

# EVIDÊNCIAS SOBRE APLICAÇÃO DAS BANDAS NEUROMUSCULARES NA REABILITAÇÃO DO PÉ NOS DOENTES PÓS ACIDENTE VASCULAR CEREBRAL

## EVIDENCE ON THE APPLICATION OF NEUROMUSCULAR BANDS IN THE REHABILITATION OF THE FOOT IN POST-STROKE PATIENTS

## EVIDENCIAS SOBRE APLICACIÓN DE BANDAS NEUROMUSCULARES EN LA REHABILITACIÓN DEL PIE EN PACIENTES DESPUÉS DE UN ACCIDENTE VASCULAR CEREBRAL

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### RESUMO

**Objetivo:** Determinar os benefícios da aplicação das bandas neuromusculares na reabilitação do pé nos doentes pós acidente vascular cerebral.

**Metodologia:** Estudo de revisão sistemática da literatura segundo o modelo de *Joanna Briggs Institute*. Incluíram-se estudos em adultos pós acidente vascular cerebral aos quais foram aplicadas bandas neuromusculares. Cinco revisores independentes realizaram a avaliação crítica, extração e síntese dos dados.

**Apresentação e interpretação dos resultados:** Os 4 estudos incluídos reportaram melhorias na postura corporal, deambulação e percepção sensorial.

**Conclusão:** Os estudos analisados sugerem que as bandas neuromusculares podem ser um método promissor a ser utilizado como método complementar no tratamento do pé do doente pós acidente vascular cerebral, sendo que são necessários mais estudos neste âmbito.

**Palavras-chave:** acidente vascular cerebral, bandas neuromusculares, Kinesio Taping, pé, reabilitação

### RESUMEN

**Objetivo:** Determinar los beneficios de la aplicación de bandas neuromusculares en la rehabilitación del pie en pacientes después de un accidente vascular cerebral.

**Metodología:** Estudio de revisión sistemática de la literatura según el modelo de *Joanna Briggs Institute*. Se incluyeron estudios en adultos post accidente cerebrovascular a los que se aplicaron bandas neuromusculares. Cinco revisores independientes realizaron la evaluación crítica, extracción y síntesis de los datos.

**Presentación e interpretación de los resultados:** Los 4 estudios incluidos reportaron mejoras en la postura corporal, deambulación y percepción sensorial.

**Conclusión:** Los estudios analizados sugieren que las bandas neuromusculares pueden ser un método prometedor que se utilizará como método complementario en el tratamiento del pie del paciente post accidente cerebrovascular, y se necesitan más estudios en este ámbito.

**Palabras clave:** accidente cerebrovascular, bandas neuromusculares, Kinesio Taping, pie, rehabilitación

### ABSTRACT

**Objective:** To determine the benefits of the application of neuromuscular bands in the rehabilitation of the foot in post-stroke patients.

**Methodology:** A systematic review of the literature according to the model of *Joanna Briggs Institute*. Studies have been included in adults after stroke to which neuromuscular bands have been applied. Five independent reviewers performed the critical evaluation, extraction and synthesis of the data.

**Presentation and interpretation of results:** The 4 included studies reported improvements in body posture, ambulation and sensory perception.

**Conclusion:** The studies analyzed suggest that neuromuscular bands may be a promising method to be used as a complementary method in the treatment of the patient's foot post stroke, and further studies are needed in this area.

**Key words:** stroke, athletic tape, Kinesio Taping, foot, rehabilitation

## INTRODUCTION

Stroke is defined as an interruption of the blood supply to the brain, usually due to the rupture of a blood vessel or its obstruction due to the presence of a clot<sup>(1)</sup>. As a consequence, neurological damage occurs, such as deficits in motor, sensory, behavioral and perceptual functions.

