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Physiotherapy treatment of tendinopathy combined with nutritional supplementation.

Systematic review.

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- COMPLETE TITLE OF FINAL DEGREE PROJECT-

Physiotherapy treatment of tendinopathy combined with nutritional supplementation.

Systematic review.

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ABBREVIATIONS

CM	Countermovement jump
5-RM test	Five-repetition maximum
ADLs	Activities of Daily Living
Cr	Creatine
DHA	Docosahexaenoic acid
EPA	Eicosapentaenoic acid
EQ-5D-3L	EuroQol Group Five Dimensions
ESWT	Extracorporeal Shock Wave Therapy
FHL	Long big toe flexor
HMB	β-hydroxy-βmethylbutyrate
IG	Intervention Group
N	Total size of the sample
n	Group size
NRS	Numeric Rating Scale
NRS	Numeric Rating Scale
OSS	Oxford Shoulder Score
PFT	Plantar Flexion Torque
PG	Placebo Group
PSFS	Patient Specific Functional Score
PUFAs	Polyunsaturated fatty acids
RCRSP	Rotator Cuff Related Shoulder Pain
RCT	Randomized Control Trial
ROM	Range of Motion
RTR	Return-to-Running
RTS	Return-to-Sport
sCPs	Specific Collagen Peptides
SD	Standard deviation
SF36BP	Short Form 36 bodily pain
SLM	Segmental Lean Mass
SPADI	Shoulder Pain and Disability Index
VAS	Visual analogue scale
VISA-A	Victorian Institute of Sports Assessment-Achilles
VISA-P	Victorian Institute of Sport Assessment-Patella

ABSTRACT

Introduction: Tendon overuse injuries represent a predominant proportion of the sport clinician's workload. Those injuries are characterized by pain (during or after training), a decline in its function and a reduced tolerance to exercise. The diagnosis of tendinopathy is primarily based on a meticulous medical history and detailed clinical examination to identify whether the tendon is the source of pain. Therapeutic exercise is the main treatment investigated and recommended in tendinopathies. Performance is often related to nutrition optimization, in this aspect, nutritional supplements appear to favor the healing processes of tendon injuries and are likely to have a role as preventative strategies.

Objective: Evaluate the possible beneficial effect on tendinopathy using nutritional supplements combined with physiotherapy treatment in athletes and non-athletes, both in short, medium, and long term.

Material and methods: A literature review was conducted from December 2022 to February 2023 by analyzing randomized clinical trials obtained from Pubmed, PEDro, frontiers and EBSCO databases. Studies published between 2018 and 2022 that also met other previously established eligibility criteria were selected as well. Finally, only those studies whose score on the PEDro Methodological Quality Rating Scale was equal to or higher than five were included in this literature review.

Results: Of the 7272 articles found collectively in the consulted databases, four were provisionally selected after application of the eligibility criteria and finally selected in this literature review, to pass the PEDro Scale. In this regard, the results show how physiotherapy can apply the benefits of nutritional supplement in the management of tendinopathy in athletes and non-athletes, to improve symptoms relating to pain and daily function, as well as muscular capacity.

Conclusion: Physiotherapy management combined with nutritional supplement could be an effective tool to improve pain and daily function, as well as muscular capacity, in athletes and non-athletes. However, more studies with larger sample sizes, and higher experimentation times, with the same nutritional supplement are still required.

Keywords: Tendinopathy, Nutritional Supplement, Pain, Function, Muscular function, Muscular strength.

RESUMEN

Introducción: Las lesiones por sobreuso del tendón representan una proporción predominante de la carga de trabajo del clínico deportivo. Se caracterizan por dolor (durante o después del entrenamiento), una disminución de su función y una menor tolerancia al ejercicio. El diagnóstico de la tendinopatía se basa principalmente en una historia clínica meticulosa y un examen clínico detallado para identificar si el tendón es la fuente del dolor. El ejercicio terapéutico es el principal tratamiento investigado y recomendado en las tendinopatías. El rendimiento suele estar relacionado con la optimización de la nutrición, de este modo, los suplementos nutricionales parecen favorecer los procesos de curación de las lesiones tendinosas y es probable que tengan un papel como estrategias preventivas.

Objetivo: Evaluar el posible efecto beneficioso sobre la tendinopatía del uso de suplementos nutricionales combinados con tratamiento fisioterapéutico en deportistas y no deportistas, tanto a corto como a medio y largo plazo.

Material y métodos: Se realizó una revisión bibliográfica desde diciembre 2022 hasta febrero 2023 analizando ensayos clínicos aleatorizados obtenidos de las bases de datos Pubmed, PEDro, frontiers y EBSCO. Se seleccionaron los estudios publicados entre 2018 y 2022 que, además, cumplían otros criterios de elegibilidad previamente establecidos. Finalmente, solo se incluyeron definitivamente en esta revisión bibliográfica aquellos estudios cuya puntuación en la Escala de Valoración de la Calidad Metodológica PEDro fue igual o superior a cinco.

Resultados: De los 7272 artículos encontrados colectivamente en las bases de datos consultadas, cuatros fueron provisionalmente seleccionados tras la aplicación de los criterios de elegibilidad y finalmente seleccionados en esta revisión bibliográfica por superar la Escala PEDro. En este sentido, los resultados muestran cómo la fisioterapia puede aprovechar los beneficios de la suplementación nutricional en el tratamiento de la tendinopatía en deportistas y no deportistas, para mejorar los síntomas relativos al dolor y la función diaria, así como la capacidad muscular.

Conclusiones: El tratamiento fisioterapéutico combinado con suplementos nutricionales podría ser una herramienta eficaz para mejorar el dolor y la función diaria, así como la capacidad muscular, en atletas y no atletas. Sin embargo, aún son necesarios más estudios con muestras de mayor tamaño, así como mayores tiempos de experimentación y con el mismo suplemento nutricional.

Palabras clave: Tendinopatía, Suplemento nutricional, Dolor, Función, Función muscular, Fuerza muscular.

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BACKGROUND

Tendon overuse injuries represent a predominant proportion of the sport clinician's workload. They are characterized by pain (during or after training), a decline in its function and a reduced tolerance to exercise. The underlying pathology was often referred to as "Tendinitis" in the 1980's due to its association with a cellular inflammatory process (Hess et al., 1989). Nowadays, according to Scott et al. (2020), clinicians and patients should use the term "tendinopathy" instead of the previous terminology "Tendinitis" because barely any inflammatory cells and markers have been demonstrated. The self-cell-driven collagen degradation process remains the best-supported pathoetiology.

Regarding epidemiology, tendinopathies have been increasing worldwide during the past twenty-three years, affecting athletic and non-athletic populations. The incidence of tendinopathy varies according to sex, age, type of sport, daily activities, and specific disease condition (Hopkins et al., 2016).

In the general population, it is considered that 1 to 2% of adults aged between 18 to 65 years old will suffer from tendinopathy during their lifetime (Riel et al., 2019; Van der Windt et al., 1995). On the other hand, in athletes, the prevalence to develop an Achilles tendinopathy is at 23.9% compared to 5.9% in the general population (Kujala et al., 2005).

The prevalence of tendinopathies also increases in relation to their location, they are frequently observed in the lower limb with an incidence of 10.52 per 1000 person-years (Albers et al., 2016). The most common tendinopathies of the lower limb occur at the heel (Achilles tendon and fasciopathy), ankle (tibialis posterior tendon), knee (patellar tendon) and the greater trochanter (gluteal insertional complex) (Riel et al., 2019). Regarding the upper limb, the supra-spinatus and the common flexors and extensors muscles are the most affected by tendinopathies (Van der Windt et al., 1995).

The rise of tendinopathies being diagnosed might be due to a greater physical activity, age, obesity and diabetes and potentially side effects of some medication (Maffulli et al., 2003). According to Oreff et al. (2023), tendon injuries pose a significant socioeconomic burden with the annual health expenditure exceeding €145 billion.

The diagnosis of tendinopathy is primarily based on a meticulous medical history and detailed clinical examination to identify whether the tendon is the source of pain. Pathological tissue abnormalities typical in tendinopathy, such as swelling, thickening and increase in vascularity can be observed on magnetic resonance imaging (MRI) and ultrasound. However, tendon pathology seen on imaging may not have correlation with the patient's symptoms (Docking et al., 2015).

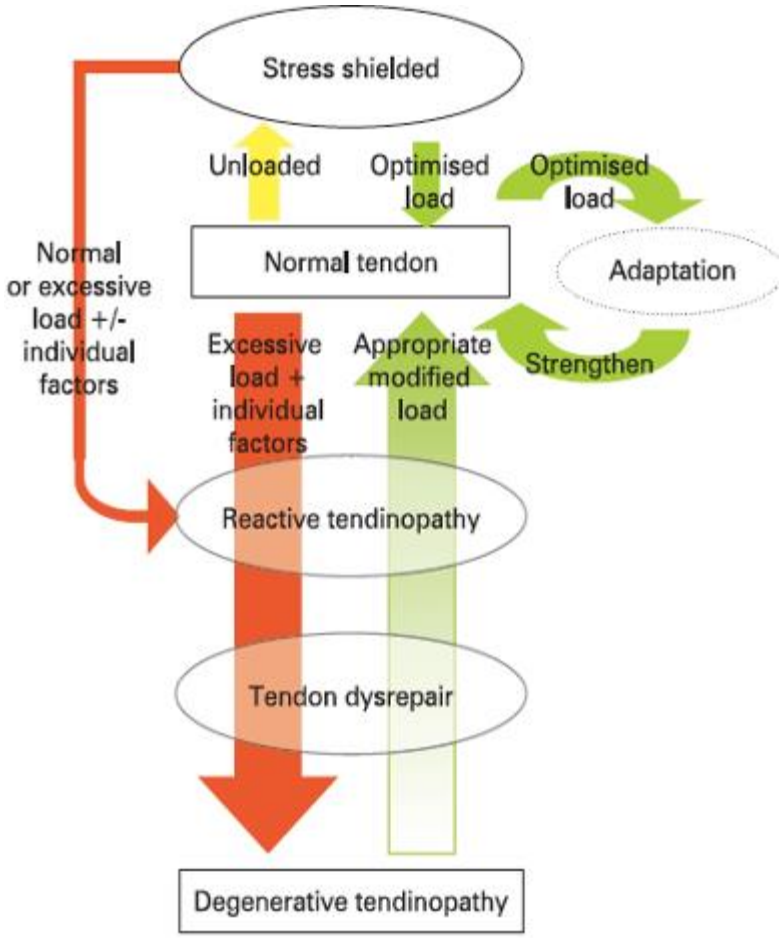
Various changes may occur in tendinopathy. They typically induce a reduced number of fibroblasts, disorganized collagen fibrils, an increase of proteoglycans, glycosaminoglycans and water and hypervascularization with nerve ingrowth (Millar et al., 2017).

A healthy tendon has its nerve fibers, blood vessels and inflammatory cells confined to the tendon surrounding structures. However, during the process leading to a tendinopathy, in response to a repetitive mechanical stimulus, peripheral nerve endings and tenocytes release neurotrophic and

neuro inflammatory mediators causing nerve sprouting with nerve fiber ingrowth into the proper tendon leading to pain (Millar et al., 2017).

According to Cook & Purdam (2009), we should consider tendon pathology following the "continuum" perspective, a three-part classification (**Figure 1**). The reactive tendinopathy is the first stage, where tenocytes activate and proliferate, producing proteoglycans which results in a short-term tendon-thickening. Then, the second stage characterizes tendon disrepair with a greater matrix breakdown. The collagen separates and the matrix becomes disorganized which may allow nerve and vessel ingrowth. The third and final stage is the degenerative tendinopathy, presenting a heterogeneous structure with areas of apoptosis. In extensive cases, the tendon may rupture and undergo surgical procedures (Cook & Purdam, 2009).

Figure 1: The Cook-Purdam model to help clinicians understand the relationship between loading/unloading and the several stages of tendon pathology.

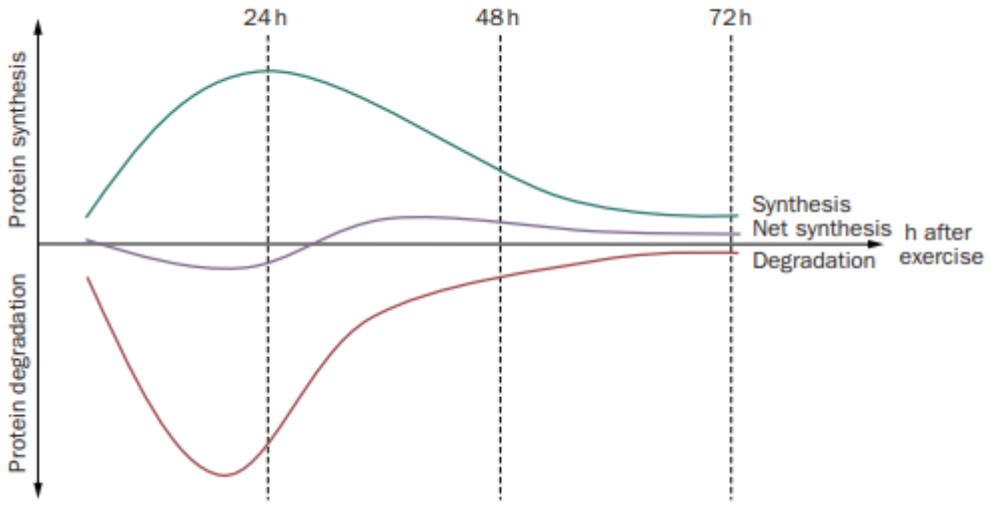


Reference: Cook & Purdam (2009)

There is no consensus of a guideline preventing tendinopathies due to the multifactorial aspects of this pathology. However, some evidence-based recommendations can equally limit the settle of a tendinopathy:

- Proper technique: Correct execution of an exercise or activity may prevent tendinopathies. Improper technique can provoke undue mechanical stress on tendons and increase the risk of suffering from tendinopathy. Special care should be taken to learn and correct the technique of an exercise (Cook & Purdam, 2009).
- Progressive overload: The principal preventing factor is to gradually increase the load, intensity, frequency, and duration of an exercise. It allows the body to adapt to the load (**Figure 2**) (Verhagen et al., 2018).

Figure 2: Tendon load adaptation



"Schematic representation of collagen synthesis and degradation. Acute exercise in humans is followed by an increase in both the synthesis and degradation of collagen. Over the first 24–36h, this response results in a net loss of collagen, but is followed by a net synthesis 36–72h after exercise. Repeated training with rest periods that are too short can result in a net degradation of the matrix and lead to overuse injury"
Reference: Magnusson et al., (2010).

- Recovery: Tendons need time to repair after exercise as tenocytes undergo mechanical transmission, they form longitudinal arrays of collagen fibrils under tensile load which acts as an input for collagen production. The mechanical stimulus induces protein synthesis and degradation of collagen. This is the reason why insufficient rest (24 hours) after exercise complied with a net loss of collagen, which can leave the tendon vulnerable to injury (Miller et al., 2005).
- Strength training: Strength training might prevent tendinopathies by stimulating growth factors (insulin-like growth factor 1 and TGF-β mRnA) of collagen synthesis. The growth factors rise independently of muscular contraction type (Olesen et al., 2006).

Regarding treatments for tendinopathies, they can be grouped in physical therapies (**Table 1**), pharmacological therapies, and surgical procedures.

Table 1: Treatment according to the phases of the tendinopathy

PHASE Treatment	REACTIVE	DYSREPAIR	DEGENERATIVE
Therapeutic exercise	**Isometric exercise** Relieve pain normalizing cortical inhibition. Two to three times per day doing four repetitions and holding the position for 45 seconds.	**Isotonic exercise** Once the pain is settled or stable at low level. Performing slightly longer eccentric phase than the concentric phase to enhance brain plasticity.	**Plyometric exercise** Once the muscle surrounding the tendon is stronger, energy storage exercise must be implemented. Gradually increasing the release, or eccentric phase. Those high loads should be completed two to three times a week.
Peace And Love Protocol	**X**		
ESWT		**X**	**X**
Electrolysis			**X**

Reference: Table own elaboration with information from Cook & Purdam (2009).

