

# Kinesio Taping effect on postural balance in the elderly

*Efeito da Kinesio Taping no equilíbrio postural de idosos*

*Efecto de la Kinesio Taping en el balance postural de ancianos*

Tathiana Sartori Cabreira<sup>1</sup>, Karla Helena Vilaça Coelho<sup>2</sup>, Paulo Roberto Veiga Quemelo<sup>1</sup>

**ABSTRACT** | The aging process leads to balance disorders that can increase the number of falls. The Kinesio Taping is a method that aims at improving muscle performance, proprioception, coordination and balance. The aim of the study was to investigate the Kinesio Taping effects on postural balance in the elderly population. We evaluated 62 female seniors, with an average age of  $68 \pm 5$  years, who were divided into two groups: the Kinesio Taping group, in which the elderly women ( $n=31$ ) were submitted to the protocol of this tape application for gastrocnemius and median foot muscles ( $n=31$ ), and Control, where the elderly women ( $n=31$ ) received a placebo tape (3M Micropore). We used a force plate to record stabilometric signals for the postural balance analysis. Both groups were evaluated post-application and with an interval of 48 hours. The used variables were total displacement, anteroposterior and mediolateral amplitudes, area, and anteroposterior and mediolateral velocities. The results showed that Kinesio Taping did not cause significant changes in relation to the Control Group, post-application and 48 hours after application. The findings indicate that Kinesio Taping was not able to change postural balance in the elderly female population.

**Keywords** | Postural Balance; Aged; Proprioception; Physical Therapy Modalities.

**RESUMO** | O processo de envelhecimento provoca alterações no equilíbrio, as quais podem aumentar o número de quedas. A *Kinesio Taping* é uma técnica com a proposta de melhorar a fisiologia muscular, a propriocepção, a coordenação e o equilíbrio. O objetivo do estudo foi verificar o efeito da *Kinesio Taping* no equilíbrio postural de idosos. Foram avaliadas 62 idosas, do sexo feminino, com média de idade de  $68 \pm 5$  anos, divididas em dois grupos:

*Kinesio Taping*, com idosas ( $n=31$ ) que foram submetidas ao protocolo de aplicação da *Kinesio Taping* para os músculos gastrocnêmio e do mediopé, e o Controle ( $n=31$ ), com aquelas que receberam uma fita placebo (Micropore 3M). Para a análise do equilíbrio postural, utilizou-se uma plataforma de força para o registro dos sinais estabilométricos. Ambos os grupos foram avaliados pós-aplicação e com intervalo de 48 horas. As variáveis utilizadas foram deslocamento total, amplitudes anteroposterior e mediolateral, área e velocidades anteroposterior e mediolateral. Os resultados demonstraram que a *Kinesio Taping* não provocou modificações significativas em relação ao Grupo Controle, pós e 48 horas após a aplicação. Os achados apontam que a *Kinesio Taping* não foi capaz de alterar o equilíbrio postural de idosos do sexo feminino.

**Descritores** | Equilíbrio Postural; Idoso; Propriocepção; Modalidades de Fisioterapia.

**RESUMEN** | El proceso de envejecimiento provoca cambios en el balance que pueden aumentar el número de caídas. La *Kinesio Taping* es una técnica con la propuesta de mejorar la fisiología muscular, la propiocepción, la coordinación y el balance. El objetivo del estudio fue verificar el efecto que la *Kinesio Taping* tiene en el balance postural de ancianos. Fueron evaluadas 62 ancianas del género femenino, con media de  $68 \pm 5$  años, divididas en dos grupos: *Kinesio Taping*, con ancianas ( $n=31$ ) que fueron sometidas al protocolo de aplicación de la cinta para los músculos gastrocnemio y del medio-pie, y el Control ( $n=31$ ) con participantes que recibieron una cinta placebo (Micropore 3M). Se utilizó una plataforma de fuerza para registrar los señales estabilométricos para el análisis del balance postural. Los dos grupos fueron evaluados después de la

Study conducted at the Physical Therapy Clinic, Universidade de Franca (UNIFRAN) - Franca (SP), Brazil.

<sup>1</sup>Physical Therapy Course and Graduate Program in Health Promotion, UNIFRAN - Franca (SP), Brazil.

<sup>2</sup>Physical Therapy Course and Graduate Program in Gerontology, Universidade Católica de Brasília (UCB) - Brasília (DF), Brazil.

