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Literature review

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Manual therapy in the functional recovery after the ankle side entry: systematic review

Terapia manual na recuperação funcional pós-entorse lateral de tornozelo: revisão sistemática

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RESUMO | INTRODUÇÃO: O tornozelo é considerado uma das regiões do corpo mais propensa às lesões esportivas, sendo 70% dessas lesões entorses de tornozelo. A recidiva de entorses pode provocar um prejuízo crônico na função proprioceptiva e sensório-motora. Não existe um tratamento específico para as entorses, sendo utilizados protocolos como o PRICE, abordagem passiva, imobilização da articulação e terapia manual. **OBJETIVO:** Trazer informações mais consistentes que elucidem os efeitos da terapia manual na recuperação da funcionalidade do paciente. **MATERIAIS E MÉTODOS:** Trata-se de uma revisão sistemática baseada no PRISMA, com buscas realizadas nas bases de dados: PubMed, SciELO, LILACS e PEDro. Foram pesquisados apenas ensaios clínicos randomizados, com avaliação maior ou igual a 5/10 na escala PEDro, nos idioma português e inglês. Os estudos deveriam incluir população com idade entre 18 e 60 anos utilizando técnicas de terapia manual como: Mulligan, Maitland, mobilização neural, massoterapia, liberação miofascial, pompage e alongamento passivo. **RESULTADOS:** Foram incluídos 7 artigos com um total de 300 indivíduos. Os estudos incluídos investigaram a recuperação da funcionalidade de pacientes submetidos à terapia manual. Limitações: heterogeneidade no tempo de lesão. **CONCLUSÃO:** Os resultados evidenciaram melhora na capacidade física para correr, saltar, pousar e realizar movimentos de corte e laterais, melhora da cinemática, marcha, distribuição de descarga de peso e função global.

PALAVRAS-CHAVE: Entorse de tornozelo. Lesões de tornozelo. Terapia manual.

ABSTRACT | INTRODUCTION: The ankle is considered one of the regions of the body most prone to sports injuries, with 70% of these injuries ankle sprains. The recurrence of sprains can cause chronic impairment in proprioceptive and sensory-motor function. There is no specific treatment for sprains, using protocols such as PRICE, passive approach, immobilization of the joint and manual therapy. Manual therapy in patients who have undergone lateral ankle sprains can provide beneficial results by improving range of motion, subtalar joint slippage, speed and length of steps, distribution of gait forces, pain relief, and activities of daily living. **OBJECTIVE:** The objective of this study is to provide more consistent information that elucidates the effects of manual therapy on the recovery of the patient's functionality. **MATERIALS AND METHODS:** This is a systematic review that followed some PRISMA rules in the databases: PubMed, SciELO, LILACS and PEDro. The articles were searched in Portuguese and English. **RESULTS:** Seven articles with a total of 300 individuals were included. The included studies investigated the retrieval of the functionality of patients undergoing manual therapy. **CONCLUSION:** The results showed an improvement in physical ability to run, jump, land and perform lateral and lateral movements, improvement of kinematics, improvement of gait, better distribution of weight discharge and improvement of overall function.

KEYWORDS: Ankle sprain. Ankle injuries. Manual therapy.

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Introduction

The ankle is considered one of the body regions most prone to injury during sport activity. Approximately 30% of sports injuries involving contact, jumping and running are located in the ankle and 77% of these are sprains[1]. Lateral ankle sprains (LAS) account for 85% of all ankle sprains. They commonly affect athletes and result in a substantial social burden[2]. This type of injury occurs when an individual, when falling, directs the foot in a plantar position, flexed and inverted. The main symptoms of lateral ankle sprain are edema, pain on palpation and functional impairment[3].

The LAS can be classified according to the level of the injury, being grade I were excessive ligament stretching occurs, grade II where there is partial ligament rupture and grade III with total ligament rupture. The severity of the injury is consequently accompanied by increased instability[4].

In addition, recurrence in individuals who have had this event at least once is common, which can cause chronic impairment in proprioceptive and sensorimotor function, as it generates a deficit in neuromuscular reflex response time[5].

