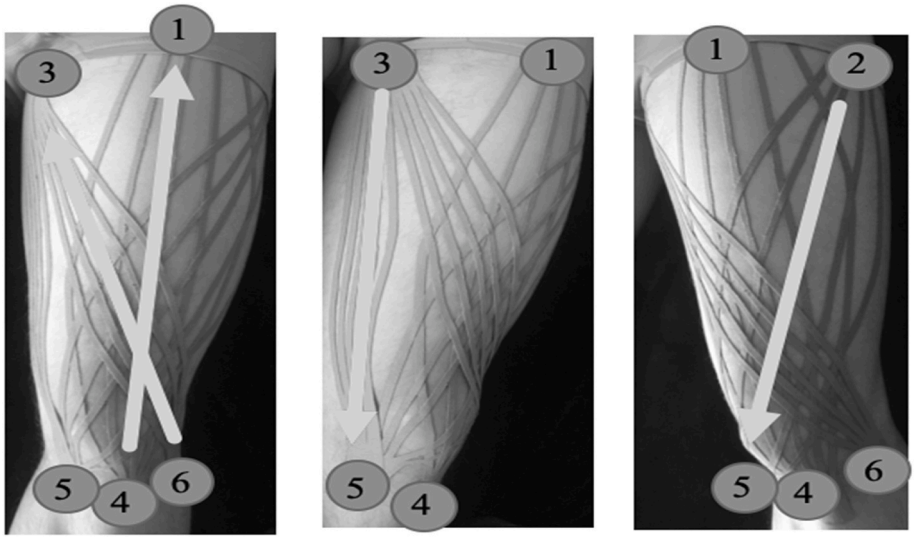

Fig. 3. Kinesio taping technique.

CoP on the X axis, that is, mediolateral distance calculated with the difference between the maximum value and the minimum value of all the data (ML_D); (2) Distance in millimeters of the CoP on the Y axis, that is, anteroposterior distance calculated with the difference between the maximum value and the minimum value of all data (AP_D); (3) Means of all relative velocities on the X axis, that is, mediolateral velocity mean in mm/s (ML_V); and (4) Means of all relative velocities on the Y axis, that is, anteroposterior velocity in mm/s (AP_V). Lower values on each variable of the SLS test show greater balance performance.

2.5. Limits of Stability

The LoS aims to assess the dynamic postural control in relation to the ability to intentionally move the CoP to the patient's maximum limit of stability in eight different directions without losing balance (Pickerill and Harter, 2011).

Participants were in a standing position with both feet placed on the platform without losing contact throughout the test; they were instructed to follow the visual feedback of a screen placed 2m away from the platform and to move the CoP to 8 pre-defined points (Fig. 2).

The test started with the participants placing their CoP in the center of the platform in accordance with a ball seen in the center of the screen. Afterwards, the ball would appear randomly at 1 of the 8 points for 8 s, during which time participants would have to move their CoP in that direction. The variables analyzed were: (1) Reaction time in seconds, that is, the time the participant took to respond to the target ball (RT); (2) Velocity in mm/s, in which the participant moved; (3) First attempt distance, that is, the distance that the participant reached in the first attempt scored as percentage, considering that when there was no movement, the score was 0% and when the point was reached the score was 100% (1AD); (4) Maximum distance, that is, the maximum distance that the participant reached in all attempts to reach the point in percentage, considering that when there was no movement the score was 0% and when the point was reached the score was 100% (MD); (5) Movement control in percentage from the minimum distance to the maximum distance reached, considering that when the movement was straight and without any deviation the score was 100% and when the movement was not uniform and with maximum deviations it was scored 0% (MC). Greater value in the tests meant greater dynamic postural control performance, apart from the reaction time.

2.6. Interventions

2.6.1. Kinesio taping procedure

Participants were requested to inform the researcher in case of previous episodes of sensitivity with adhesive material (such as plasters, patches, etc.) or skin allergy, as well as any condition that was considered important to mention. Patients with eventual skin sensitivity were controlled with the "KT Test Patch" (Lewis et al., 1994). The skin was prepared by shaving and cleaning with alcohol in the anterior region of the thigh.