For the systematic literature review (SLR) that we carried out, it is important to reflect specifically on the changes in motor and sensory function after stroke. Thus, the change in tone, namely spasticity (abnormal posture and stereotyped movement of a limb), requires our attention due to the risk of developing equine foot, which has an impact on mobility (gait) and on the person's balance. Likewise, the postural control mechanism can be affected in the individual who has had a stroke. Their daily life is changed as the change in postural control affects basic tasks such as rolling, sitting, standing and walking. In turn, the decrease in proprioceptive sensitivity (postural and vibratory) contributes to the loss of the ability to perform efficient and controlled movements, to the decrease in sensation and sense of position and movement, preventing and reducing new motor learning in the affected hemibody<sup>(2)</sup>. Given the motor complications that the individual is subject to after stroke, it is very important to act to prevent the loss of functional capacity associated with neurological deficits related to motor, sensory and postural functions.

Given the above, the Rehabilitation Nurse (RN) supports the decision-making in a documented manner, focusing on the quality and results of specialized care in rehabilitation nursing. According to the Regulation of Specific Competencies of the Specialist Nurse in Rehabilitation Nursing, the intervention area is directed towards the maintenance and promotion of well-being and quality of life, the recovery of functionality, maximization of capacities and prevention of complications, directed to the person throughout their life cycle<sup>(3)</sup>.

In the process of foot rehabilitation in post-stroke patients, there are several rehabilitation techniques available, and in recent years the applicability of athletic tape (AT) or Kinesio tape (KT) has gained more followers and popularity, having been developed each time more studies about its usefulness in this process.

Kinesio Taping is a technique that involves the application of a therapeutic elastic band on the skin, and was developed in the 1970s by the Japanese chiropractor Kenzo Kase, with the objective of providing the patient with a therapeutic resource that

would help the muscle and other tissues to achieve their homeostasis in the interval between chiropractic sessions. Some authors report that the technique is based on the induction of adequate sensory stimuli on the skin, through the application of an elastic band, which can be used to enhance and facilitate tissue and body homeostasis in any human condition<sup>(4)</sup>. Having been developed to facilitate the body's natural healing process, while providing support and stability to muscles and joints without restricting the body's range of motion; it has been used to treat a variety of orthopedic, neuromuscular, neurological and medical conditions.

Athletic tapes can act on muscle, joints, lymphatic circulation, fascia, dermis, tendons and ligaments. Thus, the benefits advocated by neuromuscular bands can be subdivided into four major functions: dermal function, muscle function, joint function and lymphatic function. However, according to the technical manual, it is possible to stimulate or inhibit a certain muscle, using neuromuscular bands. The application of the neuromuscular band made in the direction of insertion to the origin of the muscle (from distal to proximal) would have an inhibitory effect and, when the direction of application of the neuromuscular band is from the origin to the insertion of the muscle (from proximal to distal); it would have muscle facilitation or stimulation effect<sup>(4)</sup>.

According to Kenzo Kase (2003), this therapy aims to: relieve pain and abnormal sensations in the skin and muscles; to provide greater balance and support to the muscles during movements; to decrease lymphatic and blood edemas; to correct joint and biomechanical misalignments; to create more space at the epidermal, dermal and hypodermic levels; promote stimuli and improve proprioception<sup>(5)</sup>.

Despite the application of neuromuscular bands in the field of neurology, be an increasingly reality, as mentioned above, the truth is that to date few studies have been carried out to validate their use in this population. The therapeutic effects advocated by the application of neuromuscular bands remain controversial and there is no scientific evidence to support them. Thus, having gained importance in recent years in its application in the field of neurology, it is interesting to clarify and validate this technique in the rehabilitation process of post-stroke patients at foot level. Like so, to find out what is the evidence on the application of neuromuscular bands in foot rehabilitation in post-stroke patients' muscle<sup>(4)</sup>.

## METHOD

The Systematic Review followed the guidelines of the Joanna Briggs Institute (JBI). Selection criteria were defined and applied according to the PEO methodology that defines, according to Mendes *et al* (2008), the Population, the Exposure and the results, from the english Outcome<sup>(14)</sup>. Participants: all adults diagnosed with stroke; Exposure: application of neuromuscular

bands on the foot; Outcomes: rehabilitation. Only randomized clinical trials were selected.

During the month of July 2018, the search was carried out in the subsequent electronic scientific databases: Medline® and CINAHL®, defining as inclusion criteria the studies published in Portuguese, English and Spanish, with open access text and date from 2012 to 2018 and aged 19 years-old or over (all adults).