Correspondence to: Paulo Roberto Veiga Quemelo - Programa de Pós-Graduação em Promoção da Saúde da UNIFRAN - Avenida Doutor Armando Salles Oliveira, 201 - CEP: 14404-600 - Franca (SP), Brasil - E-mail: pquemelo@hotmail.com

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aplicación y con un intervalo de 48 horas. Las variables utilizadas fueron dislocación total, amplitudes antero-posterior y medio-lateral, área y velocidades antero-posterior y medio-laterales. Los resultados demuestran que la *Kinesio Taping* no causó modificaciones significativas con relación al Grupo Control, después y

48 horas después de la aplicación. Los hallazgos apuntan que la *Kinesio Taping* no fue capaz de cambiar el balance postural de ancianos del género femenino.

**Palabras clave** | Balance Postural; Anciano; Propiocepción; Modalidades de Fisioterapia.

## INTRODUCTION

According to the Brazilian Institute of Geography and Statistics (IBGE), the proportion of elderly people is growing rapidly. In 1991, this population accounted for about 4.8% of Brazilians. This ratio rose to 12.1% in 2011, and there are estimates that this proportion will double in 2050<sup>1,2</sup>. The aging process compromises the components responsible for postural balance, such as the central nervous system (CNS), the vestibular, the sensory and the proprioceptive systems, which may result in imbalance and falls<sup>3</sup>.

In this sense, the slowness in the response of the neuromuscular system can generate a functional deficit and decrease the muscle power and the speed of that elderly people use to start, perform and finish their actions. Thus, a careful evaluation is part of the approach of preventive programs and physical therapy rehabilitation, not only for the prevention of falls, as well as for the treatment of disorders related to chronic degenerative diseases, common in this age group<sup>4</sup>.

Based on this information, it is important to think about strategies that can improve postural balance of elderly people to try to prevent problems. The *Kinesio Taping* (KT) is an increasingly popular technique, which proposes to modify and activate the proprioceptive system. This method consists in the application of an elastic band without chemicals, with texture and elasticity that are very similar to human skin. It can be used in different ways and in different parts of the body, providing support to the muscles and joints, without interfering with the range of motion. It is believed that KT bandage sends sensory stimuli through mechanoreceptors found in the dermis and epidermis, providing a satisfactory response to the desired location<sup>5,6</sup>.

Studies have shown that KT promotes pain reduction, improved flexibility and alignment of postural balance, which may result in an improvement in the functional performance of subjects<sup>7,8</sup>. The method can also increase or decrease muscle tension and help in proprioception, coordination and balance disorders. The method can also increase or decrease muscle

tension and help in proprioception, coordination and balance disorders<sup>9,10</sup>. However, studies using the KT to evaluate the dynamic postural control in healthy young people<sup>11</sup> and in some clinical conditions, such as multiple sclerosis<sup>12</sup> and Parkinson's disease<sup>13</sup>, presented different results between them.

Although the number of adherents to KT has grown in recent years, two literature reviews found a low quality of studies with this bandage, concluding that data from studies provide insufficient evidence to prove its benefits<sup>14</sup>. Based on these data, the purpose of this study was to investigate the effect of KT on postural balance in elderly people.

## METHODOLOGY

### Ethical aspects and subjects

The project was approved by the Research Ethics Committee of Universidade de Franca (UNIFRAN) under public notice No. 105.950/12 and, once approved, the study participants signed a free and informed consent form.

The study included 62 elderly, healthy, female subjects, which are part of the Elderly Community Centre (CCI) of the city of Franca, in the state of São Paulo. CCI participants performed preventive and educational physical activities daily. The subjects were invited to participate in the study, constituting a convenience sample. The study had the following exclusion criteria: bedridden elderly people, those who presented any acute illness or infection, who had cognitive impairment detected by the Mini Mental State Examination<sup>15</sup>, with diagnosed neurological diseases or recent fractures (last three months) in the lower limbs or that used some type of orthotics or prosthesis the lower limb. The elderly women who voluntarily agreed to participate in the study were randomly divided into two groups (Control and KT). During the study, there were no complications or withdrawal of participants.

We collected demographic data of the elderly subjects, such as age, height, body weight and body mass index (BMI). To characterize the sample and study groups, was also applied a brief questionnaire, in which the participant pointed yes or no to alcohol, tobacco and drug consumption, as well as physical activity. The results of the socio-demographic data and characterization of the sample show a homogeneity of the participants between the control (CG) and KT groups (Table 1).