Regarding the forms of treatment, the literature does not establish a specific treatment for LAS, usually using the PRICE protocol (protection, rest, ice, compression and elevation)[6]. Other studies report contraindication to weight loss, use of crutches and cast immobilization for two weeks after injury[7].

Authors report that manual therapy applied to patients who have suffered LAS can provide beneficial results by improving range of motion, subtalar joint sliding, speed and length of steps, gait force distribution, and pain, returning patients more quickly to activities[8,9,10].

Although there is evidence on the use of manual therapy in the treatment of LAS, it is clear that most describe only the physiological treatment outcomes as pain, range of motion (ROM), muscle strength, underestimating the functional outcomes in this type of population. More consistent data are needed to elucidate the effects of manual therapy on the recovery of patient functionality.

The purpose of this study is to bring information to the clinical and academic practice of professionals in the field of sports physiotherapy and orthotraumatologic physiotherapy, homogenizing the data contained in the literature about the effect and isolated and combined manual techniques on the function of individuals who suffered LAS.

Materials and methods

This is a systematic review of the literature based on the rules of the Transparent Reporting of System Reviews and Meta-analyzes - PRISMA. We searched the literature published between 2007 and 2017, using the database. The articles were searched in Portuguese and English.

The searches were conducted by two independent reviewers between December 2017 and August 2018, with the last search performed on the 24th. EndNote version X9 software was used to remove duplicates. After the title and abstract reading, all articles deemed to be potentially interesting were selected for full reading. At this stage, the divergences were discussed by the authors and in their prevalence a third author participated in the decision.

In data extraction stage, in cases of lack of sufficient information, the researchers were instructed to make contact via e-mail with the authors of the selected articles.

Inclusion criteria

Only published randomized controlled trials whose sample consisted of individuals of both sexes, over 18 years of age and under 60 years old, treated with any manual resource alone or in combination, who were evaluated in this study, were included in this study. by at least one validated scale or movement program and having a rating greater than or equal to 5/10 on the PEDro scale[11]. Techniques or manual approaches considered included the Mulligan, Maitland concept, neural mobilization, massage therapy, myofascial release, pompage, and passive stretching. The observed outcomes should involve ankle functionality, pain reduction, walking ability and post-event safety.

Exclusion Criteria

Studies whose sample included subjects with previous history of lower limb trauma, individuals with cognitive impairment, subjects with neurodegenerative and / or rheumatologic diseases that could have compromised the results.

Descriptors

Descriptors were taken from DeCS (Health Sciences Descriptors) and MESH (PubMed Data Source Descriptors) and the search was performed by combining the words with the Boolean descriptors AND, OR and NOT. The search descriptors used were: Stretching, mobilization, manipulation, massage AND pain AND for or ankle OR Ankle Injury AND Manual Therapies OR Ankle Injury and Manual Therapy OR Ankle Injury and Manipulation Therapies OR Ankle Injury AND Manipulative Therapies OR Ankle Injury AND Manipulative Therapies OR Ankle Sprains AND Manual Therapy OR Ankle Sprains Manual Therapies OR Ankle Sprains AND Manipulation Therapy OR Ankle Sprains AND Manipulation Therapies OR Ankle Sprains AND Manipulative Therapies OR Ankle Sprain Ankle Sprain Therkies AND Manuel Therapy OR Ankle Sprain AND Manipulation Therapy OR Ankle Sprain AND Manipulation Therapies OR Ankle Sprain AND Manipulative Therapies OR Ankle Sprain AND Manipulative Therapy OR Syndesmotic Injury AND Manual Therapies OR Syndesmotic Injury AND Manndulation Injury AND Syndesm ipulation Therapies OR Syndesmotic Injury AND Manipulative Therapies OR Syndesmotic Injury AND Manipulative Therapy NOT Fractures in the PubMed Database; Streching, mobilization, manipulation, massage AND for or ankle in the PEDro database; Muskuloskeletal Manipulations AND Ankle Injury in the LILACS and SciELO database, and their Portuguese correspondents in SciELO.