Kinesio Taping application was performed by a trained physiotherapist certified by the Kinesio Taping® Association International level KT1 and KT2, previously supervised by a Certified Kinesio Taping® Instructor. KT (5 cm Kinesio Tex Gold™ Fingerprint® Tape, Kinesio Holding Company; Albuquerque, 2013) was used with two different colors, randomly selected to reduce the possible effect of chromotherapy (Çaglar et al., 2016). The application technique of KT was different for each group: for the experimental group an Epidermis-Dermis-Fascia technique was used, and for the placebo group a technique not protocoled by the norms recommended by the Kinesio Taping® Association International (Kase et al., 2003). In the experimental group the reference points for KT application were anterior inferior iliac spine (point 1), two fingers antero-inferior to the greater trochanter of the femur (point 2), two fingers infra-lateral to the pubic symphysis (point 3), tibial tuberosity (point 4), Gerdy's tubercle (5), and two fingers above the peroneal head (point 6).

The length of the KT was measured and applied from point 4 to 1, from point 2 to 5, from point 6 to 3, and from point 3 to 5, with 5 cm wide strips cut into 2.5 cm each. These 2.5 cm strips, retaining two anchors with rounded tips, were cut into 5 equal parts of 0.5 cm each. Between each application the wide area of the KT was adapted to the muscle limit of the participant with requested muscular contractions. The entire tape was applied at 0% tension (Fig. 3). The KT was removed using alcohol to moisten the strips and with great care in order not to cause changes to the participants' skin. After removing the KT, a hypoallergenic moisturizing cream was applied.

2.6.2. Sham procedure and control

In the placebo group, the KT was applied without following the guidelines of KT application, with average tension of 30%, with strips 2.5 cm wide, shorter than the muscle's length placed distal to proximal, without protocol reference points recommended by the KT method.

The control group did not receive any intervention.

Table 1
General characteristics of the sample.

	Experimental group (n = 12)	Control group (n = 14)	Placebo group (n = 13)	p
Male/Female	7/5	3/11	6/7	0.262
Age (years)	27.6 (6.7)	23.1 (5.0)	24.2 (4.9)	0.052
Height (m)	1.74 (0.09)	1.69 (0.10)	1.70 (0.08)	0.238
Weight (kg)	71.8 (9.1)	64.6 (11.7)	67.8 (6.3)	0.125
Body Mass Index (kg/m2)	23.7 (1.4)	22.6 (2.3)	23.3 (1.0)	0.432

2.7. Statistics

All analyses were conducted with Statistical Package for Social Sciences (SPSS) version 24.0 (IBM Corporation, Chicago, IL, USA). Normality of data distribution was tested with the Shapiro-Wilk test. Descriptive statistics were calculated. Comparisons among groups were performed using Kruskal-Wallis test and Chi-squared ($\chi 2$) test, as appropriate. The Friedman's test was used to detect changes within each group among the 6 moments of assessment and the Wilcoxon's signed ranks as post hoc tests. Statistical significance was set at $p < 0.05$.

3. Results

Four participants dropped out (3 did not attend follow-up assessment, and 1 reported discomfort with the KT) during the study, so the final sample comprised 39 participants. The sociodemographic data of the participants are presented in Table 1. There were no significant differences among groups in age, body mass index and body weight.

At baseline, similar results were registered among groups in the SLS with eyes open (Table 2), eyes closed (Table 3), and in the LoS (Table 4).

In the last assessment moment of the experimental group, (10-min after removal), the antero-posterior velocity changed [1.7(3.1) mm/s] with statistical significance when comparing to "Before KT". Similarly, the control group presented significant differences in the antero-posterior velocity after 30-min [0.3(1.9) mm/s], and in the antero-posterior distance after 24h [−0.7(2.5) mm]; however, these differences should be considered as not relevant. In fact, regarding the performance in the SLS, the KT did not promote any statistically significant difference among groups at any assessment moment in the assessment with eyes open (Table 2).

In a general way, the KT also did not have a significant effect in the center of pressure during the SLS in the assessment with eyes closed.

The "Mediolateral velocity" after 24h was significantly different among groups (Table 3); nevertheless, these differences are attributed to the increase in the Control group [2.6 (5.9) mm/s]. For this reason, these results should not be considered.

Despite not being enough to make the groups different from each other, some differences were also found over time within the experimental group in all variables, and once in the placebo groups.

Finally, although some statistically significant differences were found over time within groups, the comparison among groups in the LoS showed that the groups remained without relevant changes (Table 4).

4. Discussion

The present study was based on the rational that KT, using an Epidermis-Dermis-Fascia technique on quadriceps muscle, increases balance and postural control in patients submitted to ACL reconstruction surgery; nevertheless, the main results do not allow to confirm this hypothesis.