### Research strategy and identification of studies

Initially, a limited search was carried out in the Medline® and CINAHL® database using the Boolean phrases, ((MH "Stroke+") AND ((MM "Athletic tape") OR ("kinesio tap\*")) AND (MM "Foot") AND (MH "Rehabilitation+")) and ((MH "Stroke+") AND ((MH "Tapes+") OR (MM "Athletic Tape") OR ("kinesio tap\*")) AND (MH "Foot+") AND (MM "Rehabilitation")), respectively. Due to the existence of differences in the indexing processes in the bibliographic databases, it was chosen, in addition to the use of controlled vocabulary (descriptors), to use the free term "Kinesio Taping" in the research. With this strategy, there was a recovery of a greater number of references, ensuring the identification of most of the works published within the pre-established criteria.

A selection followed by reading the titles and abstracts. The selection of articles was performed individually by 3 reviewers (AC, EA and RS) with a consensus of 2 reviewers (HS and SF).

### Assessment of the methodological quality of studies

Methodological quality was assessed by 3 independent reviewers (AC, EA and RS) with consensus from 2 other reviewers (HS and SF) using the JBI Critical Appraisal Checklist for Randomized Controlled Trials assessment tool <sup>(6)</sup>, in which quality studies were considered those with a maximum of 3 negative responses (defined in a consensus prior to the investigators' analysis, in order to preserve a score equal to or greater than 75% of positive responses). To classify the level of evidence of studies, the Hockenberry levels of evidence were used, and the studies were classified with level of evidence Ib (which corresponds to evidence obtained from at least one clinical trial) <sup>(7)</sup>.

### Data extraction

Data were extracted by 3 reviewers (AC, EA, RS) and with the consensus of 2 other reviewers (HS and SF), independently, between July and August 2018, using the instrument of Joanna Briggs Institute data extraction form for systematic review of experimental/observational studies and included the characteristics of the participants, the characteristics of the intervention, the study methods and the relevant results of the evaluated outcomes.

### Data synthesis

Data synthesis was carried out in July and August 2018, with the aim of summarizing the data narrative. 3 reviewers participated in it (AC, EA, RS), with the consensus of 2 other reviewers (HS and SF). For this purpose, a table was created for each of the studies included in the systematic review, which included: title, author, country, year, type of study, population, method, objectives, results and conclusions.

### Presentation of results

1,219 articles were identified: 911 from CINAHL® Plus with Full Text (ESBCO® - host via ESSM) and 308 from MEDLINE® with Full Text (ESBCO® - host via ESSM). Of these, 850 were excluded by the search limiters, leaving 235 articles from CINAHL® and 134 from MEDLINE®. With the support of Endnote®, and after compilation of the articles mentioned above, there were 33 duplicated articles. Of these, 330 were excluded by title, as they focused on anatomical sites other than the one outlined for this review; and one was excluded after reading the abstract. The 5 selected studies were methodologically evaluated, after applying the JBI Checklist for Randomized Controlled Trials, and 4 studies were considered valid since the percentage of true responses was greater than 75% (as previously recommended) and 1 excluded for not checking the methodological validity established by the researchers. After this individual selection, and in order to increase the reliability and transparency of the selection process, all researchers met, and there was unanimity in the selection of studies.

Out of the 4 articles included, 3 are written in English and 1 in Portuguese, dated 2015 and 2017. One study was published in Turkey, one in Brazil, one in the Republic of Korea and one in Iran. All studies respect the ethical criteria regarding the investigation process carried out. Regarding the types of studies, the 4 are quantitative.

Table 1 shows the studies that composed this Systematic Review, and it includes: the authors of the studies, the year of publication, the country, the characteristics of the participants, the interventions and the results of the included studies, as well as the level of evidence (LE) of each study and methodological evaluation (ME).

## RESULTS AND DISCUSSION

In the particular analysis of the selected studies, there was a great heterogeneity of them, regarding the objectives, the method, the type of sample and the way they study the action of neuromuscular bands when applied to the foot in post-stroke patients.

From the analysis of the results of the studies included in this SLR, we can infer that the application of neuromuscular bands had positive effects in terms of balance, foot motor control, perception, ankle amplitude and gait.