Those treatments could be enhanced by the use of nutritional supplementation. Indeed, nutrition can alter tendon homeostasis in a variety of ways, both positively and adversely. Nutritional supplements products that appear to favor the healing processes of tendon injuries are likely to have a role as preventative strategies, such products have proliferated in recent years (Sirico et al., 2018). The following supplements have been studied combined with physiotherapeutic treatment in recent Randomised Control Trials (RCT).

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a. **Creatine (Cr)** is a nutritional supplement widely used for its predominant effect of rephosphorylation of adenosine diphosphate during high-intensity exercise sessions. Mechanistically, Cr increases cellular hydration which stimulates protein synthesis, growth factors and protein kinases (Chilibeck et al., 2017). It has also demonstrated anti-inflammatory and anti-catabolic effects in muscle as well as increases calcium-reuptake of the sarcoplasmic reticulum and glycogen resynthesis. In the long term, those benefits may favor strength and lean mass (Cordingley et al., 2022).

b. **Omega 3** nutritional supplement is used for its major polyunsaturated fatty acids (**PUFAs**), the eicosapentaenoic acid (EPA) and the docosahexaenoic acid (DHA). There is notable evidence that these fatty acids inhibit to some extent various aspects of the inflammatory process. EPA and DHA act on the cell surface and intracellular receptors that rule the inflammatory cell signaling and gene expression patterns. They are also related to changes in cell membrane's composition. As a result, their anti-inflammatory actions may have therapeutic efficacy in inflammatory diseases at a dose of at least two grams per day (Calder et al., 2011). However, the use of Omega 3

PUFAs has still conflicting results regarding their actions on tendons (Mavrogenis et al., 2004; Røe et al., 2005).

c. **Collagen** supplementation including Specific Collagen Peptides (**sCPs**) is often made of animal gelatin, however its benefits still need to be supported. Some randomized control trials such as Shaw et al. (2017) and Clark et al. (2008) had encouraging results about the collagen supplementation's results on tendon and joint pain as well as modulating collagen synthesis. This supplement is often mixed with other compounds such as Vitamin C or Magnesium which impairs its proper analysis and effects on tendon.

d. **β-hydroxy-βmethylbutyrate (HMB)** is a metabolite of the essential amino acid leucine. This aminoacid acts as a signaling molecule to induce protein synthesis and promotes anabolic responses of the muscles (Holeček, 2017). Therefore, HMB supplementation may help reduce muscle membrane damage, creatine kinase and lactate dehydrogenase (Van Someren et al., 2005). The suggested daily intake of HMB is around three grams per day (Tsuchiya et al., 2021).

Several approaches are used in physical therapy to treat tendinopathies. Extracorporeal shock wave therapy (ESWT) is widely used for the treatment of soft tissue disorders, it seems to promote the proliferation of tenocytes, collagen, and the differentiation of tendon derived stem cells (Leonec et al., 2016). Intratissue percutaneous electrolysis is a technique that is often used on chronic tendinopathies. It transfers a cathodic current directly to an area of degeneration in the tendon through an ultrasound-guided needle. The main goal of this technique is to generate an organic reaction to induce a regenerative phenomenon (Sànchez-Ibàñez et al., 2015).

No specific tendon-drugs have been developed, for this reason, pharmacological treatment of tendinopathies is difficult and controversial. Corticosteroids is still a widely used treatment even if nowadays it is known to be harmful causing alteration of the fibrillary organization, reduction of cellular vitality and weakening the tendon's mechanical properties (Knobloch et al., 2016).

Undeniably, therapeutic exercise is the main treatment investigated and recommended in tendinopathies. The exercise should be adapted according to the phase of the tendinopathy (**Table 1**). Although the exact mechanism is still in debate, the eccentric exercise inducing a lengthening of the muscle during contraction induces cross-linking collagen fibers and facilitates tendon remodeling by promoting an upregulation of insulin-like growth factor (Sànchez-Ibàñez et al., 2015).

HYPOTHESIS

The hypothesis of this final degree project is to evaluate if the use of nutritional supplements during the physiotherapeutic treatment of tendinopathy in athletes and non-athletes, in the short, medium, and long term, would provide benefits and therefore could contribute to improve symptoms: reducing pain perception, improving daily function, while increasing muscle capacity.

OBJECTIVES

Main objective

The overall goal of this literature review is to evaluate the possible beneficial effect on tendinopathy using nutritional supplements combined with physiotherapy treatment in athletes and non-athletes, both in short, medium, and long term.

To this end, the two following specific objectives have been set:

Specific objectives

1. To evaluate the effect on patients diagnosed with tendinopathy, of physiotherapeutic treatment combined with nutritional supplements on **perceived pain** and **daily function**:
    - Activities of Daily Living (ADLs).
    - Return to sport (RTS).

2. To assess the effect on patients diagnosed with tendinopathy, of physiotherapeutic treatment combined with nutritional supplements on **muscular capacity**:
    - Muscle strength.

MATERIAL AND METHODS

STUDY DESIGN AND POPULATION

A review of the scientific literature was carried out between December 2022 to February 2023, in order to identify if nutritional supplements combined with physiotherapeutic treatment add value in the management of tendinopathy, compared with physiotherapeutic treatment only, both in short, medium and long term. For this purpose, a search was carried out in different sources of information following the rules of the PRISMA declaration (**Figure 3 - Annex 1**).

To conduct an effective literature search, a structured clinical question was formulated using the PICO (Patient, Intervention, Comparison, Outcome) methodology, consultable in (**Figure 4** - **Annex 1**). Therefore, the research question posed was: Will nutritional supplements provide benefits in addition to the physiotherapeutic management in comparison with the physiotherapeutic treatment only, on perceived pain, daily function, and muscular capacity, in patients diagnosed with tendinopathy, in both, short, medium, and long term.

INCLUSION AND EXCLUSION CRITERIA

To shorten and reduce the content of the search, articles had to meet the following inclusion and exclusion criteria (**Table 2**):

***Table 2** : Inclusion and exclusion criteria used.*

INCLUSION CRITERIA	EXCLUSION CRITERIA
• RCT. • Clinical Trials. • Diagnosis of tendinopathy or tendon pain. • Publication date between 2018 and 2022. • Minimum methodological quality score on the PEDro Scale of 5 out of 10. • Writen in English.	Articles that: • were realized in vitro. • were realized on animals. • were duplicated during the searches carried out. • included patients with other pathologies. • the results obtained are not specified. • do not include, at least, pain, muscular function, strength.

Reference: own elaboration.

SEARCH STRATEGY

For the development of this literature review, the extraction of information was achieved by reviewing the existing scientific literature in the following databases: Pubmed, PEDro, Frontiers and EBSCO (from the Universidad Europea de Valencia, UEV, library). The search strategy for data collection was carried out using the following keywords ("tendinopathy", “dietary supplement”, "nutritional supplement", "pain", "strength", “function”, “range of motion”) and Boolean operators "AND" and “OR” were used. In this way, a total of 164 articles were found in Pubmed, 2 in PEDro, 7 155 in Frontiers and

145 in EBSCO. This information can be consulted in the table "Systematic review unfiltered apply" (**Table 3 - Annex 1**).

When applying all the inclusion and exclusion criteria to the search, except for the evaluation of methodological quality which was done a posteriori, and after a critical reading of the different abstract's articles, one of them was discarded for not meeting with the eligibility criteria. The number of articles obtained were the following: 3 articles in PubMed, 0 in PEDro, 0 in Frontiers (not desired applicable filters) and 1 in EBSCO. This information can be found in the table "Systematic review of articles with application of filters (**Table 4 - Annex 1**).

EVALUATION OF THE METHODOLOGICAL QUALITY OF THE ARTICLES

The four articles selected for the execution of this literature review were evaluated using the PEDro Scale (Physiotherapy Evidence Database). The PEDro Scale is a tool for rapid assessment of the methodological quality of trials and reviews.

The PEDro Scale consists of 11 items (**Figure 5** - **Annex 1**), each of which is scored with 1 point and can reach a score between 0 and 10, as the first item does not count. The tool assesses the criteria of choice, random assignment of subjects, allocation concealment, baseline comparability, blinding of subjects, blinding of therapists, blinding of assessors, appropriate follow-up, intention-to-treat analysis, between-group outcomes, point measures and variability.

In relation to the above, studies with a score of less than 5 out of 10 were considered to be of low methodological quality and were therefore removed from the literature review. In this respect, the four articles included exceeded the PEDro methodological quality assessment scale (**Table 5 - Annex 1)**. The entire search process can be seen in full in the diagram chart shown in (**Figure 6 - Annex 1)**.

OBTAINED ARTICLES AS SAMPLE

Finally, after search process applied, the four chosen articles were (**Table 6)**:

Table 6 Sample of obtained articles.

RCT Title	Authors
"Creatine Supplementation Supports the Rehabilitation of Adolescent Fin Swimmers in Tendon Overuse Injury Cases".	Juhasz et al. (2018).
"Oral Supplementation of Specific Collagen Peptides Combined with Calf-Strengthening Exercises Enhances Function and Reduces Pain in Achilles Tendinopathy Patients".	Praet et al. (2019).
"Effects of β-Hydroxy β-Methylbutyric Supplementation in Combination with Conservative Non-Invasive Treatments in Athletes with Patellar Tendinopathy: A Pilot Study".	Sánchez-Gómez et al. (2021).
"A randomized controlled trial of long-chain omega-3 polyunsaturated fatty acids in the management of rotator cuff related shoulder pain".	Sandford et al. (2018).

Reference: own elaboration.

RESULTS AND DISCUSSION

In order to facilitate the understanding of the results from the articles included in this systematic review, they are presented below grouped into tables according to the RCT and its significant variables.

1. DESIGN AND GENERAL CHARACTERISTICS OF THE SELECTED STUDIES

The following tables (page 21 to 25) present the main characteristics of the four RCT used in this systematic review. A detailed handmade summary is presented on **Table 7**:

Table 7: Summary of design and general characteristics of the selected studies.

TABLE	AUTHORS	CLINICAL SCALES	STUDY TIME
Table 9	Juhasz et al. (2018).	• Numeric Rating Scale (NRS). • Segmental Lean Mass (SLM). • Plantar Flexion Torque (PFT).	Six weeks
Table 10	Praet et al. (2019).	• Victorian Institute of Sports Assessment-Achilles (VISA-A) questionnaire. • Patient Satisfaction and Return-to-Running (RTR) questionnaire	Six-month
Table 11	Sánchez-Gómez et al. (2021).	• Victorian Institute of Sport Assessment-Patella (VISA-P) questionnaire. • Anthropometrics measures. • Jump ability, muscle power and muscle strength.	Four weeks
Table 12	Sandford et al. (2018).	• NRS and Short Form (SF) 36 bodily pain (BP) domain. • Short Form (SF) 36 and the 3-level version of EuroQol Group Five Dimensions (EQ-5D-3L). • Patient Specific Functional Score. • Global participant perception. • Shoulder Range of Motion (ROM) and strength.	Eight weeks

Reference: own elaboration

2. INTERVENTION AND RESULTS

Then, from page 26 to 33 are presented tables of the interventions and significant results obtained by the four RCT. A detailed handmade summary is presented below (**Table 8)**:

Table 8: Summary of intervention and results of the selected studies.

TABLE	AUTHORS	NUTRITIONAL SUPPLEMENT	STUDY TIME
Table 13	Juhasz et al. (2018).	(Cr)	Six weeks
Table 14	Praet et al. (2019).	Collagen (sCPs)	Six-month
Table 15	Sánchez-Gómez et al. (2021).	HMB	Four weeks
Table 16	Sandford et al. (2018).	Omega-3 PUFAs	Eight weeks

Reference: own elaboration
Cr: creatine**; sCPs:** Specific collagen peptides; **HMB**: β-Hydroxy β-methylbutyric; **PUFAs**: polyunsaturated fatty acids.

Table 9: Design and general characteristics of Juhasz et al. (2018) clinical trial.

Title: **Creatine Supplementation Supports the Rehabilitation of Adolescent Fin Swimmers in Tendon Overuse Injury Cases.**

STUDY DESIGN	SAMPLE	STUDY'S GROUP DATA	STUDY'S OBJETIVES	DURATION OF THE STUDY	CLINICAL SCALES		REFERENCE
Double-blind research design	**N=** 18 **IG** (Cr) **n=** 9 (male = 5, female = 4; years=15.5± 1.4). **PG** (dextrose) **n = 9** (male = 5, female = 4; years = 14.8 ± 1.6).	**Adolescent fin swimmers** Diagnosis**:** **FHL's tendinopathy** due to overuse. Symptoms duration (weeks): 4-6 (subacute).	Investigate the effects of **Cr supplementation** on FHL's tendinopathy recovery (**prevention of muscle mass** and **strength loss** during immobilization and pain reduction) and to identify a possible **increase effect on the therapy** on adolescent athletes, thanks to Cr administration.	**Six weeks:** Three phases of 2 weeks each one 1. Acute 2. Recovery 3. Maintenance Assessment: 2 weeks 4 weeks 6 weeks	**Muscle mass**	**Segmental Lean Mass (SLM)** Measured the **injured leg's lean mass** (Bioelectrical Impedance Analysis).	Juhasz et al. (2018)
					Range of Motion (ROM)	**Plantar Flexion Torque (PFT)** custom-made dynamometer (**Annex 2)**.	
					Pain Assessment	**Numeric Rating Scale (NRS)** Measured on a scale ranging from 0-10: 0= No Pain 1-3 = Mild Pain (nagging, annoying, interfering little with ADLs) 4–6 = Moderate Pain (interferes significantly with ADLs) 7-10 = Severe Pain (disabling; unable to perform ADLs) (**Annex 2**).	

Reference: own elaboration
Abbreviations: N: Total size of the sample; **n**: Group size; **IG**: Intervention group; **PG:** Placebo group; **Cr:** Creatine; **FHL:** Long big toe flexor**; ADLs**: Activities of Daily Living.
Clinical scales: PFT: measures the ankle plantar flexion isometric peak torque; **NRS:** The patients were asked three questions: What number would you give your pain right now? What number on a scale from 0 to 10 would you give your pain when it is the worst that it gets and when it is the best that it gets? At what number is the pain at an acceptable level for you?

Table 10: Design and general characteristics of Praet et al. (2019) clinical trial.

Title: **Oral Supplementation of Specific Collagen Peptides Combined with Calf-Strengthening Exercises Enhances Function and Reduces Pain in Achilles Tendinopathy Patients**

STUDY DESIGN	SAMPLE	STUDY'S GROUP DATA	STUDY'S OBJETIVES	DURATION OF THE STUDY	CLINICAL SCALES		REFERENCE
Prospective double-blinded placebo-controlled clinical trial with a **cross-over design**	**N=** 20 **IG** (first) – **PG** (second) (Group AB) **n= 10** (Male = 5, female = 5; years= 45.3 ± 6.4). **PG** (first) **– IG** (second) (Group BA) **n= 10** (Male = 8, female = 2: years= 42.0 ± 9.4).	Participants **want to be able to run again** Diagnosis: **chronic mid-portion Achilles tendinopathy** uni- (n = 7) or bilateral (n = 13). Symptoms duration (months): 54 ± 90	Investigate whether **oral supplementation of sCPs** improves symptoms (pain and function) and tendon vascularity in patients diagnosed with chronic mid-portion Achilles tendinopathy in combination with **physiotherapeutic-structured exercise.**	**6 months** Assessment: Baseline 3 months **(Cross over operation)** 6 months	**Pain and Function**	**Victorian Institute of Sports Assessment–Achilles (VISA-A) Questionnaire** A self-administered questionnaire to evaluate the clinical severity (pain and functional limitations) for patients with chronic Achilles tendinopathy (**Annex 2**).	Praet et al. (2019)
					Satisfaction	**Patient Satisfaction** Questionnaire on subjective patient satisfaction (**Annex 2**).	
					Return To Sport (RTS)	**Return-to-Running (RTR)** Questionnaire on what level they had been able to resume their running sports activities (**Annex 2**).	