Knowing that 8 months after ACL reconstruction balance of competitive athletes was not restored (Mohammadi et al., 2012), it is important to find strategies to improve balance and neuromuscular function to incorporate in rehabilitation protocols. The increase of cutaneous stimulation induced by taping techniques, such as KT, may improve postural stability by stimulating the superficial receptors of the skin (Bonfim et al., 2009). Our results do not corroborate this effect as we did not find any improvement in balance and postural stability at any assessment moment after applying KT.

Our findings agree with the manuscript published by Oliveira et al. (2016) which verified in their study with 47 patients submitted to anterior cruciate ligament reconstruction that KT when applied on the

Table 2
Center of pressure during Single-Leg Standing with open eyes: intergroup analysis and intragroup comparison from Before Kinesio Taping (KT) application of different parameters of the postural control (median and interquartile range values).

Parameter	Group	Before KT (Absolute values)	DifferenceBefore KT-After 30-min	DifferenceBefore KT-After 24h	DifferenceBefore KT-After 48h	DifferenceBefore KT-After 72h	DifferenceBefore KT-10-min after removal
Mediolateral distance (mm)	Experimental group	2.9(1.1)	0.3(0.9)	0.2(1.0)	0.0(1.1)	0.1(2.8)	0.6(1.7)
	Control group	2.8(0.9)	0.2(0.5)	−0.4(1.2)	−0.1(1.5)	−0.1(1.1)	−0.1(0.9)
	Placebo Group	2.6(2.4)	0.1(0.6)	−0.1(0.8)	−0.2(0.6)	−0.1(0.8)	−0.1(1.0)
	p	0.592	0.915	0.429	0.968	0.735	0.812
Anteroposterior distance (mm)	Experimental group	3.4(1.6)	0.2(1.0)	0.2(1.7)	0.0(1.2)	0.6(2.0)	0.6(2.5)
	Control group	3.0(1.1)	0.3(0.5)	−0.7(2.5)*	−0.6(2.3)	−0.3(2.7)	−0.2(2.7)
	Placebo Group	3.2(3.0)	0.1(1.6)	−0.1(0.9)	0.2(1.2)	−0.1(2.5)	0.5(2.3)
	p	0.498	0.334	0.584	0.928	0.936	0.644
Mediolateral velocity (mm/s)	Experimental group	9.7(2.7)	0.7(9.9)	1.3(2.8)	0.3(2.5)	0.5(1.6)	1.4(2.5)
	Control group	10.1(5.1)	0.9(1.4)	0.1(3.9)	0.3(3.0)	0.4(2.8)	0.5(4.1)
	Placebo Group	8.2(5.7)	−0.4(2.2)	−0.6(2.6)	−0.1(2.3)	−0.2(2.7)	1.0(2.7)
	Experimental group	0.297	0.958	0.882	0.971	0.613	0.472
Anteroposterior velocity (mm/s)	Experimental group	11.8(4.3)	0.9(3.9)	1.7(4.8)	1.4(3.1)	0.6(3.0)	1.7(3.1)*
	Control group	10.3(4.9)	0.3(1.9)*	−0.8(4.3)	0.2(3.2)	−0.8(3.2)	−0.1(3.3)
	Placebo Group	10.2(8.4)	1.4(2.6)	−0.1(4.6)	0.9(4.3)	0.2(5.0)	1.4(3.9)
	p	0.531	0.869	0.949	0.935	0.979	0.729

Legend: $p < 0.05$: * significantly different from before application of Kinesio Taping.

Table 3
Center of pressure during Single-Leg Standing with closed eyes: intergroup analysis and intragroup comparison from Before Kinesio Taping (KT) application of different parameters of the postural control (median and interquartile range values).