In study 1, the authors reveal that after implementing the therapeutic plan that consisted of applying athletic tapes on foot, there is an improvement in

perception, with consequences in improving the balance of individuals in the group <sup>(8)</sup>.

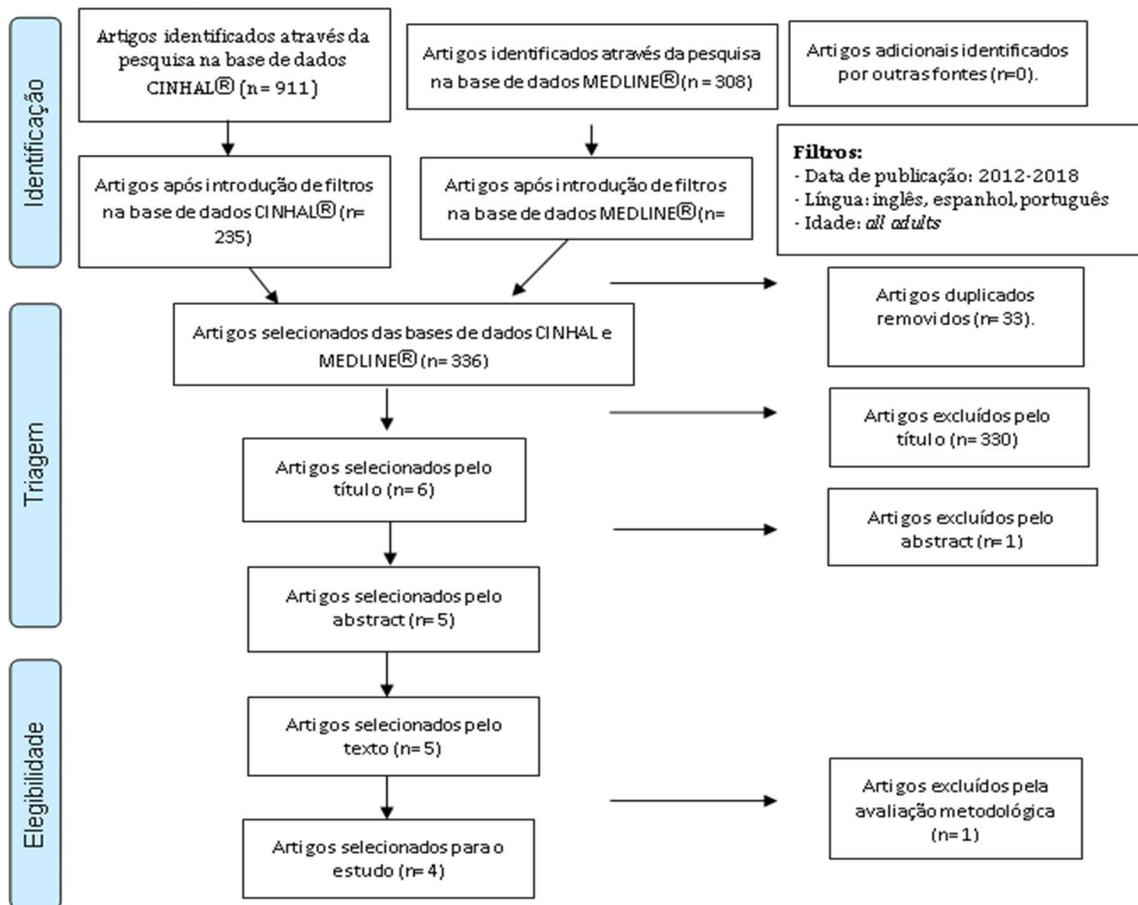


Figure 1 - Selection process diagram

Article (n.º), Author, Year (Country)	Type of Study/Population	Interventions	Results/Outcome	E.L	M.E.
1, Yazici, Guclu-Gunduz, Bayraktar, Aksoy, Nazliel, Kilinc, Yildirim, Irkec, 2015 (Turquia) <sup>(8)</sup>	Randomized clinical trial	Experimental: 19 persons with stroke Control: 16 healthy persons without neurological disorders.	Improvements in the balance of individuals in the experimental group, which is associated with increased somatosensory perception due to the presence of athletic tape in the foot.	lb	10/13
2, Lima, Wanderley, Henriques, Filho, Oliveira, 2017 (Brasil) <sup>(9)</sup>	Randomized, double-blind clinical trial	Experimental: 7 persons with stroke to whom neuromuscular tension bands were applied Control: 7 persons with stroke to whom tension-free neuromuscular bands were applied.	The hypothesis that the application of athletic tapes with tension was effective in the gain of ankle joint range was not proven. However, 3 persons in the control group said they felt a positive difference when using the athletic tapes in terms of gait and 2 persons reported a positive difference in terms of perception.	lb	12/13
3, Yang, Heo, Lee, 2015 (República da Coreia) <sup>(10)</sup>	Randomized primary experimental study	Experimental: 19 persons with stroke to whom neuromuscular bands were applied and subsequently evaluated for postural balance and pressure distribution in the foot Control: 19 individuals with stroke underwent the same procedures as the experimental group but in reverse order.	There was a change in the center of balance after the application of neuromuscular bands.	lb	10/13
4, Rojhani-Shirazi, Amirian, Meftahi, 2015 / Irão <sup>(11)</sup>	Randomized controlled clinical trial.	Experimental: 20 persons with stroke to which athletic tapes were applied Control: 20 persons with stroke who were not applied athletic tapes.	Statistically significant improvement in balance and foothold in the experimental group compared to the control group.	lb	10/13

Table 1 – Summary of studies included in the SLR.

In the study carried out by Lima et al (study 2), the findings were not significant in terms of ankle amplitude gain. However, the authors report that study participants reported an improvement in gait, as well as in perception<sup>(9)</sup>.

Regarding study 3, after the application of athletic tapes, the experimental group showed alterations in the center of balance<sup>(10)</sup>.

Study 4 mentions a statistically significant improvement in terms of balance and foot motor control<sup>(11)</sup>.