Methodological quality assessment

The methods used in the articles were evaluated by the PEDro[11] scale, which comprises 11 items, for which the 1st is not included in the calculation, generating a sum of 10 points. The criteria are: 1-Eligibility criteria; 2-Random allocation; 3- Hidden allocation; 4-Baseline comparability; 5- Blind subjects; 6- Blind therapists; 7- Blind appraisers; 8- Proper follow up; 9- Analysis of intention to treat; 10- Comparisons between groups; 11- Point estimates and variability.

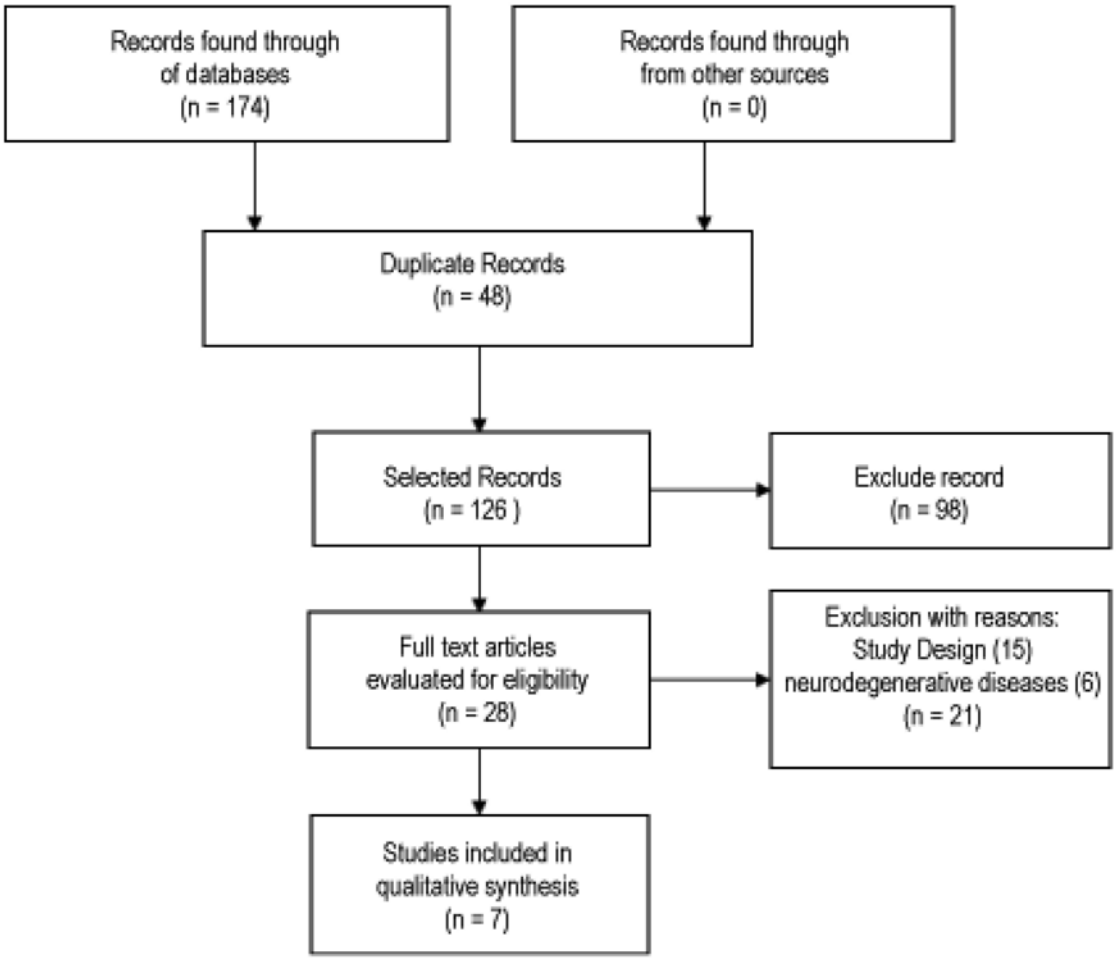
A search was made in the PEDro database and in the absence of data, the authors would evaluate each item independently, with further discussion of the differences.

Results

Study selection

From the search criteria, initially 174 studies were detected. Of these studies, 28 were selected for analysis after title and abstract reading. After reading the selected articles, 21 were excluded due to the presence of exclusion criteria, totaling seven studies for final analysis (Figure 1).