Reference: own elaboration
Abbreviations: N: Total sample size; **n**: Group size; **IG**: Intervention group; **PG:** Placebo group; **sCPs:** specific collagen peptides
Clinical scales: VISA-A Questionnaire: consists of eight questions that measure the areas of pain, function in daily life and sports activity. The results range from 0 to 100, with 100 representing the perfect score; **Patient Satisfaction**: After 3 months, patients received the questionnaire to judge the effect of the treatment: *from excellent, good to moderate and poor.* The first two groups "excellent" and "good" were regarded as successful and the last on "moderate" and "poor" as not successful.; **RTS-RTR:** After 6 months, patients received the questionnaire to indicate their level of return to sports in the past 3 months: A) I am or have not been active in sports. B) I have not been able to return to sports. C) I have been able to return to sports but not in my desired sport. D) I have been able to return to my desired sport, but not yet at my old level. E) I have been able to return to my old level in the desired sport.

Table 11: Design and general characteristics of Sánchez-Gómez et al. (2021) clinical trial.

Title: **Effects of β-Hydroxy β-Methylbutyric Supplementation in Combination with Conservative Non-Invasive Treatments in Athletes with Patellar Tendinopathy: A Pilot Study.**

DESIGN	SAMPLE	STUDY'S GROUP DATA	STUDY'S OBJETIVES	DURATION OF THE STUDY	CLINICAL SCALES		REFE-RENCE
Experimental Double-Blind Randomized Trial Pilot Study	**N=8** Years= 18–49 **IG (**HMB) **n=** 4 (male = 2, female = 2) **PG** (sucrose) **n=** 4 (male = 2, female = 2)	**Federated athletes** (Basketball, volleyball, handball, and athletics) **Diagnosis**: **PT tendinopathy** Symptom duration (month): 4-19,5	Analyze the effect of physiotherapy based on **eccentric training**, **stretching** and **ESWT**, in addition to an **HMB** or placebo supplementation on athlete's: body composition, perceived pain, muscular function.	**4 weeks** Assessment: Baseline After 4 weeks	**Pain and Function**	**Victorian Institute of Sport Assessment-Patella** (**VISA-P questionnaire**) Measure the impact of PT symptoms in function and ability to play sport (**Annex 2**).	Sánchez-Gómez et al. (2021)
					Body composition	**Anthropometrics Measures** Bioelectrical Impedance	
					Muscular function	**Jump ability**: CMJs test. **Muscle power**: BS test. Variables analyzed: Load Lifted (PPKG) in kilograms - Mean Velocity (m/s) (PPMV) - Peak Power (W) (PPpp). **Strength**: 5-RM (leg extension exercise).	

Reference: own elaboration
Abbreviations: N: Total sample size; **n**: Group size; **IG**: Intervention group; **PG:** Placebo group; **PT:** patellar tendinopathy; **ESWT**: extracorporeal shockwave therapy; **HMB**: β-Hydroxy β-methylbutyric; **CMJ**: countermovement jump; **BS**: back-squat; **PPKG**: peak power kg lifted; **PPMV**: peak power mean velocity; **PPpp**: peak power (W); **5-RM**: five-repetition maximum.
Clinical scales: VISA-P questionnaire: Self-assessment tool for clinical outcomes used in patients with PT. Measures the areas of pain, function in daily life and sports activities. The asymptomatic score is 100; the minimum score is 0; **Anthropometrics measures**: body mass, body mass index (BMI), body fat mass (kg), % body fat, body muscle mass (kg) and % muscle mass (bioelectrical impedance analysis); **Muscular function:** prior warm-up. **Jump ability:** measured by CMJs test (maximum height): 3 CMJs, 45 seconds rest between jumps; **Muscle power**: BS test: 2 repetitions, 2 seconds of rest between repetitions, lifting 20 kg at maximum velocity (optimal muscle activation). When the bar mean velocity was above 0.80 m/s, the participants increased the load by 5 kg. The test finished after reaching the PPpp (W); **Muscle strength**: prior specific warm-up consisted of 10 repetitions at 50% of load corresponding to the estimated 10-RM (based on the individual assessment). After 3 minutes of recovery, the participants initiated the test. There was a break of 2 minutes when the participants selected a load which could lift more or less than 5-RM.

Table 12: Design and general characteristics of Sandford et al. (2018) clinical trial.

Title: **A randomized controlled trial of long- chain omega-3 polyunsaturated fatty acids in the management of rotator cuff related shoulder pain**

DESIGN	SAMPLE	STUDY'S GROUP DATA	STUDY'S OBJETIVES	DURATION OF THE STUDY	CLINICAL SCALES		REFE-RENCE
Multicenter, double-blind, placebo-controlled randomized clinical trial.	**N=73** **IG** (omega-3 PUFAs) **n=** 38 (male 17, female 21; year = 52.2 ± 12.0). **PG** (inert oil) **n=** 35 (male 15, female 20; year = 52.0 ± 16.2).	Type of population not specified Diagnosis: **RCRSP**. Symptom duration (month): 4-19,5. **Study information**: No mention "tendinopathy", but RCRSP defined as: "pain and dysfunction arising from one or more of the rotator cuff Tendons […]".	Assess if 2-month **supplementation** with **omega-3 PUFAs** combined with **therapeutic exercise** confers a benefit (reduce pain, disability and improve function) compared to placebo and the same exercises in RCRSP.	**8 weeks (**Weekly attendance) **Assessment** Baseline 2 months 3 months 6 months 12 months	**Disability**	**Oxford Shoulder Score (OSS**) Questionnaire of shoulder pain and function, 12-item patient-reported (**Annex 2**). **Shoulder Pain and Disability Index (SPADI)** Measure current disability and pain (**Annex 2**).	Sandford et al. (2018)
					Pain perception	**Numerical Rating Scale (NRS)** (Mentioned in **Table 9)** **Short Form (SF) 36 bodily pain (BP) domain** 36 items with eight health concepts.	
					Quality of life	**SF 36** **Euro Qol 5D-3 L: Visual Analogue Scale for quality of life (VAS)**.	
					Global perception	**Global perception of change** score (0–100; 100=best)	

Table 12 continues on the following page.

DESIGN	SAMPLE	STUDY'S GROUP DATA	STUDY'S OBJETIVES	DURATION OF THE STUDY	CLINICAL SCALES		REFE-RENCE
					Impairment measures	**Shoulder range of motion and strength** (In degrees, centimeters, and pounds).	Sandford et al. (2018)
					Function	**Patient Specific Functional Score (PSFS)** Quantify activity limitation and measure functional outcome (**Annex 2**).	

Reference: own elaboration.
Abbreviations: N: Total size of the sample; **n**: Group size; **IG**: Intervention group; **PG:** Placebo group; **PUFAs:** polyunsaturated fatty acids**; RCRSP:** rotator cuff related shoulder pain; **NRS**: Numerical Rating Scale; **VAS:** visual analogue scale; **OSS**: Oxford Shoulder Score; **SPADI;** Shoulder Pain and Disability Index; **SF 36 BP:** Short Form (SF) 36 bodily pain (BP) domain; **PSFS:** Patient Specific Functional Score;
Clinical scales: OSS: It contains 12 items, regarding shoulder pain and function, each with 5 answers. starting with 1 (best/fewest symptoms) to 5 (worst/most severe) which is awarded to correspond to the patient's symptoms. The total gives a minimum score of 12 and a maximum of 60. A higher score implies a greater degree of disability**; SPADI**: It contains 13 items that assess two domains; a 5-item subscale that measures pain and an 8-item subscale that measures disability. There are two versions of the SPADI; the original version has each item scored on a VAS and a second version has items scored on an NRS. In this ultimate version, the patient is asked to circle the number that best describes the pain or disability on a 0 to 10 scale. Each subscale is summed and transformed to a score out of 100. The total score is taken of the two subscales to give a total score out of 100, higher score indicating greater impairment or disability (Breckenridge & McAuley., 2011); **NRS**: consists of a digital version of the visual analogue scale. The most common form of the scale is a horizontal line with an eleven-point numerical scale. It ranges from zero to ten, with zero being an example of a person in no pain and ten being the worst possible pain. This type of scale can be administered verbally. It can also be administered on paper to be completed physically; **SF 36 BP:** 36 items with eight health concepts: bodily pain, physical functioning, role limitations due to physical health problems, role limitations due to personal or emotional problems, emotional state (well-being), social current state (functioning), energy/fatigue, and general health perceptions. Another indicator included is the perception or change in the general patient's heath; **Euro Qol 5D-3 L**: introduced in 1990 by the **EuroQol Group,** the 3-level version of EQ-5D (EQ-5D-3L) is a descriptive system of the following five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension has 3 levels: no problems, some problems, and extreme problems. Patient's result results into a 1-digit number that expresses the level selected for each dimension. The digits for the five dimensions can be combined into a 5-digit number that describes the patient's health state (EuroQol Research Foundation., 2023); **PSFS**: a self-reported questionnaire for patients with back, neck, knee, and upper extremity pain. 1. Patients are asked to identify up to five important activities they are unable to perform or are having difficulty because of their problem. 2. Patients are asked to rate on the NRS the current level of difficulty associated with each activity. 3. Following the intervention, patients are asked again to rate the activities previously identified (and are given the chance to nominate new problematic activities that might have arisen during that time). 4. To indicate the result, "0" represents "unable to perform" and "10" represents "able to perform at prior level". 5. Patients select a value that best describes their current level of ability on each activity assessed (Stratford., Gill., Westaway., & Binkley., 1995).

Table 13: Intervention and results Juhasz et al. (2018) clinical trial.

Title: **Creatine Supplementation Supports the Rehabilitation of Adolescent Fin Swimmers in Tendon Overuse Injury Cases.**

<table>
<tr><th colspan="2">INTERVENTION</th><th colspan="2">OUTCOME MEASURE CLINICAL SCALES</th><th>REFER-ENCE</th></tr>
<tr><td colspan="2" rowspan="11">COMMON EXERCISE INTERVENTION
3 PHASES
1) ACUTE PHASE (1-2 weeks): relative immobilization (with elastic bandage) and R.I.C.E. (Rest, Ice, Compression, Elevation) protocol. Crutches were used for walking. The second week, progressive isometric workout was prescribed and adapted to pain intensity (early mobilization).
2) RECOVERY PHASE (3-4 weeks): appropriate loading of the tendon, focusing on muscle strength and flexibility. Protected range of motion is gradually increased to full passive and active range of motion. In addition, physical therapy, mobilization of the muscles of the lower limbs, isometric, isotonic, and isokinetic exercises were performed.
3) MAINTENANCE PHASE (5-6 weeks): Sport-specific training and stretching, to restore maximum performance and minimizing the risk of reinjury, restoring full strength and flexibility.</td><td>Group</td><td>IG</td><td>PG</td><td rowspan="11">Juhasz et al. (2018)</td></tr>
<tr><td>Outcomes</td><td colspan="2">SLM (Segmental Lean Mass), %; kg</td></tr>
<tr><td>Phase</td><td colspan="2">Relative immobilization</td></tr>
<tr><td>Baseline
VS
2 weeks</td><td>SLM decreased
(-5.6 ± 0.5%)
(-0.43 ± 0.05 kg)</td><td>SLM decreased
(-8.9 ± 0.9%)
(-0.65 ± 0.09 kg)</td></tr>
<tr><td rowspan="2">p-value</td><td><0.01</td><td><0.01</td></tr>
<tr><td colspan="2">< 0.01</td></tr>
<tr><td>Phase</td><td colspan="2">Rehabilitation</td></tr>
<tr><td>2 weeks
VS
6 weeks</td><td>SLM increased
(5.5 ± 0.6%)
(+0.4 ± 0.04 kg)</td><td>SLM increased
(3.8 ± 0.8%)
(+0.25 ± 0.06 kg)</td></tr>
<tr><td rowspan="2">p-value</td><td><0.01</td><td><0.01</td></tr>
<tr><td colspan="2"><0.01</td></tr>
<tr><td>Baseline
VS
6 weeks</td><td>SLM close to baseline state
(-0.3 ± 1.1 %)
(-0.02 ± 0.01kg)</td><td>SLM decreased
(-5.5 ± 3.4 %)
(-0.4 ± 0.04kg)</td></tr>
<tr><td>p-value</td><td colspan="2"><0.01</td></tr>
</table>

Table 13 continues on the following page.

<table>
<tr><th colspan="2">INTERVENTION</th><th colspan="3">OUTCOME MEASURE CLINICAL SCALES</th><th>REFER-ENCE</th></tr>
<tr><td colspan="2" rowspan="2">NUTRITIONAL INTERVENTION</td><td>Outcomes</td><td colspan="2">PFT (Plantar Flexion Peak Torque), %</td><td rowspan="12">Juhasz et al. (2018)</td></tr>
<tr><td>Phase</td><td colspan="2">Rehabilitation weeks</td></tr>
<tr><td>IG</td><td>PG</td><td>Baseline</td><td colspan="2">PFT were not measurable prior to immobilization.</td></tr>
<tr><td colspan="2" rowspan="2">LOADING PHASE (INITIAL FIVE DAYS)</td><td>2 weeks</td><td>103.2 ± 10.8 (N∗m)</td><td>95.9 ± 5.5 (N∗m)</td></tr>
<tr><td>p-value</td><td colspan="2">p < 0.05</td></tr>
<tr><td colspan="2" rowspan="5">Intake of 20g divided into 4 x 5g portions of 100% micronized Cr monohydrate. A single dose of 12g includes 5g Cr monohydrate, 7g dextrose, and 0.075g ascorbic acid.</td><td rowspan="5">4 x 5g portions of placebo, a mixture composed of dextrose, ascorbic acid and flour tasting and equivalent in appearance to the CR group’s mixture.</td><td>2 weeks
VS
4 weeks</td><td>PFT increased
(10.4±2.9%)</td><td>PFT increased
(7.1 ± 2.3%)</td></tr>
<tr><td rowspan="2">p-value</td><td>< 0.01</td><td>< 0.01</td></tr>
<tr><td colspan="2">p < 0.01</td></tr>
<tr><td>4 weeks
VS
6 weeks</td><td>PFT increased
(16.8 ± 1.7%)</td><td>PFT increased
(14.7 ± 2.3%)</td></tr>
<tr><td>p-value</td><td>< 0.01</td><td>< 0.01</td></tr>
<tr><td>2 weeks
VS
6 weeks</td><td>CR
28.8 ± 3.1%</td><td>VS</td><td>PL
22.8 ± 2.8%</td></tr>
<tr><td>p-value</td><td colspan="3">< 0.01</td></tr>
</table>

Table 13 continues on the following page.

INTERVENTION	OUTCOME MEASURE CLINICAL SCALES				REFER-ENCE
MAINTENANCE PHASE The remaining 37 days both groups took the Cr or placebo (1 x 5g) before breakfast.	Outcomes	**NRS Numeric Rating Scale (0 best -100 worst), %**			Juhasz et al. (2018)
	Phase	Relative immobilization			
	Baseline *VS* 2 weeks	NRS decreased (-64.4 ± 9.6%).		NRS decreased (-57.7 ± 9.4%)	
	p-value	**< 0.01**		**< 0.01**	
	Phase	Rehabilitation			
	Baseline *VS* 4 weeks	NRS decreased (-93.1 ± 8.2%)		NRS decreased (-72.4 ± 8%)	
	p-value	**< 0.01**		**< 0.01**	
	Baseline *VS* 6 weeks	NRS decreased (-98.4 ± 4.8%)		NRS decreased (-88.8 ± 9.6%)	
	p-value	**< 0.01**		**< 0.01**	
	2 weeks *VS* 6 weeks	**CR 94.4 ± 16.7%**	***VS***	**PL 75 ± 20.4%**	
	p-value	**< 0.02**			

Reference: Own elaboration.
Abbreviations: IG: Intervention group; **PG:** Placebo group; **FHL:** Long big toe flexor**; ADLs**: Activities of Daily Living.
Note: Data expressed as mean ± standard deviation**; p-value**: significant difference if p < 0.05; **Blue colour**: IG; **Salmon colour**: PG

Table 14: Intervention and results of Praet et al. (2019) clinical trial.