Parameter	Group	Before KT (Absolute values)	DifferenceBefore KT-After 30-min	DifferenceBefore KT-After 24h	DifferenceBefore KT-After 48h	DifferenceBefore KT-After 72h	DifferenceBefore KT-10-min after removal
Mediolateral distance (mm)	Experimental group	7.5(2.4)	0.5(2.7)	−0.2(2.8)	0.6(2.4)	0.1(5.0)	1.3(2.4)*
	Control group	6.7(2.8)	0.6(2.9)	0.3(2.7)	0.6(3.0)	0.9(2.9)	0.9(2.5)
	Placebo Group	6.2(5.1)	−0.3(2.1)	−0.2(3.5)	0.7(3.7)	0.5(4.5)	0.8(3.7)
	p	0.522	0.152	0.078	0.638	0.237	0.674
Anteroposterior distance (mm)	Experimental group	10.9(12.4)	0.6(4.5)	1.0(9.0)	3.0(9.9)*	2.7(8.0)	3.8(8.7)*
	Control group	12.6(11.5)	2.8(9.4)	4.0(8.7)	4.8(10.6)	2.7(11.1)	2.6(10.2)
	Placebo Group	10.5(13.2)	3.2(5.2)	0.5(7.6)	2.4(6.5)	1.5(8.5)	3.4(6.0)
	p	0.881	0,0.810	0.321	0.841	0.622	0.958
Mediolateral velocity (mm/s)	Experimental group	23.5(5.8)	1.8(5.1)	0.3(5.9)#	3.4(4.4)*	−1.0(6.7)	3.7(6.1)*
	Control group	22.7(7.2)	1.8(4.9)	2.6(5.9)	1.8(9.3)	1.0(10.2)	1.8(11.3)
	Placebo Group	20.9(9.0)	−0.8(4.1)	−0.7(5.6)#	0.3(6.7)	2.1(9.0)	3.5(7.3)
	p	0,539	0.480	0.045	0.924	0.292	0.972
Anteroposterior velocity (mm/s)	Experimental group	27.4(10.3)	2.6(4.7)	2.0(7.0)	4.4(10.2)*	3.4(6.1)	3.8(13.5)
	Control group	27.0(20.3)	0.9(12.7)	1.9(11.9)	3.1(5.4)	2.8(14.6)	3.2(15.9)
	Placebo Group	26.4(10.6)	2.1(10.3)	0.2(10.1)	3.2(12.6)	−1.2(18.1)	5.6(12.5)*
	p	0.956	0.459	0.158	0.470	0.392	0.902

Legend: $p < 0.05$: * significantly different from before application of Kinesio Taping. # Significantly different to Control group.

Table 4
Limits of Stability: intergroup analysis and intra group comparison from Before Kinesio Taping (KT) application of different parameters of the postural control (median and interquartile range values).

Parameter	Group	Before KT (Absolute values)	DifferenceBefore KT-After 30-min	DifferenceBefore KT-After 24h	DifferenceBefore KT-After 48h	DifferenceBefore KT-After 72h	DifferenceBefore KT-10-min after removal
Reaction Time (S)	Experimental group	0.7(0.3)	0.2(0.3) *	0.2(0.3) *	0.2(0.2)*	0.2(0.5)*	0.1(0.2)*
	Control group	0.6(0.4)	0.0(0.2)	0.0(0.2)	0.0(0.4)	0.0(0.4)	0.0(0.4)
	Placebo Group	0.0(0.3)	0.2(0.4)	0.0(0.4)	0.0(0.4)	0.1(0.4)	0.0(0.3)
	p	0.208	0.371	0.694	0.838	0.946	0.288
Velocity (mm/s)	Experimental group	61.9(26.8)	−11.9(25.7)	−20.4(57.2)*	−25.5(37.6)*	−29.4(48.2)*	−21.3(39.1)*
	Control group	73.8(24.3)	−3.5(17.4)	−9.2(34.7)	−13.8(28.2)*	−9.8(26.7)*	−9.4(30.2)*
	Placebo Group	63.5(32.0)	−2.0(21.3)	−10.0(25.8)	−11.7(26.5)*	−20.2(39.8)*	−27.1(40.1)*
	p	0.923	0.474	0.471	0.656	0.551	0.934
First attempt distance (%)	Experimental group	74.1(12.0)	1.6(23.2)	−0.9(7.4)	4.1(15.9)	−8.9(19.4)	−3.6(12.9)
	Control group	71.2(17.1)	0.5(9.3)	−4.7(14.6)	1.2(14.6)	−4.0(26.1)	−3.6(22.7)
	Placebo Group	77.0(27.3)	2.6(17.9)	−3.7(16.9)	0.0(22.0)	−2.0(29.4)	−13.4(22.4)*
	p	0.442	0.182	0.996	0.515	0.233	0.142
Maximum Distance (%)	Experimental group	97.6(14.1)	−3.3(6.7)*	−5.3(8.9)*	−3.4(5.6)*	−8.4(7.7)*	−6.6(11.8)
	Control group	97.9(15.8)	−0.7(7.3)	−4.5(14.7)	−2.1(15.0)	0.3.2(14.4)	−1.6(14.9)
	Placebo Group	99.4(18.5)	3.0(7.8)	−2.8(10.3)	−4.0(19.0)	−2.8(17.6)	−2.9(11.9)
	p	0.963	0.197	0.488	0.250	0.325	0.669
Movement Control (%)	Experimental group	55.0(10.1)	−2.2(19.2)	−3.9(20.5)	1.2(7.46)	−3.7(10.5)	1.4(23.0)
	Control group	50.7(15.8)	−2.5(7.5)	−2.3(4.8)	−2.6(19.7)	−6.3(10.1)*	−8.2(9.8)*
	Placebo Group	60.2(17.2)	−6.7(6.8)	2.5(12.8)	−0.5(17.8)	−3.4(16.9)	−1.3(16.8)
	p	0.320	0.337	0.589	0.963	0.748	0.778