Figure 1. Flowchart of article selection



Study design, demographic and clinical characteristics

Seven randomized controlled trials were included in this study. The articles were published between 2011 and 2016. The quality of the works was established based on the PEDro Scale and is described in Table 1.

Table 1. Profile of articles included in the review

Autor	Intervenção	Controle	Protocolo de tratamento	Efeitos	Avaliação da qualidade
Truyols-Domínguez et al[3]	Thrust e Nonthrust + Liberação Miofascial e Pompage= 25	Thrust e Nonthrust= 25	1x a cada 7 dias durante 4 semanas. Cada mobilização foide30 segundos + liberação miofascial e Pompage.	Melhora da descarga de peso durante a caminhada.	8/10
Cosby et al[6]	Maitland AP talocruralgrau III =8	Controle= 7	3x ao dia e PRICE por 24 horas após o tratamento.	Melhora na função relatada depois de 24 horas.	8/10
Kang et al[12]	Mulligan + Alongamento= 12/	Alongamento isolado = 12	Cada sessão tinha 10 repetições de exercícios (30s x30s).	Melhora da cinemática articular do tornozelo na marcha, com um maior glide e melhora da caminhada.	5/10
Beazell et al[13]	Maitland tibiofibular proximal= 15/ Maitland tibiofibular distal= 15	Controle= 13	3x por semana durante 3 semanas.	Não houve melhora na função auto relatada.	7/10
Mckeon& Wikstrom[14]	STARS (Alongamento= 20/ Maitland AP= 20/ Massagem Plantar= 20)	Controle= 20	Sessões de 5 minutos 3x por semana durante 2 semanas.	Maior capacidade para correr, pousar, saltar, realizar movimentos de corte e laterais	5/10
Plaza-Manzano et al[15]	Maitland AP e PA talocrural grau III, tração e mobilização neural= 28	Fortalecimento e propriocepção	2x por semana durante 4semanas. 10 mobilizações de 20 a 30 segundos, com um intervalo de2 minutos.	Melhora na função auto relatada.	7/10
Lubbe et al[16]	Maitland AP (Graus III, IV, V) + Programa de reabilitação (equilíbrio, coordenação e força)=16	Programa de reabilitação (exercícios) =14	1º passo: Exercícios isométricos, evoluindo para exercícios dinâmicos com faixa elástica (3x12) + Maitland. 2º passo: Placa Oscilatória e Balance Trainer durante 10 minutos.	Não foi eficaz para a deficiência de pé e tornozelo	8/10

AP= Ântero-Posterior/ PA*= Pôstero-Anterior; STARS= EstratégiasSensoriais de Reabilitação do Tornozelo; PRICE= Proteção, repouso, crioterapia, compressão e elevação; FADI-ADL= Foot and Ankle Disability Index- Activities of Daily Living; CAIT= Cumberland Ankle Instability Tool

Manual therapy modalities were used in combination, isolated and compared with some other technique or a placebo group. Maitland was the most used technique, being present in six studies, Mulligan's other techniques, passive stretching, myofascial release, neural mobilization, Pompage and massage therapy were used only once in the respective studies.

The total sample consisted of 300 individuals with LAS and functionality deficit, ranging from 17 to 80 individuals between articles. The most frequent gender was male (54.55%), and one study[12] evaluated only males and two studies[6,13] did not show the gender of the participants. Only one study described the participants' ethnicity, with a predominance of whites (81.25%).

Diagnoses were made using clinical and functionality criteria in six studies and only one[3] was made through medical diagnosis. Sample characteristics are available in Table 2.