Title: **Oral Supplementation of Specific Collagen Peptides Combined with Calf-Strengthening Exercises Enhances Function and Reduces Pain in Achilles Tendinopathy Patients**

<table>
<tr><th colspan="3">INTERVENTION</th><th colspan="3">OUTCOME MEASURES CLINICAL SCALE</th><th>REFE-RENCE</th></tr>
<tr><td colspan="3">COMMON
EXERCISE INTERVENTION</td><td>Outcome</td><td colspan="2">VISA-A Scores
(0 worst - 100 perfect score)</td><td rowspan="11">Praet et al. (2019)</td></tr>
<tr><td colspan="3" rowspan="4">Eccentric calf-strengthening program in addition to a specific RTR program.
1. Calf raise on the unaffected limb (or both limbs if bilateral symptoms).
2. Eccentric drop on the injured leg: both, knee straight and knee bent to target the gastrocnemius and soleus muscles (2 × 90 repetitions/day, despite pain).
Instruction: Avoid weight-bearing sports for the first four weeks. Participants must re-port less than 2/10 pain on single leg hop to start low intensity running exercises.</td><td>Phase</td><td colspan="2">Before crossing over</td></tr>
<tr><td>Group</td><td>AB (IG first)</td><td>BA (PG first)</td></tr>
<tr><td>Baseline</td><td>60.8%
(95%CI: (52.0–69.6)</td><td>62.8%
(95%CI: 54.0–71.6)</td></tr>
<tr><td>Baseline VS
3 months</td><td>Score increase
(20,7%)</td><td>Score increase
(8,4%)</td></tr>
<tr><td colspan="3">NUTRITIONAL INTERVENTION</td><td>Phase</td><td colspan="2">After crossing over</td></tr>
<tr><td>Group AB (IG first)</td><td>Group BA (PG first)</td><td>Group</td><td>AB (PG second)</td><td>BA (IG second)</td></tr>
<tr><td rowspan="2">Received sCPs
for the first 3 months before crossing over to placebo product.</td><td rowspan="2">Received placebo product first (3 months) before crossing over to sCPs·</td><td>3 months VS
6 months</td><td>Score increase
(7,4%)</td><td>Score increase
(20,6%)</td></tr>
<tr><td>Baseline VS
6 months</td><td>Total score in-crease
(18,5%)</td><td>Total score in-crease
(23%)</td></tr>
<tr><td colspan="3">Half an hour before training, participants ingested 2.5 g of hydrolysed sCPs (TENDOFORTE®, GELITA AG) or placebo product.</td><td>p-value</td><td colspan="2">$p < 0.0001$</td></tr>
</table>

Reference: Own elaboration.
Abbreviations: sCPs: Specific Collagen Peptides**; IG**: Intervention group; **PG:** Placebo group; **RTR**: Return-to-Running**.**
Note: p-value: significant if < 0,05; **CI**: confidence interval; **Blue colour**: IG; **Salmon colour**: PG

Table 15: Intervention and results of Sánchez-Gómez et al. (2021) clinical trial.

Title: **Effects of β-Hydroxy β-Methylbutyric Supplementation in Combination with Conservative Non-Invasive Treatments in Athletes with Patellar Tendinopathy: A Pilot Study**

<table>
<tr><th>INTERVENTION</th><th colspan="4">OUTCOME MEASURES CLINICAL SCALE</th><th>REFE-RENCE</th></tr>
<tr><td rowspan="11">COMMON
PHYSIOTHERAPIST INTERVENTION

Eccentric training program and ESWT (with home exercises).

Exercises: knee exercises performed daily on the painful leg; single-legged eccentric decline squat exercise (3 sets of 10 repetitions). Complemented with a weight vest of 5 kg (if VAS score for pain assessment is 3 points or less).

The eccentric training program was performed twice a day with 2 minutes of recovery between sets.

Before and after exercises, statics stretching was performed.

In addition to the strength training and stretching program, were included: three sessions (with a 1-week interval) of ESWT and manual therapy (deep manual massage of the tendon) and quadriceps unloading (of both legs).</td><td>Group</td><td colspan="2">IG</td><td colspan="2">PG</td><td rowspan="11">Sánchez-Gómez et al. (2021)</td></tr>
<tr><td>Outcome</td><td colspan="4">MUSCULAR FUNCTION: JUMP ABILITY</td></tr>
<tr><td>TEST</td><td colspan="4">CMJs test (cm and %)</td></tr>
<tr><td>Baseline</td><td colspan="2">Height reached
38.1 ± 10.4 cm</td><td colspan="2">Height reached
37.0 ± 6.0 cm</td></tr>
<tr><td>Phase</td><td colspan="4">After intervention and supplementation</td></tr>
<tr><td rowspan="2">Baseline
VS
4 weeks</td><td colspan="4">Height reached difference
13.4%</td></tr>
<tr><td colspan="2">IG
(41.1 ± 11.7cm)</td><td>VS</td><td>PG
(35.6 ± 4.7 cm)</td></tr>
<tr><td>p-value</td><td colspan="4">p < 0.049</td></tr>
<tr><td>Outcome</td><td colspan="4">MUSCULAR FUNCTION: POWER</td></tr>
<tr><td>Test</td><td colspan="4">PPpp (Peak power), (%)</td></tr>
<tr><td>Baseline
VS
4 weeks</td><td colspan="2">Score increased
(26.3 ± 31.6%)</td><td colspan="2">Score increased
(7.4 ± 14.6%)</td></tr>
<tr><td>p-value</td><td colspan="2">0.002</td><td colspan="2"></td></tr>
</table>

Table 15 continues on the following page.

<table>
<tr><th colspan="2">INTERVENTION</th><th colspan="3">OUTCOME MEASURES CLINICAL SCALE</th><th>REFE-RENCE</th></tr>
<tr><td colspan="2">NUTRITIONAL INTERVENTION</td><td>Test</td><td colspan="2">PPKG (peak power kg lifted), (%)</td><td rowspan="11">Sánchez-Gómez et al. (2021)</td></tr>
<tr><td>IG</td><td>PG</td><td></td><td></td><td></td></tr>
<tr><td>Dose: 3 g·day^{-1} HMB

Ingestion: three capsules <u>60 minutes before</u> ex-ercise</td><td>Dose: 3 g·day^{-1} sucrose

Ingestion: three capsules <u>60 minutes before exercise</u></td><td>Baseline
VS
4 weeks</td><td>Score increased
(20.4 ± 23.5 %)</td><td>Score decreased
(0.92 ± 34.8%)</td></tr>
<tr><td colspan="2" rowspan="5">Prohibited: To consume any foods rich in caffeine 24 hours prior, to avoid any possible ergogenic effect of caffeine during the assessment sessions. (e.g., coffee, tea, tea soft drinks, cola drinks, mate, energy drinks, chocolate drinks and chocolate)</td><td>p-value</td><td>0.028</td><td></td></tr>
<tr><td>Outcome</td><td colspan="2">MUSCULAR FUNCTION : STRENGTH</td></tr>
<tr><td>Test</td><td colspan="2">5-RM test (kg)</td></tr>
<tr><td>Baseline
VS
4 weeks</td><td>Score increased
(23.8 ± 24.4%)</td><td>Score increased
(14 ± 10.5%)</td></tr>
<tr><td>p-value</td><td>0.001</td><td></td></tr>
</table>

Reference: Own elaboration.
Abbreviations: IG: Intervention group; **PG:** Placebo group; **ESWT**: extracorporeal shockwave therapy; **HMB**: β-Hydroxy β-methylbutyric; **CMJ**: countermovement jump; **5-RM test:** five-repetition maximum.
Note: Data presented as mean ± standard deviation (SD); **p-value:** significant if < 0,05; **Blue colour**: IG; **Salmon colour**: PG

Table 16: Intervention and results of Sandford et al. (2018) clinical trial.

Title: **A randomized controlled trial of long- chain omega-3 polyunsaturated fatty acids in the management of rotator cuff related shoulder pain**

INTERVENTION	**OUTCOME MEASURES CLINICAL SCALE**			**REFERENCES**
COMMON PHYSIOTERAPIST INTERVENTION	Outcome	**NRS (0 best -100 worst), %**		Sandford et al. (2018)
Main goal: improve strength and sensorimotor control of the shoulder with exercises. Lower limb exercises are also included. Manual therapy is added in the treatment of the shoulder for approximately 1 min.	Group	IG	PG	
	Baseline VS 2 months	Decrease in pain (-36.7 ± 21.0%) (95% CI 0.04 to 2.3)	Decrease in pain (-36.5 ± 26,4%) (95% CI 1.2 to 3.1)	
	p-value	p < 0,01	p < 0,01	
	Outcome	**SF 36 BP (0 worst – 100 best)**		
	Baseline VS 2 months	Decrease in pain (24.36 ± 14,7 to 37.4 %)	Decrease in pain (35.1 ± 31.9 to 38.9 %)	
	p-value	p < 0,01	p < 0,01	
	Outcome	**Disability- SPADI (0–100; 0=best)**		
	Baseline VS 3 months	**Decrease in disability** (-64 ± 18.9 **%**) (95% CI –15.6 to –0.9)	Non significative decreased (-41,2 ± 0%)	
	p-value	p <0,05	p >0,05	

Table 16 continues on the following page.

<table>
<tr><th colspan="2">INTERVENTION</th><th colspan="2">OUTCOME MEASURES CLINICAL SCALE</th><th>REFER-ENCES</th></tr>
<tr><td colspan="2" rowspan="2">NUTRITIONAL INTERVENTION</td><td>Outcome</td><td colspan="2">Impairment measures: ROM and Strength</td><td rowspan="19">Sandford et al. (2018)</td></tr>
<tr><td>Measure</td><td colspan="2">Symptomatic GHJ flexion (degrees)</td></tr>
<tr><td>IG</td><td>PG</td><td>Baseline VS 3 months</td><td>Increased flexion (12.4 ± 10.8 to 14.0°)</td><td>Non significative increase (5.5 ± 3.2 to 7.8°)</td></tr>
<tr><td rowspan="9">MaxEPA (Seven Seas Ltd, Hull, UK, MHRA product licence 19488/0353) soft shell capsules containing 170 mg eicosapentaenoic acid (EPA), 115 mg docosahex- ae-noic acid (DHA) and 2 units/g tocopherols ace-tate (vitamin E) were pro-vided.</td><td rowspan="9">Placebo supplement was identical in appearance with PUFA Omega 3 but contained a mixed inert oil (olive oil BP (the only olive variety originating and produced in Croati) containing the same amount of vitamin E and antioxidants as the active treatment). Finally, oleic acid replaced EPA and DHA.</td><td>p-value</td><td>p <0,05</td><td>p >0,05</td></tr>
<tr><td rowspan="2">Baseline VS 12 months</td><td colspan="2">IG VS PG</td></tr>
<tr><td colspan="2">Mean difference 7.7° (95% CI 2.4 to 12.9) in favour of IG</td></tr>
<tr><td>p-value</td><td colspan="2"><0.01</td></tr>
<tr><td>Measure</td><td colspan="2">Symptomatic GHJ abduction (degrees)</td></tr>
<tr><td>Baseline VS 3 months</td><td>Increased abduction (16.9 ± 12.4 to 21.4°)</td><td>Non significative increase (5.8 ± 3.3 to 8.3°)</td></tr>
<tr><td>p-value</td><td>p <0,05</td><td>p >0,05</td></tr>
<tr><td rowspan="2">Baseline VS 12 months</td><td colspan="2">IG VS PG</td></tr>
<tr><td colspan="2">Mean difference 10.4° (95% CI 3.1 to 17.7) in favour of IG</td></tr>
<tr><td>p-value</td><td colspan="2">p<0.01</td></tr>
<tr><td>Measure</td><td colspan="2">Symptomatic GHJ external rotation strength, (%)</td></tr>
<tr><td>Baseline VS 12 months</td><td>Increased outcome (47.2 ± 44.5 to 50.9 %)</td><td>Increased outcome (15,6 ± 12.6 to 19.5 %).</td></tr>
<tr><td>p-value</td><td colspan="2">p < 0.01</td></tr>
</table>

Reference: Own elaboration.
Abbreviation: GHJ: Glenohumeral Joint; **EPA**: eicosapentaenoic acid; **DHA**: docosahex- aenoic acid; **PUFAs:** polyunsaturated fatty acid
Note: Data presented as mean ± standard deviation (SD); **p-value:** significant if < 0,05; **Blue colour**: IG; **Salmon colour**: PG

The following discussion starts with the different therapeutic management used in the four RCT (Juhasz et al., 2018; Praet., et al., 2019; Sánchez-Gómez et al., 2021 and Sandford et al., 2018). Then it was organized according to the significant variables observed and the specific objectives set proposed, in patients diagnosed with tendinopathy both in the short, medium, and long term.

RESOURCES OF THE PHYSIOTHERAPEUTIC MANAGEMENT

It is important to mention the diversity of physiotherapeutic treatments used in the four RCT studied for the rehabilitation of patients diagnosed with tendinopathy.

Their efficiency is visible in the precedent results tables (**Table 13** for Juhasz et al., 2018; **Table 14** for Praet et al., 2019; **Table 15** for Sánchez-Gómez et al., 2021; **Table 16** for Sandford et al., 2018), in the PG's column.

First of all, it is important to mention that the participants of the different RTC were not affected by the same stage of tendinopathy. Indeed, were observed in participants different stages of the physiopathology such as tendinopathies in subacute phase from 1 to 1,5 months (**Table 9**) (Juhasz et al., 2018), and chronic tendinopathies from 4 to 19,5 months (**Table 11** and **Table 12**) (Sánchez-Gómez et al., 2021; Sandford et al., 2018) until 54 to 90 months (**Table 10**) (Praet et al., 2019).

Moreover, localization of tendinopathy and type of population studied were different. Including athletes, such as adolescent swimmer fin athletes with long big toe flexor (FHL) tendinopathy (**Table 9**) (Juhasz et al., 2018), as well as federated athletes diagnosed with chronic patellar tendinopathy (PT) (**Table 11**) (Sánchez-Gómez et al., 2021). Furthermore, participants which goal was to be able to run again diagnosed with chronic mid-portion Achilles tendinopathy were studied (**Table 10**) (Praet et al., 2019). Finally, the RCT of Sandford et al. (2018) do not specify the type of population studied, but all of them course rotator cuff related shoulder pain (RCRSP) defined in the RCT as "pain and dysfunction arising from one or more of the rotator cuff tendons and maybe associated with long- term morbidity and functional loss" by Lewis et al. (2015) (**Table 12**).

These different characteristics may explain the variability in the physiotherapeutic management between the four RCT. Regarding Juhasz et al. (2018) clinical trial, because the athletes suffered a subacute FHL tendinopathy, for the first two weeks of intervention, called the acute phase, they were under a relative immobilization period at home with the application of an elastic bandage and R.I.C.E. protocol (Rest, Ice, Compression, Elevation), including the use of crutches for walking and received an early mobilization with a progressive isometric workout adapted to pain intensity (**Table 13**).