Legend: $p < 0.05$: * significantly different from before application of Kinesio Taping.

quadriceps did not enhanced balance (Oliveira et al., 2016). Furthermore, studies conducted in healthy participants found similar results. Lins et al. (2016) analyzed the immediate and delayed effects of KT on the neuromuscular performance of the quadriceps femoris, on balance, and lower limb function, and found neither immediate nor delayed changes in neuromuscular performance in one-footed static balance (Lins et al., 2016). Wilson et al. (2016) also found no effect in balance and functional performance when the KT was applied on the

gastrocnemius muscle in healthy individuals (Wilson et al., 2016).

In contrast to the above findings, Bonfim et al. (2009) examining the effect of additional sensory information in proprioception and postural balance in patients with anterior cruciate ligament injury, observed an improvement of the detection threshold of passive knee motion and in the stance control system performance. Furthermore, Kwon et al. (2014) using a silicone sleeve or taping as an additional cutaneous stimulus found an immediate improvement on balance after its application, in a study comprising 13 participants who were submitted to ACL reconstruction surgery (Kwon et al., 2014). Additionally, Nakajima and Baldridge (2013) analyzed the effect of KT on vertical jump and dynamic postural control in healthy young individuals and, although KT application on the ankle had no impact on vertical jump, its application improved dynamic postural control (Nakajima and Baldridge, 2013).

One reason for the controversial results among studies could be related with the taping technique used to give additional sensorial stimulation. Kinesio® Taping was used as a method to induce additional stimulation on quadriceps (Lins et al., 2016; Oliveira et al., 2016) and the gastrocnemius muscle (Wilson et al., 2016) however did not show a significant influence on postural balance, while studies which showed significant improvements in balance used infrapatellar taping (Bonfim et al., 2009), knee taping (Kwon et al., 2014), and Kinesio® Taping in the lateral region of the leg and ankle (Nakajima and Baldridge, 2013). Therefore, the diversity of taping techniques that were used makes it difficult to draw any conclusion. Consequently, in future studies it is important to compare different additional stimulus induced by taping techniques on postural balance.

Another possible explanation to the contradictory results could be the test/instrument used to measure balance. Some studies (Lins et al., 2016; Oliveira et al., 2016) used the Baropodometry platform (Eclipse 3000 – Guy-Capron® SA, France) and used the Balance System (Biodex Medical Systems, Shirley, NY) (Wilson et al., 2016) and found no influence on postural balance. Studies with positive results on postural balance used the Star Excursion Balance Test (SEBT) to assess dynamic balance (Nakajima and Baldridge, 2013), force platform (AMTI-OR6-1000) (Bonfim et al., 2009), and the time standing on a TOGU disc (TOGU Gebr, Prien-Bachham, Germany) (Kwon et al., 2014).

The current study has some limitations. First, the study was focused on immediate effects, so we are unable to determine any longer-term effects of KT. Second, we included individuals with different recovery period after ACL reconstruction making our sample heterogeneous Third, the sample was composed by patients, so we cannot completely exclude their knowledge about the potential effects of KT, possible leading to bias. Finally, another limitation of the study is the small sample size, which limits the generalization of our results.

5. Conclusion

The results of the present study suggest that KT, using the Epidermis-Dermis-Fascia technique, does not improve static balance and dynamic postural control in patients submitted to anterior cruciate ligament reconstruction.

CRediT authorship contribution statement

João Sousa: Writing - Original Draft, Resources, Investigation; **Fernando Ribeiro:** Writing - Review and Editing; **Mário Lopes:** Investigation; **Rui Soles Gonçalves:** Visualization, Data curation, **Rui Torres:** Conceptualization, Methodology, Validation and Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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