Based on the data listed above, it is possible to verify that after placing the athletic tapes, the following gains are described: in balance (studies 1 and 4); in the change in the center of balance (study 3); in perception (studies 1 and 2); in foot control (study 4) and in gait (study 2). Although there is a relationship of gains after placement of athletic tapes in studies, its comparison is questionable due to the existing discrepancy in the design of the studies, in their methodology and sometimes hidden information, namely: type of stroke and respective area of injury; post-stroke recovery time, care prior to the application of athletic tapes, detailed neuromuscular band application method; exposure time; scales and method of evaluating results.

The studies selected for this Systematic Review were assigned grade C regarding the degree of recommendation according to the quality of scientific evidence, according to the Jovell and Navarro-Rubio scale<sup>(12)</sup>. Since there is insufficient scientific evidence, the decision to adopt the technology must be based on other criteria.

This Systematic Literature Review brings as main contribution to the practice of rehabilitation nurses the knowledge existing in the application of neuromuscular bands in the foot of the patient after a stroke. On the other hand, it guides for a more precise elaboration of new studies since it mentions the limitations found in the existing studies, as well as some suggestions.

## CONCLUSIONS

Stroke has a great impact on a person's life cycle, as it acutely affects their health and quality of life. Nursing is a science that relates to transitional human experiences, in which health and well-being stand out as intervention outcomes; in this theoretical understanding, the challenge of the rehabilitation nurse professional centers on understanding the transition process, developing adaptive strategies that help the person to regain stability and well-being<sup>(13)</sup>.

In this sense, it is up to the rehabilitation specialist nurse to implement rehabilitation programs based on

the best existing evidence, in order to obtain gains that translate in recovery/minimization of post-stroke patient deficits. When performing this SLR, we verified there are some benefits in the application of athletic tapes in foot rehabilitation in post-stroke patients, namely in terms of body posture, gait and sensory perception. Despite the limitations found, which include the small number of studies, the small sample size and the methodological differences that make it difficult to compare the results, there was no compromise in achieving the goals initially outlined.

Therefore, we believe that it would be beneficial to carry out more studies in this area, taking into account a greater number of participants, a longer follow-up, a more detailed and monitored description of the application of neuromuscular bands, as well as the realization of a program of rehabilitation in order to complement this technique.

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