Table 2. Sociodemographic and clinical characteristics of the sample of included articles

Author	n (M / F)	age GI	age GC	degree of lesion	evaluation tool	Limitation Type	Time to lesion
Truyols-Dominguez et al.,[3]	37/13	32 ± 11	33 ± 9	I and II	Assessment of Acute Lateral Ankle Sprains	Support of weight and walking track	**<5 days**
Cosby et al.,[6]	17	19.76 ± 1.35	19.76 ± 1.35	I and II	FADI / S-FADI	Function self reported	**1 to 7 days**
Kang et al.,[12]	24/0	22:42 ± 1.78	22.75 ± 1.54	-	Vicon MX T10 / Advanced Medical Technology	march	**-**
Beazell et al.,[13]	43	27.5 ± 8.8	23.8 ± 5.6	I, II and III	FAAM / S FAAM-	Function self reported	**-**
Mckeon & Wikstrom[14]	33/47	G1 = 6.7G2 = 23.6 ± 2.7 22.3 ± / G3 = 22.0 ± 2.8	22.9 ± 4.5	-	FAAM / FAAM-ADL / PASS	disability	**180 days**
Plaza-Manzano et al.,[15]	39/17	24.1 ± 2.4	24.4 ± 2.4	I, II and III	CAIT	Function self reported	**365 days**
Lubbe et al.,[16]	16/14	26 ± 4.4	26 ± 5.6	I and II	FADI	foot and ankle disability	**> 42 days**

Age; IG = Intervention Group; CG = control Group; M = Male; F = Female; G1 = Group 1; G2 = Group 2; G3 = Group 3; n = sample size.

Discussion

Functional gains provided by manual therapy in individuals with LAS ranged from the simplest to the most complex activities, it was noticeable the improvement in activities that require greater physical capacity such as running, jumping, landing and performing cutting and lateral movements[14], improved kinematics providing greater joint sliding and gait improvement[11], better distributed weight bearing during walking[3], and self-reported function improvement[12,15].

Authors[3,11,16] who used a treatment protocol with combined techniques found higher functional gains when compared to isolated protocols. As observed in the study by Kang et al.[12], composed of males (n = 24), divided into two groups: 12 were allocated to a group that received the Mulligan technique associated with gastrocnemius stretching and the other 12 participants performed only the gastrocnemius stretching exercise. Each session lasted 5 minutes, with 30 seconds of exercise and 30 seconds of rest, totaling 10 repetitions. The length of treatment was not specified. After the protocols were applied there was an improvement in the ankle joint kinematics, favoring gait, with better sliding and walking pattern.

The improved functionality of these patterns can be explained by the Mulligan concept consisting of joint mobilization associated with active movements, aiming at the reorganization of positional failure with central nervous system (CNS) sensory stimuli and muscle reactivation. That is, manual joint mobilizations associated with active movements generate an afferent response to the CNS, generating an efferent response of greater muscle activation with consequent greater range of motion[17].

Truyols-Domínguez et al.[3], found an improvement in weight loss during walking in subjects treated with the Maitland grade III and IV technique, called Thrust and Non-thrust, combined with myofascial release and Pompage compared to those who received only Thrust and Non-thrust Groups were treated once every 7 days for 4 weeks. Each mobilization was about 30 seconds and after mobilization, myofascial release was performed at trigger points and triceps spinal pompage. It is suggested that these results were obtained by combining the joint effects caused by the Maitland technique with the effects directed to the neighboring soft tissue, promoted by myofascial release and Pompage.

Maitland grade III and IV mobilization aims to break the viscoelastic barrier and improve joint hypomobility18. Myofascial release and Pompage are described as techniques aimed at increasing peripheral circulation and decreasing fascial adhesions, respectively[19,20].

However, this reflection should be viewed with caution, considering that Lubbe et al.[16], tested additional effects with combined therapies in relation to groups undergoing an isolated protocol, but found no functional differences between the groups. In his research, 18 subjects who underwent an exercise program consisting of Maitland grades III, IV and V, proprioception, balance and strength exercises, compared to a group that performed all the above exercises except Maitland, were analyzed. The treatment lasted 5 weeks, the intervention group received 29 sessions and the control group received 35 sessions. The protocol was divided into two steps. In the first, isometric exercises were performed, evolving to dynamic resistance exercises with elastic band (3 sets of 12 to 15 repetitions), and the manual therapy technique was applied later.

The difference between the aforementioned studies may have been due to the fact that the study by Lubbe et al.[16], performed an exercise protocol in both groups, and the Maitland concept was not performed in the control group. Thus, isometric and resistance exercises may have brought non-beneficial results, and in the study by Truyols-Domínguez et al.[3], only manual techniques without association of exercises were performed.