On the other hand, participants in the three others RCT did not receive a relative immobilization period as they all present a chronic tendinopathy, but directly realized a well-structured active strengthening program as realized in the recovery and maintenance phase of Juhasz et al., (2018) RCT (consult both **Table 13** and **Annex 3** for more details on the physiotherapeutic management), including exercises for sensorimotor shoulder control (**Table 16**) (Sandford et al., 2018) and eccentric exercises (**Table 14** and **Table 15**) (Praet et al., 2019 and Sánchez-Gómez et al., 2021 respectively). Also, more details on the physiotherapeutic management of Praet et al. (2019) RCT are present in **Annex 3**.

More precisely Praet et al. (2019) and Juhasz et al. (2018) both used a sport specific program for their amateur runners and swimmer fin athletes respectively to restore maximum performance and

minimizing the risk of re-injury, including sport specific stretching program (**Annex 3)** (Juhasz et al., 2018). In the same way Sánchez-Gómez et al. (2021) used stretching protocol for the participants diagnosed with PT, as well as ESWT (**Table 15**).

Finally, this ultimate RCT mentioned right above, as well as Sandford et al. (2018) (**Table 16**), both use manual therapy (deep manual massage of the tendon and muscle unloading) as part of the physiotherapeutic treatment.

PAIN, FUNCTION AND MUSCULAR CAPACITY EVOLUTION

Although the clinical scales used were not the same in all four studies, the results of this literature review indicate that: Firstly, regarding perceived pain and function, participants diagnosed with tendinopathy, seem to report a decrease in pain perception and an enhancement in function (with Cr and sCPs supplementation) (Juhasz et al., 2018 and Praet et al., 2019, respectively). Secondly, regarding muscular capacity, participant's muscle properties are increased by HMB (Sánchez-Gómez et al., 2021), Cr (Juhasz et al., 2018) and Omega 3 PUFAs (Sandford et al., 2018) supplementation.

PAIN INTENSITY REDUCTION AND FUNCTION IMPROUVEMENT

Firstly, considering that our first specific objective aimed **to evaluate the effect, on a patient diagnosed with tendinopathy, of physiotherapeutic treatment combined with nutritional supplements on perceived pain and daily function (ADLs, Sport activity),** depending on the assigned nutritional supplement and clinical scale used, participants reported a decrease in perceived pain and disability while an improvement in ADLs over the short, medium and/or long term.

Using VISA scales, precisely in case of patellar tendinopathy (VISA-P) and Achilles tendinopathy (VISA-A), the decrease of pain perception and functional limitation did not present the same results depending on the nutritional supplement used. In the case of Sánchez-Gómez et al. (2021), four weeks of HMB supplementation coupled with physiotherapeutic treatment do not report any effect on IG pain, function and sport activity measured by the VISA-P questionnaire ($p > 0.05$). In contrast, in the cross over study of Praet et al. (2019), sCPs supplementation in addition to physiotherapy rehabilitation has been beneficial in both groups along the experimental six months (**Table 14**). A significatively pain and function improvement in ADLs and sport activity, has been perceived in both groups during the three months supplementation period respectively, and the same significant outcomes are observed at the end of the trial ($p < 0.0001$) for VISA-A score.

Finally, Sandford et al. (2018), also use one questionnaire, the OSS, to evaluate shoulder pain and function. However, after eight weeks of physiotherapeutic treatment combined with Omega 3 PUFAs supplementation, no significant results were observed. Authors mentioned that this scale should not be sensitive enough to detect any change attributed to the nutritional supplement.

The use of the NRS to evaluate pain progression in participants diagnosed with FHL tendinopathy and RCRSP, do not demonstrate the same significant reduction in pain intensity, with Cr supplementation *VS* Omega 3 PUFAs supplementation. In addition, the nutritional supplement was not attributed to the same study population. In Juhasz et al. (2018) study, while a significant reduction is observed over

the six weeks of rehabilitation within both group (p<0,02), adolescent fin swimmers IG, supplemented with Cr, reported a faster pain reduction after two weeks of relative immobilization (p<0,01) (**Table 13**). On the other hand, in the case of Sandford et al. (2018), a significant difference is only observed in pain reduction after 2 months of Omega 3 PUFAs supplementation or placebo within both groups (p<0,01) (**Table 16**). In addition, there is no significant outcome between IG *VS* PG, both after 2 months supplementation *VS* twelve months. This same study was the only one to use a second bodily pain and physical functioning scale, the SF 36 BP, showing a significant difference after 2 months of intervention also within both groups (p<0.01), meaning that outcome comparing IG *VS* PG was not significant. In other words, Omega 3 PUFAs supplementation do not present a significant effect on RCRSP reduction (**Table 16**).

Regarding pain and disability, Sandford et al. (2018) is the only RCT to evaluate patient's disability using the SPADI scale, and a significant finding reduction is observed in RCRSP. Indeed, the effects of Omega 3 PUFAs are always observed in the short term after interruption of the supplementation. In this sense, they found a significant reduction in disability and pain form Baseline *VS* 2 months of Omega 3 PUFAs supplementation (p=0.00 within both groups) but no significant findings appeared when comparing both groups. Regarding baseline *VS* 3-month, IG *VS* PG demonstrated a faster improvement in disability and pain (-64% *VS* -42% respectively) (**Table 16**). In other word, during the two first months IG and PG was supplemented with Omega 3 PUFAs or placebo respectively, and no significant findings were observed between both groups, but at the third month assessment, a significant result is observed despite one month of interruption of supplementation only for IG (-64%; p<0,03). However, the long-term results, from Baseline *VS* 12 months, show better outcomes for PG *VS* IG pain reduction (-77% VS -71% respectively) (p=0.00 *VS* p=0.03). Therefore, as both groups received the same physiotherapeutic intervention, this difference might be explained by the tendinopathy's natural course of healing process, specific to everyone.

Finally, the RCT above is the single one too to measure ROM in RCRSP, in abduction and flexion movement. Baseline *VS* 12 months showed significant outcome and greatest ROM for IG. Mean findings differ in favour of IG shown 7.7° in flexion and 10.4° in abduction (p<0.01), which could be attributed to omega-3 PUFAs benefits (**Table 16**). However, authors mentioned that these differences could not be clinically important.

MUSCULAR CAPACITY IMPROVEMENT

Secondly, considering that our second specific objective aimed **to assess the effect, on a patient diagnosed with tendinopathy, of physiotherapeutic treatment combined with nutritional supplements on muscular capacity (muscle strength),** according to the prescribed nutritional supplement and clinical scale used, participants showed an improvement in muscular function, over the short, medium and/or long term.

Regarding Sánchez-Gómez et al. (2021), HMB supplementation coupled with physiotherapeutic treatment showed an enhancement in muscular performance (**Table 15**). Progression in jump ability over the four weeks of intervention were the main significant outcome observed, shown by height reached in the countermovement jump (CMJ) test from Baseline *VS* 4 weeks between both groups (IG

VS PG) (p = 0.049), in favor of IG. This result could be explained by an increase in muscle power outcomes only reported in IG, from baseline *VS* 4 weeks. Indeed, findings shown a significant score in peak power (PP) (p = 0.002), in addition to an enhancement in the load (kg) lifted (PPkg) (p = 0.028), only in IG. With respect to muscular strength, the load weighted in the 5-repetition maximum (5-RM) test, from baseline *VS* 4 weeks, was only significant and higher too in IG (p = 0.001) (**Table 15**). Finally, as mentioned previously, the only significant outcome between IG *VS* PG is showed by the jump ability (CMJs test), from baseline *VS* 4 weeks (p = 0.049), illustrated by 41.1 ± 11.7cm *VS* 35.6 ± 4.7 cm respectively. It appears important to mention that these findings in muscular function changes were not accompanied by any modification in the study of anthropometric variables, (p > 0.05) (**Table 11**).

On the other hand, Juhasz et al. (2018) evaluated FHL tendinopathy recovery as well, in adolescents fin swimmers, by measuring the muscle mass and strength loss over a six-week rehabilitation period supplemented with Cr or placebo (**Table 13**). Even though the reduction in SLM was linear within both groups, the decrease was significantly higher in PG *VS* IG (-8.9% *VS* -5.6% respectively; p<0.01), showing that, Cr supplementation helps to maintain muscle mass and prevent strength loss during two-weeks of relative immobilization. Then, during the next four-week of active rehabilitation period, Cr enhanced muscle hypertrophy and strength; IG *VS* PG (5.5% *VS* 3.8%; p<0.01). Finally, from baseline *VS* 6 weeks, IG showed that combining specific therapy with Cr supplementation increased SLM significantly and approached to the base level (total loss of -0.3% for IG *VS* -5.5% for PG). In this way, as mentioned by Juhasz et al. (2018), Cr supplementation considerably shortens the entire rehabilitation time because the preservation of the skeletal muscle mass plays a main role in the rehabilitation of muscle and tendon damage. In this sense, Juhasz et al. (2018) also indicated that the gains observed in body mass are likely due to water retention during supplementation. Since Cr is an osmotically active substance it should result in increased water retention (Hultman et al., 1996; Volek et al., 1997) and consequent gains in total body water (not studied in this RTC) and thus SLM.

Despite this, the main study does not have data about the maximum strength of the FHL, which could have been measured before injury, to estimate the force reduction caused by the tendinopathy. However, Juhasz et al. (2018), also measured the gain in Plantar Flexion Torque (PFT). They observed a linear increase in torque within both groups during the relative immobilization period, which should be attributed to the decrease in pain intensity. During the four weeks of physiotherapeutic rehabilitation and Cr supplementation, from 2 weeks *VS* 6 weeks, the rate of force increases similarly within both groups (p<0.01), but IG *VS* PL shown an enhancement in force with greater rate in favor to IG, which may be attributed to benefits of Cr supplementation (p<0.01) (**Table 13**).

Last but not least, Sandford et al. (2018), in their RCT showed that 2 months of omega-3 PUFA supplementation improve significatively shoulder external rotation strength for IG *VS* PG (47.2% *VS* 15,6%, respectively) from Baseline *VS* 12 months, despite 10 months post-supplementation and physiotherapeutic treatment (p<0.01) (Table **16**).

LIMITATIONS

The following are the main limitations of this systematic review:

Lack of evidence

The lack of studies and specific research investigating tendinopathy and nutritional supplementation in the area of physiotherapy represents our principal limit. Indeed, to date it has been difficult to find different clinical trials conducting their experiment with the same type of nutritional supplement. Therefore, we decided to compare the results found according to the variables studied, not the nutritional supplement used.

Lack of homogeneity

It has also been difficult to find clinical trials in which the patients suffered from the same type of tendinopathy (location, nature (insertional or mid-portion), stage (subacute or chronic).

In this sense, the patients were mixed, and there were no clinical trials according to a specific age and sex category.

Added substance to nutritional supplement

Depending on the nutritional supplement, the formulation was not completely pure, or detailed (sCPs in TENDOFORTE) and other substances were added (in the case of Cr monohydrate), which may cause synergy or antagonism effects, which are not mentioned in the studies.

Different participant's criteria

Inclusion and exclusion criteria were not the same in all RCT: athletes or non-athletes participants, tolerated or un-tolerated use of acute analgesic medication during the study, smoker or non-smoker participant, and previous surgery intervention specified or unspecified as not tolerated.

Small numerical samples

Among the clinical trials used, the sample size of participants was small.

Time of study

Study experiment for many RCT was too short to observe significant findings at long term.

Database filters

It is also important to note that, depending on the databases used, we were limited by the ability to add data filters to target our searches.

Physiotherapeutic treatment and Clinical scales

Physiotherapeutic management was not detailed in all clinical trials. Clinical scales used were almost all different even if the main objectives were the same in the four RCT. It could be justified by the localization, nature and stage of tendinopathy.

FUTURE RESEARCH LINES AND RECOMMENDATIONS

In the following enumeration, future lines of research or recommendations arising from this literature review are listed:

1. To conduct more RCT in this field with larger sample size.
2. To carry on studies with a larger time of experimentation.
3. To manage different RCT with the same nutritional supplement, without added extra substance.
4. To conduct clinical trials on the same body part localization tendinopathy, and if possible, at the same stage of evolution, with different nutritional supplement, on the same period of time.
5. To conduct other RCT using the same clinical scales for the different variables studied.

CONCLUSIONS

Based on the results of this systematic review, the following conclusions are highlighted below:

1. The nutritional supplement which seems to promote the fastest decrease in perceived pain at short term, in addition to physiotherapy rehabilitation composed of two weeks of relative immobilization, regarding FHL tendinopathy appears to be Cr.
2. Two nutritional supplements seem to promote decrease in pain intensity and disability, while improving daily function, coupled with physiotherapeutic rehabilitation (strengthening-eccentric-specific sport training), at medium term:
    a. After three months of supplementation without interruption, presents to be sCPs (collagen) in Achilles tendinopathy.
    b. After one month of interruption following two months of supplementation and physiotherapeutic treatment, appears to be Omega 3 PUFAs in RCRSP.
3. The nutritional supplement which seems to promote muscular performance coupled with physiotherapeutic treatment (ESWT, strength-eccentric training and stretching) in the short term, at four weeks, increasing jump ability (height reached), appears to be the HMB in PT tendinopathy.
4. The nutritional supplement which seems to give better findings at short term regarding the entire rehabilitation time associated with physiotherapy (made of isometric, strengthening exercises and sport specific exercise) acts to be Cr in FHL tendinopathy. It minimizes muscular mass loss and maintain strength during two weeks of relative immobilization, promoting a faster rehabilitation as enhanced muscle hypertrophy and strength during four weeks of active rehabilitation, which plays a main role in tendon's rehabilitation.
5. The nutritional supplement which has the appearance to promote better findings on shoulder external rotation strength at long term (despite 10 months of interruption of both interventions), prescribed on two months associated with the same time of physiotherapy rehabilitation, presents to be Omega 3 PUFAs in RCRSP.

Main Conclusion

This systematic review seems to show that physiotherapy could benefit from added value in the treatment of tendinopathy with the use of nutritional supplements (Cr, sCPs, HMB and Omega 3 PUFAs) to contribute to the reduction of pain perception and increase function in ADLs, as well as to limit muscle performance loss and improve muscular capacity and recovery time. However, the set of limitations found in this research work, the scarcity of significant results on pain itself (not associated with function), as well as the lack of homogeneity in strength variables studied, underline the fact that further studies are needed to consider the use of nutritional supplement as an added value in the treatment of tendinopathies, in athletes and non-athletes.

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ANNEX 1

Following documents presented below (from page 46 to 55) show the methodology items used included in this literature review. A handmade summary is presented to continue:

Figure 3: PRISMA flow diagram for systematic reviews which included searches of databases, pattern 2020.