## Application of bandages

The KT Group (GKT), composed of 31 participants, received the application of KT (K-Tape® brand, Lumos, Inc.) for gastrocnemius and the midfoot muscles of both members. CH consisted of 31 subjects who received a placebo application of a tape (Micropore 3M® brand) on the same muscles of both members, as shown in Figure 1. The order of application of the KT and placebo tapes was chosen randomly among the elderly women who agreed to participate voluntarily in the study. The justification for the choice of applying KT to that area of the body was due to the fact that the posterior muscles of the body play a role in postural balance, specifically the lower limbs, which provide support to the feet and for the standing position, assisting in the proprioception and balance of the individual.<sup>16,17</sup>

Before applying the tape, the area was cleaned with 70% rubbing alcohol for better fixation and, for both tapes, the application technique used was the “I” technique, which consists in applying two strips in the format of the letter “I”. The first tape was placed along the length of the plantar aponeurosis with a fixed point in the middle third of the medial gastrocnemius muscle, up to the metatarsal phalangeal articulation; the second, which was also applied in the format of an “I” with no fixed point, was positioned along the midfoot

arch in the direction of tension lines, to assist with supporting the metatarsal arch, as viewed in Figure 1<sup>5,18</sup>.

## Data collection and analysis

The experimental protocol was performed in the upright position, and the subjects were instructed to stand with their feet apart at a distance of 30 cm, with eyes open, directing their gaze to a fixed point, marked with colored tape on the wall at eye level (vertically) and at a distance of three meters from the force plate, horizontally. They were asked to keep the position static for 40 seconds for the collection of stabilometric data, which was made after the application of the tapes and after 48 hours.

For the analysis of postural balance, we used a force plate (EMG System do Brazil Ltda.®) for recording stabilometric signals. The variables were calculated according to the speed of oscillation and displacement of the subject's center of pressure in the anteroposterior - AP (Fx), mediolateral - ML (Fy) and vertical (Fz) directions, on the force platform<sup>19</sup>. The equipment was allocated in a proper laboratory with all necessary care to avoid interference in signal recording. The variables used were the AP (cm) and ML (cm) amplitudes; the total displacement



Figure 1. Kinesio Taping application and data collection. (A) application of Kinesio Taping; (B) Application placebo tape (3M Micropore); (C) data collection with Kinesio Taping on the force plate; (D) data collection with placebo tape (3M Micropore) on the force plate

Table 1. Distribution of participants, according to sociodemographic variables, and information on the sample

Variables	CG (n=31)	KTG (n=31)	Total (n=62)
Age (years)	68±5	68±5	68±5
Height (cm)	1.56±0.06	1.56±0.07	1.56±0.06
Weight (kg)	65.3±12.4	64.5±11.3	64.8±11.8
BMI (cm/kg <sup>2</sup> )	26.6±4.3	26.1±4.3	26.4±4.3
Use of alcohol	16% (n=5)	3% (n=1)	9% (n=6)
Use of medication	100% (n=31)	83% (n=26)	91% (n=57)
Use of tobacco	3% (n=1)	0% (n=0)	1% (n=1)
Physical activity	97% (n=30)	100% (n=31)	98% (n=61)

CG: Control Group; KTG: Kinesio Taping Group; n: number of the sample; BMI: body mass index

(variation in both directions, AP and ML); area (cm<sup>2</sup>), which was calculated by adjusting the ellipse of the movement of the center of pressure (95% confidence interval of the ellipse of the center of pressure) and AP and ML (cm/s) speeds<sup>19,20</sup>. To obtain the signals, an analog-to-digital converter (A/D) with 16-bit resolution and sampling frequency of 100 Hz, were used<sup>19</sup>. Data were analyzed later using WinDaq, version 3.36 (Dataq Instruments<sup>®</sup>).

## Statistical analysis

Stabilometry data were tabulated in Excel, in which the mean, standard deviation and frequency of results were calculated. For statistical analysis, we used the GraphPad Prism 5.0 software, with the Kolmogorov-Smirnov test for normal distribution among the domains. For the comparison of the normal results, Student's *t* test was used. As for the data that did not show normal distribution, we used the Mann-Whitney test, with a significance level of  $p < 0.05$ .

## RESULTS AND DISCUSSION

The results of the variables total displacement, AP and ML amplitude, AP and ML area and speed were not significantly different between the KTG and the CG, as shown in Table 2.