Mckeon et al.[14], conducted a study in which 80 individuals divided into 4 groups were analyzed. They all received 6 sessions over two weeks with a 24-hour interval between them, each session lasting about 5 minutes. Patients in the first group (n = 20) received Maitland grade III for 2 minutes, with a 1-minute interval between mobilizations. Patients in the second group (n = 20) received plantar massage at the same interval as the Maitland mobilizations. Patients in the third group (n = 20) participated in the stretching group, in which two sets of stretching were divided into an oblique board, with three stretches of 30 seconds and 10 seconds rest and 1 minute rest between sets. The other 20 patients did not receive treatment or participated in a simulated activity where they were instructed to sit for 5 minutes during treatment. On the FAAM-ADL scale, during the 2-week follow-up, only plantar massage and stretching

showed significant results in improved function, but after one month of treatment the three interventions offered better functionality for patients with greater running ability, jump, land and perform the so-called sideways cutting movements. On the FAAM-S scale, plantar massage and Maitland showed significant results for two weeks, and after one month, only plantar massage stood out.

Discrepant results between scales may have occurred because the individuals in the sample were regular exercise practitioners, which may have been instrumental in the fact that the subscale made for athletes (FAAM-S) showed better functional results than the subscale of daily life activities (FAAM-ADL). Another aspect of this study is that daily life activities require greater functional integrity than isolated activities for a given sport, which may justify this difference between these scales.

Some authors[6,13,15] have analyzed self-reported function after applying the associated or isolated Maitland technique when compared to a control group. Cosby et al.[6], ankle joint used the Maitland technique associated with the PRICE protocol (n = 8) compared to a control group that was not treated with any technique (n = 7). Participants in the intervention group received Maitland AP (anteroposterior) grade III mobilization of the ankle joint joint 3 times during the day and application of the PRICE protocol 24 hours after treatment. There were significant effects on function reported after 24 hours on the FADI-ADL scale. These results can be explained because in addition to the Maitland mobilizations, there was an addition of PRICE after the intervention. The PRICE protocol is widely used in clinical practice, usually in the acute phase of the injury, as it consists of rest, elevated limb positioning and the use of cryotherapy to promote analgesia and avoid edema in the injured limb, followed by other types of functional training[1]. Since sprains in this study occurred between 24 hours and 7 days, it is likely that the combination of mobilizations with PRICE increased treatment effectiveness.

Truyols-Domínguez et al.[3], associated the Maitland AP (anteroposterior) and PA (posteroanterior) technique of the ankle joint, together with traction and neural mobilization, compared to a control group that performed strengthening and proprioception.

Beazell et al.[13], used the Maitland technique in isolation on two occasions. In the first, the intervention group consisted of 28 participants who performed 10 mobilizations of 20 to 30 seconds with a 2-minute interval at a frequency of 2 times a week for 4 weeks. After the interventions it was possible to observe an improvement in self-reported function in the group that performed compared to a control group (n = 13) that did not receive any type of intervention. Secondly, the Maitland technique was applied to the proximal tibiofibular joint (n = 15) and distal tibiofibular joint (n = 15) at a frequency of 3 times a week for 3 weeks. No significant results were observed.

Generally, the movement most affected by ankle sprain is dorsiflexion and articulation and ankle joint[21], so it would be interesting if this application could be made in this joint.

Limitations

There was heterogeneity in the time and degree of injury of the patients, beyond the evaluation scales, which may directly influence the results of the interventions. The studies by Kang et al.[12], and Beazell et al.[13], did not show injury time, and the other studies ranged from injury time less than 5 days to one year. This way the outcomes cannot be compared.

Conclusion

The use of manual therapy for functionality recovery has yielded significant results, whether in the practice of more intense activities such as running, jumping, landing and in more common activities of daily living such as adequate weight bearing while walking. There was also an improvement in self-reported function by the patient himself, increasing his scores on scales and subscales of functionality.

Authors' Contributions

All authors contributed equally to the development of the study.

Conflicts of interest

No financial, legal or political conflict involving third parties (government, companies and private foundations, etc.) has been declared for any aspect of the work submitted (including but not limited to grants and funding, advisory board membership, study design, preparation manuscript, statistical analysis, etc.).

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