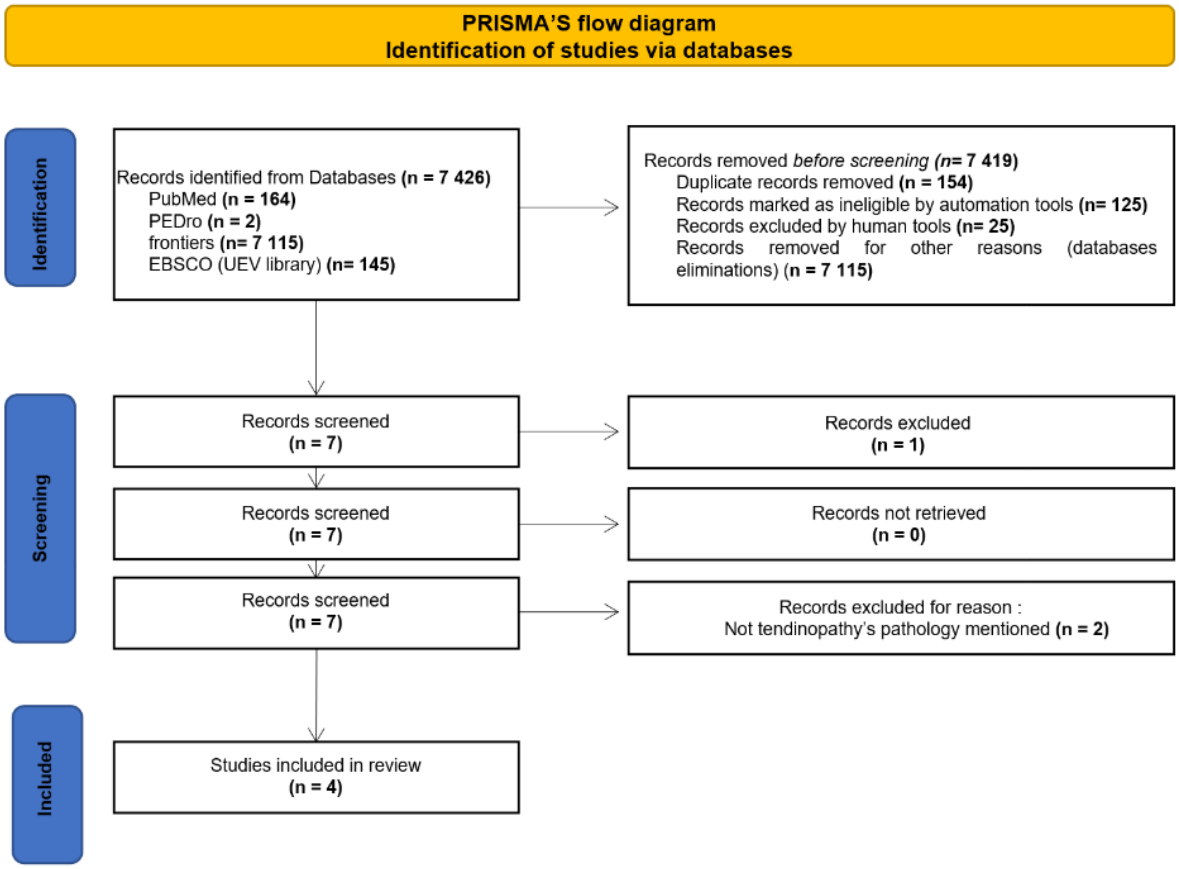
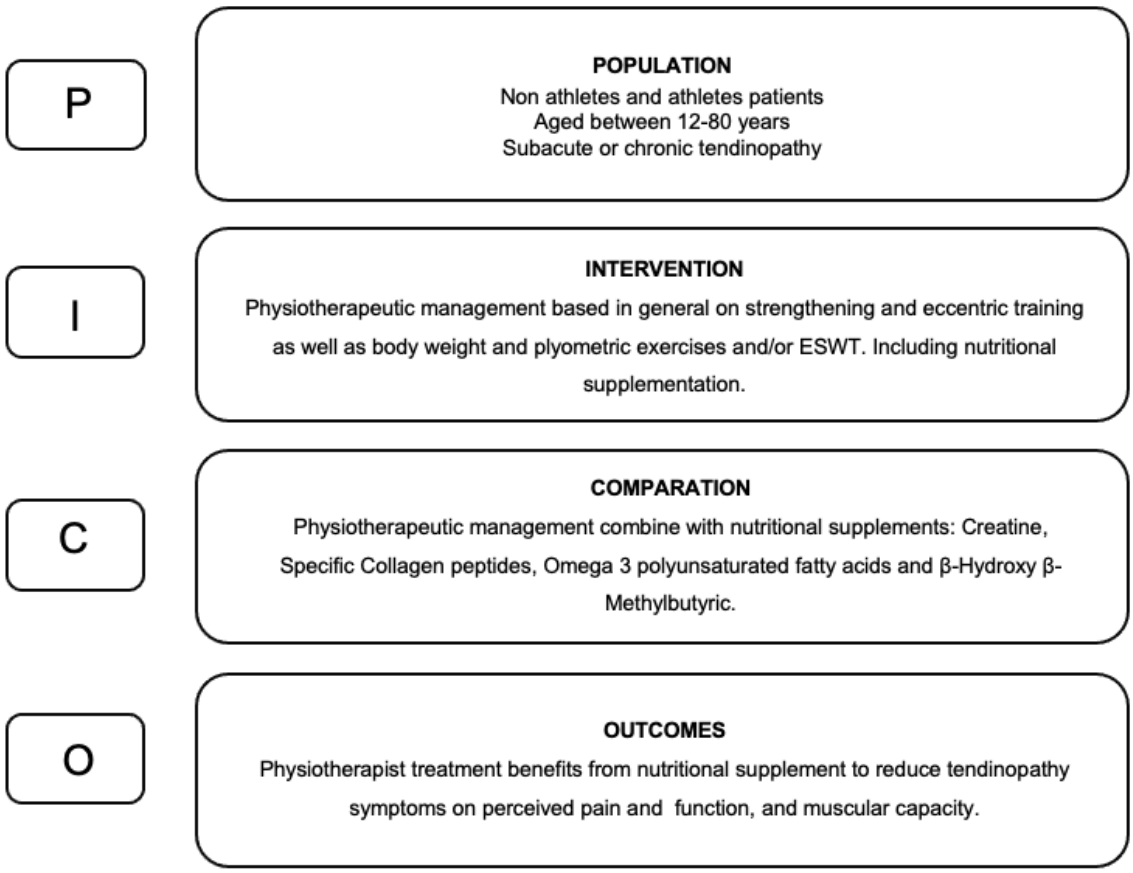


Diagram model reference: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71
Content: own information.

Figure 4: PICO Methodology applied.



Reference: Own elaboration

Table 3: Literature review of unfiltered articles.

DATA BASE	UNFILTERED DESCRIPTORS	RESULTS UNFILTERED ARTICLES	TOTAL
PUBMED *(26-12-2022 & 06-01-2023)*	*["Tendinopathy"] AND ["dietary supplement"]*	20	164
	["Tendinopathy"] AND ["intervention nutritional"]	40	
	["Tendinopathy AND ["nutritional supplement"]	18	
	["Supplementation"] and ["tendon properties"]	38	
	["Tendinopathy"] AND ["dietary supplement "] AND ["strength"]	2	
	Tendinopathy"] AND ["nutritional supplement"] AND ["strength"]	2	
	["Tendinopathy"] AND ["dietary supplement"] AND ["pain"]	8	
	["Tendinopathy"] AND ["nutritional supplement"] AND ["pain"]	6	
	["Tendinopathy"] AND ["dietary supplement"] AND ["function"]	16	
	["Tendinopathy"] AND ["nutritional supplement"] AND ["function"]	14	
	["Tendinopathy"] AND ["dietary supplement"] AND ["range of motion"]	0	
	["Tendinopathy"] AND ["nutritional supplement"] AND ["range of motion"]	0	

Table 3 continues on the following page

DATA BASE	UNFILTERED DESCRIPTORS	RESULTS UN-FILTERED ARTI-CLES	TOTAL
PEDro **(***02-02-2023)*	*[“Tendinopathy AND [“nutritional supplement”]*	1	2
	[“Tendinopathy”] AND [“dietary supplement ”]	1	
	[“Tendinopathy AND [“dietary supplement OR nutritional supplement”] AND [“pain” OR “function” OR “strength OR range of motion”]	0	
FRONTIERS **(***08-02-2023)*	*[“Supplementation”] and [“tendon properties”]*	7,115	7,115
EBSCO ***(From the UEV library)*** *(02-02-2023)*	*[“Tendinopathy”] AND [“dietary supplement ”]*	56	145
	[“Tendinopathy AND [“nutritional supplement”]	15	
	[“Tendinopathy”] AND [“dietary supplement”] AND [“pain”]	34	
	[“Tendinopathy”] AND [“nutritional supplement”] AND [“pain”]	21	
	[“Tendinopathy”] AND [“dietary supplement”] AND [“function”]	9	
	[“Tendinopathy”] AND [“nutritional supplement”] AND [“function”]	5	
	[“Tendinopathy”] AND ["dietary supplement"] AND [“strength”]	3	
	[“Tendinopathy”] AND ["nutritional supplement"] AND [“strength”]	1	
	[“Tendinopathy”] AND ["dietary supplement"] AND [“range of motion”]	1	
	[“Tendinopathy”] AND ["nutritional supplement"] AND [“range of motion”]	0	

Reference: Own elaboration

Table 4: Literature review of articles with application of filters.

DATA BASE	UNFILTERED DESCRIPTORS	COMMUN'S FILTERS APPLIED	FILTERS APPLIED	DATABASE'S DUPLICATES REMOVED	ALL DUPLICATES REMOVED	PROVISIONALLY SELECTED ARTICLES
PUBMED	*["Tendinopathy"] AND ["dietary supplement "]*	***TYPE OF STUDY*** RCT OR Clinical Trial ***MENTIONED KEY WORDS*** Tendinopathy AND Pain OR Function OR Strength OR Range of motion ***PUBLICATION DATE*** 2018- 2022 ***LANGUAGE*** English	2	2	**2**	**3**
	["Tendinopathy"] AND ["intervention nutritional"]		*3*	1	**1**	
	["Tendinopathy AND ["nutritional supplement"]		2	0	0	
	["Supplementation"] and ["tendon properties"]		0	0	0	
	["Tendinopathy"] AND ["dietary supplement"] AND ["strength"]		1	0	0	
	Tendinopathy"] AND ["nutritional supplement"] AND ["strength"]		1	0	0	
	["Tendinopathy"] AND ["dietary supplement"] AND ["pain"]		2	0	0	
	["Tendinopathy"] AND ["nutritional supplement"] AND ["pain"]		2	0	0	
	["Tendinopathy"] AND ["dietary supplement"] AND ["function"]		2	0	0	
	["Tendinopathy"] AND ["nutritional supplement"] AND ["function"]		2	0	0	
	["Tendinopathy"] AND ["dietary supplement"] AND ["range of motion"]		0	0	0	
	["Tendinopathy"] AND ["nutritional supplement"] AND ["range of motion"]		0	0	0	

Table 4 continues on the following page.

DATA BASE	UNFILTERED DESCRIPTORS	COMMUN'S FILTERS APPLIED	FILTERS APPLIED	DATABASE'S DUPLICATES REMOVED	ALL DUPLICATES REMOVED	PROVISIONALLY SELECTED ARTICLES
PEDro	*["Tendinopathy AND ["nutritional supplement"]*	***TYPE OF STUDY*** RCT OR Clinical Trial ***MENTIONED KEY WORDS*** Tendinopathy AND Pain OR Function OR Strength OR Range of motion ***PUBLICATION DATE*** 2018- 2022 ***LANGUAGE*** English	0	0	0	0
	["Tendinopathy"] AND ["dietary supplement "]		0	0	0	
FRONTIERS	*["Supplementation"] and ["tendon properties"]*		*Not desirable applicable filters*			0
EBSCO	*["Tendinopathy"] AND ["dietary supplement "]*		3	3	0	**1**
	["Tendinopathy AND ["nutritional supplement"]		2	1	0	
	["Tendinopathy"] AND ["dietary supplement"] AND ["function"]		2	0	0	
	["Tendinopathy"] AND ["nutritional supplement"] AND ["function"]		0	0	0	
	["Tendinopathy"] AND ["dietary supplement"] AND ["pain"]		3	0	0	
	["Tendinopathy"] AND ["nutritional supplement"] AND ["pain"]		2	1	**1**	
	["Tendinopathy"] AND ["dietary supplement"] AND ["strength"]		1	0	0	
	["Tendinopathy"] AND ["nutritional supplement"] AND ["strength"]		0	0	0	
	["Tendinopathy"] AND ["dietary supplement"] AND ["range of motion"]		0	0	0	
	["Tendinopathy"] AND ["nutritional supplement"] AND ["range of motion"]		*0*	*0*		

Reference: Own elaboration

Figure 5: PEDro Methodological Quality Assessment Scale**.**

PEDro scale

1. eligibility criteria were specified	no ❑ yes ❑ where:
2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received)	no ❑ yes ❑ where:
3. allocation was concealed	no ❑ yes ❑ where:
4. the groups were similar at baseline regarding the most important prognostic indicators	no ❑ yes ❑ where:
5. there was blinding of all subjects	no ❑ yes ❑ where:
6. there was blinding of all therapists who administered the therapy	no ❑ yes ❑ where:
7. there was blinding of all assessors who measured at least one key outcome	no ❑ yes ❑ where:
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	no ❑ yes ❑ where:
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by "intention to treat"	no ❑ yes ❑ where:
10. the results of between-group statistical comparisons are reported for at least one key outcome	no ❑ yes ❑ where:
11. the study provides both point measures and measures of variability for at least one key outcome	no ❑ yes ❑ where:

The PEDro scale is based on the Delphi list developed by Verhagen and colleagues at the Department of Epidemiology, University of Maastricht (*Verhagen AP et al (1998). The Delphi list: a criteria list for quality assessment of randomised clinical trials for conducting systematic reviews developed by Delphi consensus. Journal of Clinical Epidemiology, 51(12):1235-41*). The list is based on "expert consensus" not, for the most part, on empirical data. Two additional items not on the Delphi list (PEDro scale items 8 and 10) have been included in the PEDro scale. As more empirical data comes to hand it may become possible to "weight" scale items so that the PEDro score reflects the importance of individual scale items.

The purpose of the PEDro scale is to help the users of the PEDro database rapidly identify which of the known or suspected randomised clinical trials (ie RCTs or CCTs) archived on the PEDro database are likely to be internally valid (criteria 2-9), and could have sufficient statistical information to make their results interpretable (criteria 10-11). An additional criterion (criterion 1) that relates to the external validity (or "generalisability" or "applicability" of the trial) has been retained so that the Delphi list is complete, but this criterion will not be used to calculate the PEDro score reported on the PEDro web site.

The PEDro scale should not be used as a measure of the "validity" of a study's conclusions. In particular, we caution users of the PEDro scale that studies which show significant treatment effects and which score highly on the PEDro scale do not necessarily provide evidence that the treatment is clinically useful. Additional considerations include whether the treatment effect was big enough to be clinically worthwhile, whether the positive effects of the treatment outweigh its negative effects, and the cost-effectiveness of the treatment. The scale should not be used to compare the "quality" of trials performed in different areas of therapy, primarily because it is not possible to satisfy all scale items in some areas of physiotherapy practice.

Last amended June 21st, 1999

Figure 5 continues on the following page.