This study concludes that the application of KT was not effective for the improvement of postural balance in active elderly women for the variables total displacement, area, amplitude and AP and ML speed. The results of this study demonstrate that the KT did not induce neuromuscular activity and does not alter the balance of elderly women. Similar to these findings, Lins et al.<sup>21</sup> evaluated 60 healthy women after the application of KT in the lower limb and observed that it was not effective in improving balance and functional performance. Similarly, young patients with chronic ankle instability showed no

improvement in dynamic postural stability after application of KT for the stabilization of the fibula<sup>22</sup>. On the other hand, Karadag-Saygi et al.<sup>23</sup> observed that the application of KT associated with botulinum toxin resulted in enhancement of stride length, gait velocity and passive movement amplitude in elderly patients with spasticity. In a recent study, it was also shown that KT applied to the sural triceps muscle increases muscle performance on vertical jump in sedentary young people<sup>24</sup>.

One must consider that the participants of this study did not have any balance disorder complaints and were physically active. Given this condition, it is possible to theorize that the application of KT may not show positive results in healthy subjects who perform physical activity regularly. However, future studies are needed to confirm and clarify this hypothesis. Perhaps if the investigation had been carried out with elderly women who presented any clinical conditions, such as osteoporosis or Parkinson's disease, the results might have been different<sup>25,26</sup>. Most studies using KT found in the literature involved inflammatory and algic conditions in patients or athletes<sup>27-30</sup>. According to the literature, the positive results of applying KT in algic conditions occur due to the shallowness of the cellular receptors of touch and pressure, which can be activated by the KT and cause the effect of spinal cord lock<sup>6,31</sup>.

Taking into consideration the inference mentioned in the studies shown, one possible explanation for the findings of this study was probably due to the depth of proprioceptive receptors, such as muscle spindle and Golgi tendon organ<sup>31</sup>. In addition, the intervention of this study involved only part of the postural balance control system, which depends on integrated information from the vestibular, proprioceptive and visual systems, along with psycho-cognitive components, such as attention, anxiety and fear of falling<sup>32</sup>. Thus, such information and the results presented corroborate the findings of Halseth et al.<sup>33</sup>, which implemented KT in the anterior region of the foot, the ankle and the leg, in order to improve proprioception of the ankle in healthy individuals. The authors

Table 2. Distribution of values in mean±standard deviation and p-value for the results of the variables for the force plate

Variables	Post-application			48 hours after application		
	CG	KTG	p-value	CG	KTG	p-value
TD (cm)	32±12	31±12	0.7074	34.7±14	32±13	0.4986
AP Amplitude (cm)	1.4±1.0	1.1±0.7	0.2065	1.5±1.0	1.3±0.8	0.2898
ML Amplitude (cm)	0.8±0.5	0.7±0.6	0.2751	0.9±0.9	0.8±0.5	0.6330
Area (cm <sup>2</sup> )	0.8±1.0	0.6±1.0	0.5129	1.2±1.8	0.8±1.4	0.5365
AP Speed (cm/s)	0.6±0.2	0.5±0.2	0.8003	0.6±0.2	0.6±0.3	0.4261
ML Speed (cm/s)	0.5±0.2	0.4±0.1	0.5133	0.5±0.2	0.5±0.2	0.8608

KTG: Kinesio Taping Group; CG: Control Group; TD: total displacement; AP: anteroposterior; ML: mediolateral

observed that the elastic band does not improve proprioception in healthy individuals, but report that their use can accelerate the return to activities in patients in acute and subacute phases of injury.

Other types of therapy may be adopted concurrently with the use of KT as a measure to improve postural balance, as it is known that physical exercises and functional training programs have positive effects on the postural balance of the elderly<sup>34,35</sup>. Buranello et al.<sup>35</sup> demonstrated that physically active elderly women performed better in the Berg Balance Scale and in the Timed Up and Go test, with consequent reduction in the risk of falls<sup>35</sup>. In this sense, the application of KT can be enhanced and present a better effect when combined with other types of therapy, as observed by Şimşek et al.<sup>36</sup>, in which the authors obtained better results in the rehabilitation of subacromial impingement syndrome when associated the use of KT to therapeutic exercise. In this context, future studies relating the use of KT to articulation flexibility programs, proprioceptive and balance training are needed to demonstrate possible effects on improvement of the functionality in the elderly.

In conclusion, the results suggest that the KT does not cause changes in postural balance of active elderly women, immediately after application or after 48 hours. This reinforces the fact that this technique should not be applied indiscriminately in clinical practice.

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