Notes on administration of the PEDro scale:

All criteria	**Points are only awarded when a criterion is clearly satisfied**. If on a literal reading of the trial report it is possible that a criterion was not satisfied, a point should not be awarded for that criterion.
Criterion 1	This criterion is satisfied if the report describes the source of subjects and a list of criteria used to determine who was eligible to participate in the study.
Criterion 2	A study is considered to have used random allocation if the report states that allocation was random. The precise method of randomisation need not be specified. Procedures such as coin-tossing and dice-rolling should be considered random. Quasi-randomisation allocation procedures such as allocation by hospital record number or birth date, or alternation, do not satisfy this criterion.
Criterion 3	*Concealed allocation* means that the person who determined if a subject was eligible for inclusion in the trial was unaware, when this decision was made, of which group the subject would be allocated to. A point is awarded for this criteria, even if it is not stated that allocation was concealed, when the report states that allocation was by sealed opaque envelopes or that allocation involved contacting the holder of the allocation schedule who was "off-site".
Criterion 4	At a minimum, in studies of therapeutic interventions, the report must describe at least one measure of the severity of the condition being treated and at least one (different) key outcome measure at baseline. The rater must be satisfied that the groups' outcomes would not be expected to differ, on the basis of baseline differences in prognostic variables alone, by a clinically significant amount. This criterion is satisfied even if only baseline data of study completers are presented.
Criteria 4, 7-11	*Key outcomes* are those outcomes which provide the primary measure of the effectiveness (or lack of effectiveness) of the therapy. In most studies, more than one variable is used as an outcome measure.
Criterion 5-7	*Blinding* means the person in question (subject, therapist or assessor) did not know which group the subject had been allocated to. In addition, subjects and therapists are only considered to be "blind" if it could be expected that they would have been unable to distinguish between the treatments applied to different groups. In trials in which key outcomes are self-reported (eg, visual analogue scale, pain diary), the assessor is considered to be blind if the subject was blind.
Criterion 8	This criterion is only satisfied if the report explicitly states *both* the number of subjects initially allocated to groups *and* the number of subjects from whom key outcome measures were obtained. In trials in which outcomes are measured at several points in time, a key outcome must have been measured in more than 85% of subjects at one of those points in time.
Criterion 9	An *intention to treat* analysis means that, where subjects did not receive treatment (or the control condition) as allocated, and where measures of outcomes were available, the analysis was performed as if subjects received the treatment (or control condition) they were allocated to. This criterion is satisfied, even if there is no mention of analysis by intention to treat, if the report explicitly states that all subjects received treatment or control conditions as allocated.
Criterion 10	A *between-group* statistical comparison involves statistical comparison of one group with another. Depending on the design of the study, this may involve comparison of two or more treatments, or comparison of treatment with a control condition. The analysis may be a simple comparison of outcomes measured after the treatment was administered, or a comparison of the change in one group with the change in another (when a factorial analysis of variance has been used to analyse the data, the latter is often reported as a group ´ time interaction). The comparison may be in the form hypothesis testing (which provides a "p" value, describing the probability that the groups differed only by chance) or in the form of an estimate (for example, the mean or median difference, or a difference in proportions, or number needed to treat, or a relative risk or hazard ratio) and its confidence interval.
Criterion 11	A *point measure* is a measure of the size of the treatment effect. The treatment effect may be described as a difference in group outcomes, or as the outcome in (each of) all groups. *Measures of variability* include standard deviations, standard errors, confidence intervals, interquartile ranges (or other quantile ranges), and ranges. Point measures and/or measures of variability may be provided graphically (for example, SDs may be given as error bars in a Figure) as long as it is clear what is being graphed (for example, as long as it is clear whether error bars represent SDs or SEs). Where outcomes are categorical, this criterion is considered to have been met if the number of subjects in each category is given for each group.

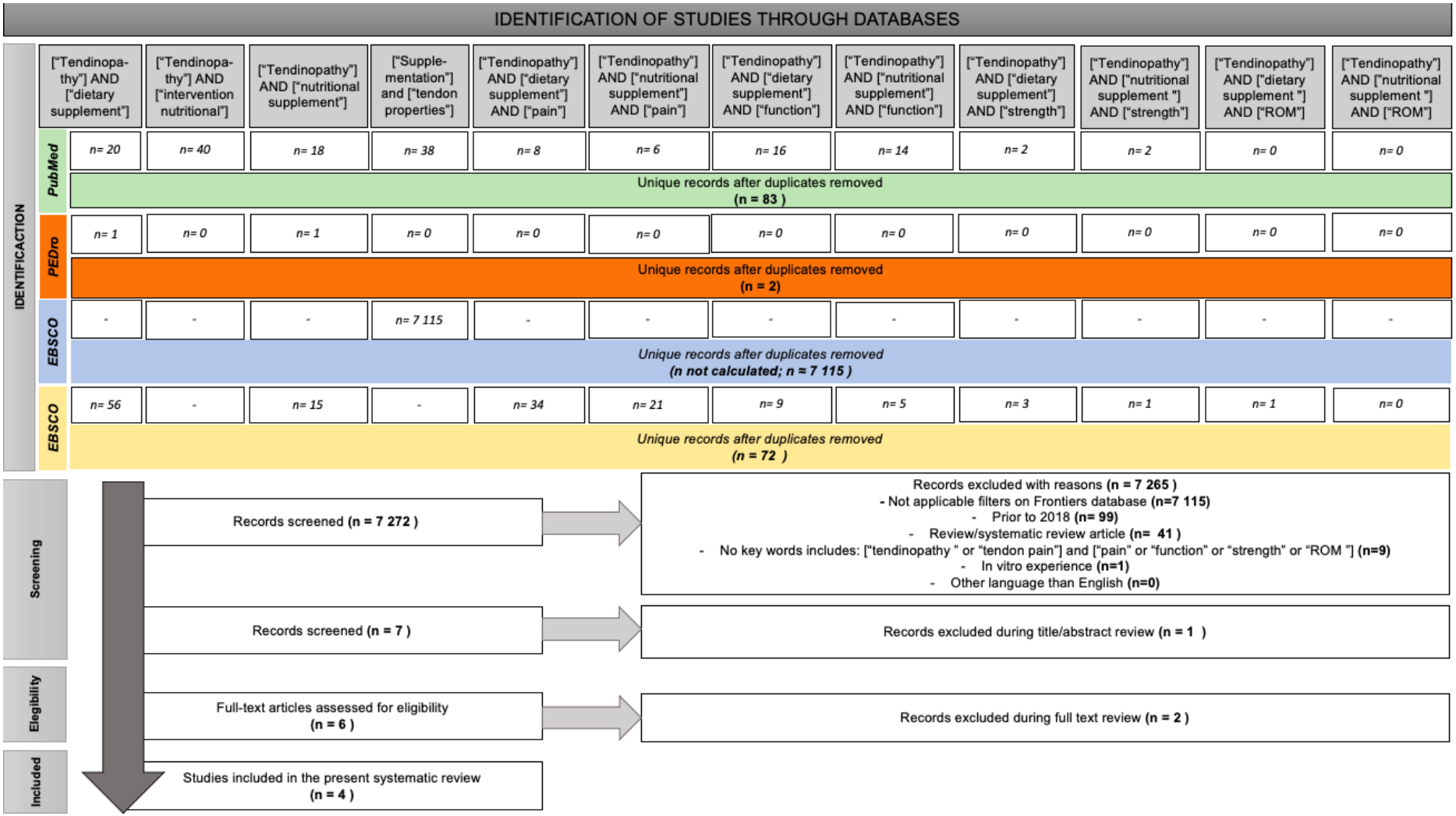
Table 5: PEDro Methodological Quality Assessment of the articles included in the systematic review.

AUTHORS AND YEARS OF PUBLICATION	PEDRO SCALE ITEMS											TOTAL SCORE PEDro SCALE
	1	2	3	4	5	6	7	8	9	10	11	
PUBMED												
Imre Juhasz., et al. (2018)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**NO**	**YES**	**YES**	**YES**	**YES**	**9/10**
Stephan F.E. Praet, et al., (2018)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**10/10**
Ángela Sánchez-Gómez., et al. (2022)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**NO**	**YES**	**YES**	**YES**	**YES**	**9/10**
EBSCO												
Fiona M Sandford., et al. (2018)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**10/10**

1. Eligibility criteria were specified; 2. Subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received); 3. Allocation was concealed; 4. The groups were similar at baseline regarding the most important prognostic indicators; 5. There was blinding of all subjects; 6. There was blinding of all therapists who administered the therapy; 7. There was blinding of all assessors who measured at least one key outcome; 8. Measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups; 9. All subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to treat”; 10. The results of between-group statistical comparisons are reported for at least one key outcome; 11. The study provides both point measures and measures of variability for at least one key outcome

Reference: Own elaboration

Figure 6: Flow chart for the search strategy and assessment of methodological quality.

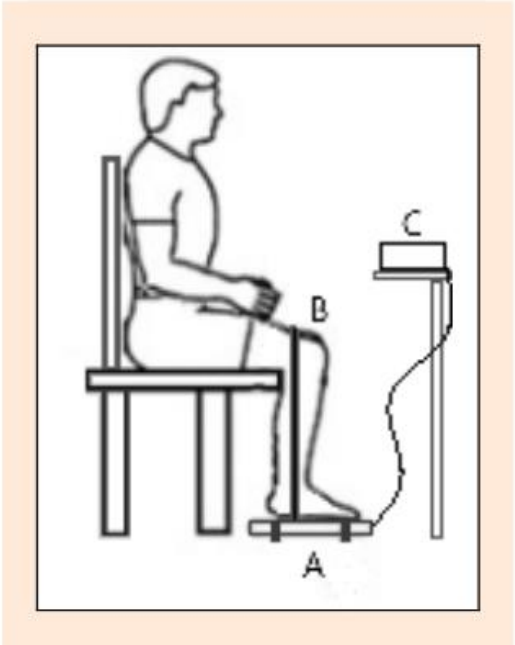


Reference: Own elaboration

ANNEX 2

Following documents presented below (from page 57 to 69) represent the different scales and questionnaires included in this literature review. A handmade summary is presented for continuation:

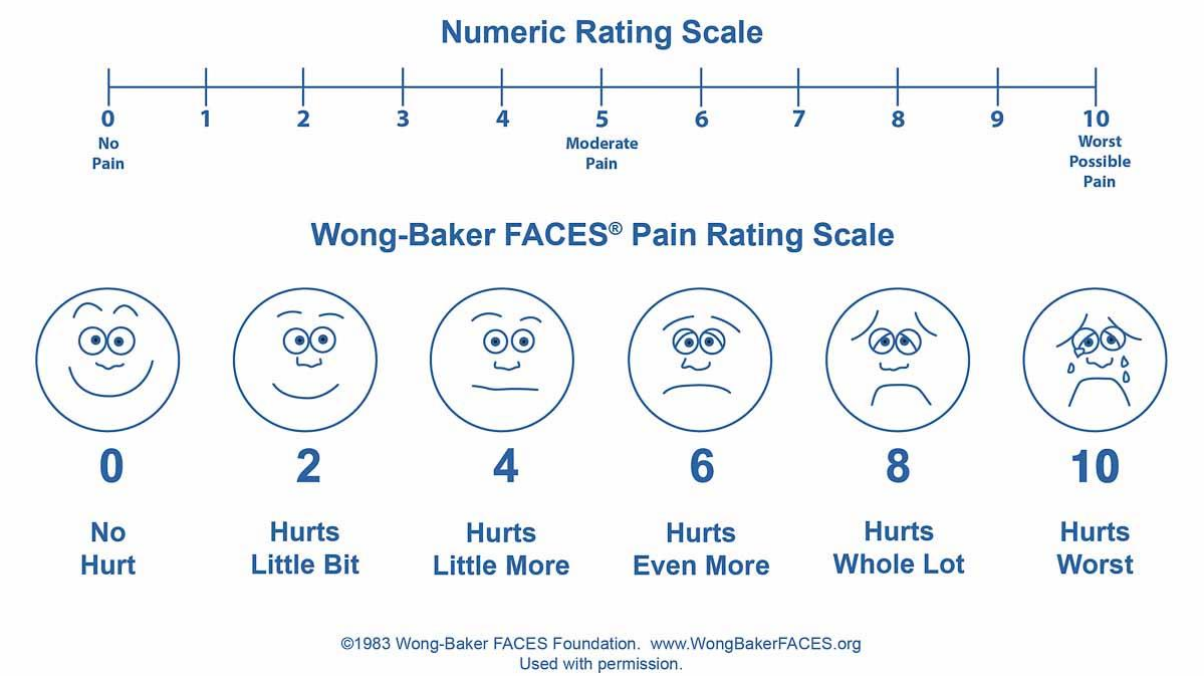
Process measurement of Plantar Flexion Torque (PFT) (Newton∗Meters).



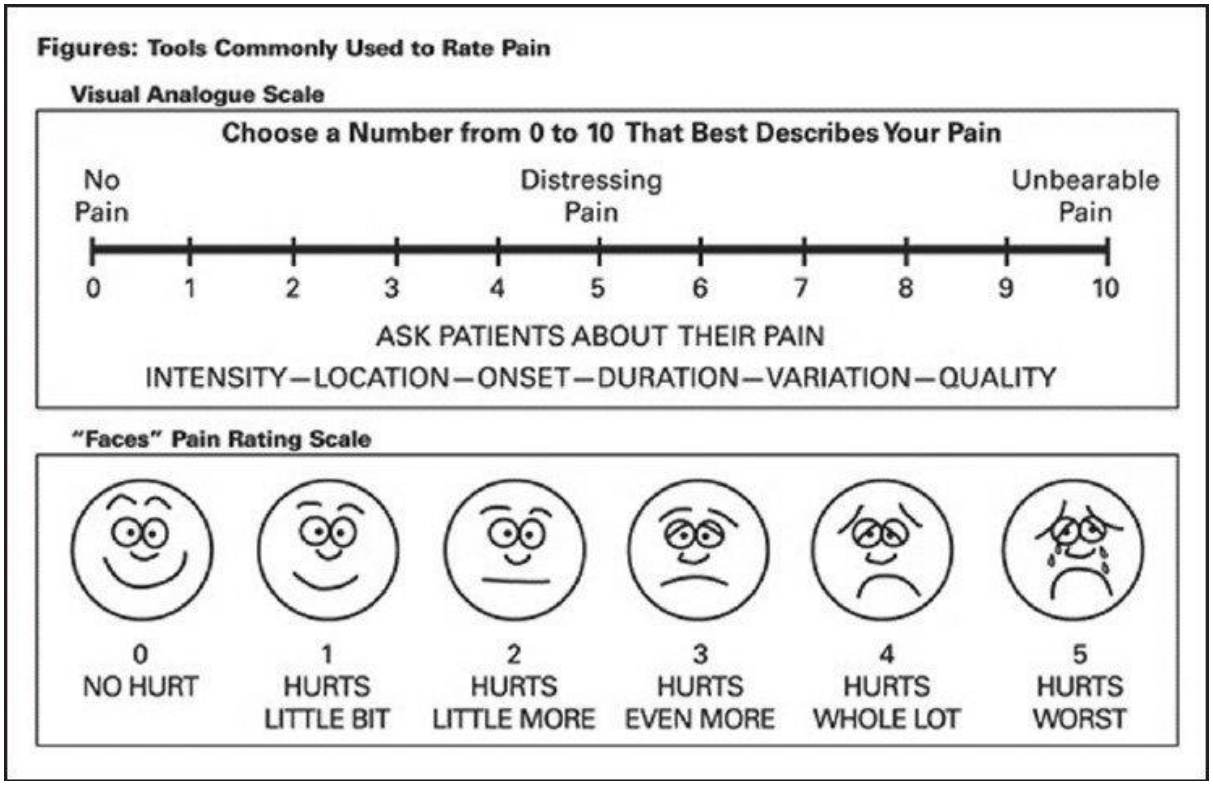
The Measurement of Plantar Flexion Torque. The Experimental Setup for Measurements of Ankle Plantar Flexion Torque (PFT; Mmax; N•m). Dynamometer (A), Non Elastic Strap (B), Digital Screen (C).

Reference: Juhasz et al., (2018).

Numeric Rating Scale (NRS) for assessment of pain perception.



Visual Analogue Scale (VAS) for assessment of pain perception.



Reference: Visual analogue scale (VAS) for assessment of children's pain perception. (s. d.).

Victorian Institute of Sport Assessment (VISA-) Achilles (-A) Questionnaire (VISA-A).

VISA-A QUESTIONNAIRE

PHYSIOTUTORS

Patient Name: _____

Date: _____

Instructions: In this questionnaire, the term "pain" refers specifically to pain in the achilles tendon region

1. For how many minutes do you have stiffness in the Achilles region on first getting up?

100 minutes ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 0 minutes

2. Once you are warmed up for the day, do you have pain when stretching the Achilles tendon fully over the edge of a step? (keeping knee straight)

Strong severe pain ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 No pain

3. After walking on flat ground for 30 minutes, do you have pain within the next 2 hours? (If unable to walk on flat ground for 30 minutes because of pain, score 0 for this question).

Strong severe pain ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 No pain

4. Do you have pain walking downstairs with a normal gait cycle?

Strong severe pain ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 No pain

5. Do you have pain during or immediately after doing 10 (single leg) heel raises from a flat surface?

Strong severe pain ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 No pain

6. How many single leg hops can you do without pain?

0 ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 10

7. Are you currently undertaking sport or other physical activity?

0	Not at all	
4	Modified training ± modified competition	
7	Full training ± competition but not at same level as when symptoms began	
10	Competing at the same or higher level as when symptoms began	

8. Please complete EITHER A, B or C in this question.

- If you have **no pain while undertaking Achilles tendon loading sports** please complete **Q8a only**.
- If you have **pain while undertaking Achilles tendon loading sports but it does not stop you from completing the activity,** please complete **Q8b only**.
- If you have **pain that stops you from completing Achilles tendon loading sports,** please complete **Q8c only.**

A. If you have no pain while undertaking Achilles tendon loading sports, for how long can you train/practise?

NIL	1-10 minutes	11-20 minutes	21-30 minutes	>30 minutes
0	7	14	21	30

B. If you have some pain while undertaking Achilles tendon loading sport, but it does not stop you from completing your training/practice for how long can you train/ practise?

NIL	1-10 minutes	11-20 minutes	21-30 minutes	>30 minutes
0	4	10	14	20

C. If you have pain that stops you from completing your training/practice in Achilles tendon loading sport, for how long can you train/practise?

NIL	1-10 minutes	11-20 minutes	21-30 minutes	>30 minutes
0	2	5	7	10

TOTAL SCORE (_____ /100) = _____%

PHYSIOTUTORS **MORE INFORMATION**

Victorian Institute of Sport Assessment (VISA-) Patella (P) Questionnaire.

VISA-P QUESTIONNAIRE

PHYSIOTUTORS

Patient Name: _____

Date: _____

Instructions: In this questionnaire, the term "pain" refers specifically to pain in the knee cap region

1. For how many minutes can you sit pain free?

0 minutes ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 100 minutes

2. Do you have pain walking downstairs with a normal gait cycle?

Strong severe pain ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 No pain

3. Do you have pain at the knee with full active non-weightbearing knee extension?

Strong severe pain ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 No pain

4. Do you have pain when doing a full weight bearing lunge?

Strong severe pain ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 No pain

5. Do you have problems squatting?

Unable to do ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 No problems

6. Do you have pain during or immediately after doing 10 single leg hops?

Strong severe pain ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 No pain

7. Are you currently undertaking sport or other physical activity?

0	Not at all	
4	Modified training ± modified competition	
7	Full training ± competition but not at same level as when symptoms began	
10	Competing at the same or higher level as when symptoms began	

8. Please complete EITHER A, B or C in this question.

- If you have **no pain** while undertaking sport please complete **Q8a only.**
- If you have **pain while undertaking sport but it does not stop you** from completing the activity, please complete **Q8b only.**
- If you have **pain that stops you from completing sporting activities**, please complete **Q8c only.**

A. If you have no pain while undertaking sport, for how long can you train/practise?

NIL	1-5 minutes	6-10 minutes	7-15 minutes	>15 minutes
0	7	14	21	30

B. If you have some pain while undertaking sport, but it does not stop you from completing your training/practice for how long can you train/practise?

NIL	1-5 minutes	6-10 minutes	7-15 minutes	>15 minutes
0	4	10	14	20

C. If you have pain which stops you from completing your training/practice for how long can you train/practise?

NIL	1-5 minutes	6-10 minutes	7-15 minutes	>15 minutes
0	2	5	7	10

TOTAL SCORE (_____ /100) = _____%

PHYSIOTUTORS

MORE INFORMATION

Questionnaire on subjective patient satisfaction and returning to sports level.

Table A3. Questionnaire on subjective patient satisfaction and returning to sports level.

Name: Date of Birth: Study ID: Date of filling out questionnaire: ( ) - 3 months after starting treatment ( ) - 6 month after starting treatment
Dear participant, Through the following brief questionnaire we would like to assess your opinion on the treatment that you have been given over the past 3 months. Can you please indicate how you would judge the effect of the treatment that you were given? excellent () good () moderate () poor () *The groups "excellent" and "good" were regarded as successful and the groups of "moderate" and "poor" as not successful.* Could you please indicate underneath whether you have been able to return to sports in the past 3 months? A. I am or have not been active in sports B. I have not been able to return to sports C. I have been able to return to sports but not in my desired sport D. I have been able to return to my desired sport, but not yet at my old level E. I have been able to return to my old level in the desired sport. *The groups "D" and "E" were regarded as successful and the groups of "A, B or C" as not successful.*

Reference : Praet et al., (2019).

Oxford Shoulder Score (OSS) for disability.

PROBLEMS WITH YOUR SHOULDER

Tick (✓) one box for every question.

1. During the past 4 weeks…

How would you describe the **worst** pain you had from your shoulder?

None	Mild	Moderate	Severe	Unbearable
☐	☐	☐	☐	☐

2. During the past 4 weeks…

Have you had any trouble dressing yourself because of your shoulder?

No trouble at all	A little bit of trouble	Moderate trouble	Extreme difficulty	Impossible to do
☐	☐	☐	☐	☐

3. During the past 4 weeks…

Have you had any trouble getting in and out of a car or using public transport because of your shoulder?

No trouble at all	A little bit of trouble	Moderate trouble	Extreme difficulty	Impossible to do
☐	☐	☐	☐	☐

4. During the past 4 weeks…

Have you been able to use a knife and fork - at the same time?

Yes, easily	With little difficulty	With moderate difficulty	With extreme difficulty	No, impossible
☐	☐	☐	☐	☐

5. During the past 4 weeks…

Could you do the household shopping on your own?

Yes, easily	With little difficulty	With moderate difficulty	With extreme difficulty	No, impossible
☐	☐	☐	☐	☐

6. During the past 4 weeks…

Could you carry a tray containing a plate of food across a room?

Yes, easily	With little difficulty	With moderate difficulty	With extreme difficulty	No, impossible
☐	☐	☐	☐	☐

7. During the past 4 weeks…

Could you brush/comb your hair with the affected arm?

Yes, easily	With little difficulty	With moderate difficulty	With extreme difficulty	No, impossible
☐	☐	☐	☐	☐

8. During the past 4 weeks…

How would you describe the pain you usually had from your shoulder?

None	Very mild	Mild	Moderate	Severe
☐	☐	☐	☐	☐

9. During the past 4 weeks…

Could you hang your clothes up in a wardrobe, using the affected arm?

Yes, easily	With little difficulty	With moderate difficulty	With great difficulty	No, impossible
☐	☐	☐	☐	☐

10. During the past 4 weeks…

Have you been able to wash and dry yourself under both arms?

Yes, easily	With little difficulty	With moderate difficulty	With extreme difficulty	No, impossible
☐	☐	☐	☐	☐

11. During the past 4 weeks…

How much has pain from your shoulder interfered with your usual work (including housework)?

Not at all	A little bit	Moderately	Greatly	Totally
☐	☐	☐	☐	☐

12. During the past 4 weeks…

Have you been troubled by pain from your shoulder in bed at night?

No nights	Only 1 or 2 nights	Some nights	Most nights	Every night
☐	☐	☐	☐	☐

Finally, please check back that you have answered each question.
Thank you very much.

Reference: © Isis Innovation Limited, 1998. All rights reserved. Oxford Shoulder Score – English for the United Kingdom

Shoulder Pain and Disability Index (SPADI).

SHOULDER PAIN AND DISABILITY INDEX (SPADI)

PHYSIOTUTORS

The Shoulder Pain and Disability Index (SPADI) is a self-administered questionnaire that consists of two dimensions, one for pain and the other for functional activities. The pain dimension consists of five questions regarding the severity of an individual's pain. Functional activities are assessed with eight questions designed to measure the degree of difficulty an individual has with various activities of daily living that require upper-extremity use. The SPADI takes 5 to 10 minutes for a patient to complete and is the only reliable and valid region-specific measure for the shoulder.

SCORING INSTRUCTIONS

To answer the questions, patients place a mark on a 10cm visual analogue scale for each question. Verbal anchors for the pain dimension are 'no pain at all' and 'worst pain imaginable', and those for the functional activities are 'no difficulty' and 'so difficult it required help'. The scores from both dimensions are averaged to derive a total score.

INTERPRETATION OF SCORES

Total pain score: _____ / 50 x 100 = %

(Note: If a person does not answer all questions divide by the total possible score, eg. if 1 question missed divide by 40)

Total disability score:_____ / 80 x 100 = %

(Note: If a person does not answer all questions divide by the total possible score, eg. if 1 question missed divide by 70)

Total Spadi score: _____ / 130 x 100 = %

(Note: If a person does not answer all questions divide by the total possible score, eg. if 1 question missed divide by 120)
The means of the two subscales are averaged to produce a total score ranging from 0 (best) to 100 (worst).
Minimum Detectable Change (90% confidence) = 13 points
(Change less than this may be attributable to measurement error)

MORE INFORMATION

SHOULDER PAIN AND DISABILITY INDEX (SPADI)

PHYSIOTUTORS

Please place a mark on the line that best represents your experience during the last week attributable to your shoulder problem.

PAIN SCALE

How severe is your pain?

Circle the number that best describes your pain where: 0 = no pain and 10 = the worst pain imaginable.

At its worst?	0	1	2	3	4	5	6	7	8	9	10
When lying on the involved side?	0	1	2	3	4	5	6	7	8	9	10
Reaching for something on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
Touching the back of your neck?	0	1	2	3	4	5	6	7	8	9	10
Pushing with the involved arm?	0	1	2	3	4	5	6	7	8	9	10

DISABILITY SCALE

How much difficulty do you have?

Circle the number that best describes your experience where: 0 = no difficulty and 10 = so difficult it requires help.

Washing your hair?	0	1	2	3	4	5	6	7	8	9	10
Washing your back?	0	1	2	3	4	5	6	7	8	9	10
Putting on an undershirt or jumper?	0	1	2	3	4	5	6	7	8	9	10
Putting on a shirt that buttons down the front?	0	1	2	3	4	5	6	7	8	9	10
Putting on your pants?	0	1	2	3	4	5	6	7	8	9	10
Placing an object on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
Carrying a heavy object of 10 pounds (4.5 kg)	0	1	2	3	4	5	6	7	8	9	10
Removing something from your back pocket?	0	1	2	3	4	5	6	7	8	9	10

Patient Specific Functional Score (PSFS) for function assessment.

PATIENT-SPECIFIC FUNCTIONAL SCALE (PSFS)

PHYSIOTUTORS

Patient Name: _____

Date: _____

INSTRUCTIONS

Clinician to read and fill in below: Complete at the end of the history and prior to physical examination.

Initial Assessment:

I am going to ask you to identify up to three important activities that you are unable to do or are having difficulty with as a result of your _____ problem. Today, are there any activities that you are unable to do or having difficulty with because of your _____ problem? (Clinician: show scale to patient and have the patient rate each activity).

Follow-up Assessments:

When I assessed you on (state previous assessment date), you told me that you had difficulty with (read all activities from list at a time). Today, do you still have difficulty with: (read and have patient score each item in the list)?

PATIENT-SPECIFIC ACTIVITY SCORING SCHEME (POINT TO ONE NUMBER):

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

Unable to perform activity

Able to perform at the same level as before injury or problem

ACTIVITY	INITIAL					
1.						
2.						
3.						
4.						
5.						
Additional						
Additional						

Total score = sum of the activity scores/number of activities
Minimum detectable change (90%CI) for average score = 2 points
Minimum detectable change (90%CI) for single activity score = 3 points

MORE INFORMATION

ANNEX 3

Following tables presented below (from page 71 to 72) are the different physiotherapeutic management therapeutic exercise according to the RTC. A handmade summary is presented for continuation:

Exercise and return to sport (RTS) program.

Table A2. Exercise and return-to-running program.

Eccentric calf exercise program
Exercise 1: Gastrocnemius Heel Drop Hold onto something stable for balance. Begin with the heel raised and knee straight Slowly lower the heel below the step Push up to the starting position by using the uninjured leg Perform 3 × 15 repetitions, 2 × daily, 7 days/week.
Exercise 2: Soleus Heel Drop Hold onto something stable for balance. Begin with heel raised and knee bent Slowly lower the heel below the step Push up to the starting position by using the uninjured leg Perform 3 × 15 repetitions, 2 × daily, 7 days/week What Should I Expect to Feel After the Exercise? When performed properly, this exercise program is going to cause some tendon and muscle soreness, especially during the first one to two weeks. Studies have shown that it is a safe training program with no risk of new injuries. The soreness will become much less as you progress with the exercises over the course of weeks. Please STOP the program and contact your physician or physiotherapist if you experience significant pain or discomfort. When you can perform the exercise without experiencing any pain or discomfort, start to increase the weight. This can be achieved by using a calf raise machine, wearing a weighted back pack or vest. Add 5 kg per week until at 60 kg.
Physiotherapy Follow-up Protocol for Return to Running 4 week review All been given Alfredson program Hop pain less than 1–2/10 can commence running 2 times/week Shuffle-Jog warm up 5 mins on grass 3 sets of 5 run throughs 80 m (or equivalent) 50–60% pace on grass Rolling start No more than 20% increase in distance per week 3 sets 6 reps 4 sets 5 reps Should be no pain by 3rd run through Repeat over 3 weeks If pain is increased overall, rest a week, return to exercises and then recommence as above If Ok progress to 3 sessions/week (every second day) Shuffle-Jog warm up 5 mins on grass 4 sets 6 run throughs 80 m (or equivalent) 55–65% pace on grass 4 sets 7 reps or equivalent distance (one session may be steady state) 4 sets 8 reps or equivalent distance (one session may be steady state) Repeat 3 weeks Review at 6 weeks Tailored approach to return to pre- baseline/ aspirational training loads Educational support regarding realistic goals Weekly increase limited to 7–10% increase Review at 12 weeks

Reference: Praet et al., (2019).

Physiotherapy treatment plan of FHL tendinopathy for adolescent fin swimmers.

PHASES	PERIODE (programme per week)	EXERCISE, METHODS (main exercises)	FREQUENCY (pc/block/day)	AIM
Acute	1-2	**RICE and Isometric Exercises:** Back location: -Flex the musculus quadriceps femoris; hold for 5 sec. than relax 2 sec. -Flex the leg extensor muscles; hold for 5 sec. than relax 2 sec. Hallux is in neutral state.	5-10 exercises 3-8 times per day (at home)	Pain relief; Holding muscle strength
Recovery	3-4	**Improving Range of Motion:** Stretching with PIR and PNF technique: -Hallux and ankle extension; hold for 5 sec.; than relax 2 sec. -Active strengthening, own muscle strength: -Hallux and ankle flexion: hold for 5 sec. than relax 2 sec.	3 PIR ex/10-20 pc 2 PNF ex/10-20 pc (with physiotherapist) 5 Strength ex/10-20pc (at home)	Holding the ankle and toe mobility Strength the plantar flexor muscles with own, active muscle exercises
Maintenance	5-6	**Strengthening:** Own muscle strength: -Hallux and ankle flexion: hold for 5 sec. than relax 2 sec. Resistance ex. with bands: -Hallux and ankle flexion: hold for 5 sec. than relax 2 sec. Sport-specific physiotherapy: -Prone position; flex the knees, uncles and toes than relax. With bands also. Strength and balance ex. with dyn-air: -Step up to the dyn-air with the patient leg, flex the hallux and the ankle and step back Strength and flexibility with Fit-Ball: -Sit on the Fit-Ball; suspension on the ball, step forward and flex the toe and ankle to the floor, step back - Sit on the Fit-Ball; lower extremity extended, toe and ankle extended, hold for 5 sec. than relax 2 sec.; step back	5ex/10-20pc (with physiotherapist) 5ex/10-20pc (with physiotherapist) 2ex/10-20pc 2ex/10-20pc 2ex/5-10pc	Strength the plantar flexor muscles with gymnastic devices

The rehabilitation status was individually controlled by a physiotherapist. PIR - postisometric relaxation; PNF - proprioceptive neuromuscular facilitation; ex - exercises; pc - pieces.

Reference: Juhasz et al., (2018).