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ANALYZING AND EVALUATING VISCERAL OSTEOPATHIC MANIPULATION TECHNIQUES IN CLINICAL IMPROVEMENT AND PAIN: SYSTEMATIC REVIEW WITH META-ANALYSIS

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Abstract: Introduction: Visceral manipulation, a technique based on the principles of osteopathy, has been widely used as a manual therapeutic approach with the purpose of restoring the mobility and motility of internal organs. Its clinical application has been linked to the improvement of musculoskeletal and visceral symptoms; however, controversies remain regarding the scientific soundness that supports its effectiveness. Objective: To analyze the clinical efficacy of visceral manipulation in different pathological conditions, with an emphasis on outcomes such as pain, functional capacity, and quality of life, through a systematic review of the literature with an attempt at meta-analysis. Methodology: This is a systematic review developed based on the PRISMA guidelines. Two randomized controlled clinical trials were included, extracted from the PubMed database, which met the previously defined eligibility criteria. The selected studies were assessed for risk of bias using the Cochrane Collaboration's RoB 2.0 tool and for quality of evidence based on the GRADE approach, including a *summary of findings* table. Data extraction included general characteristics of the studies, population characteristics, interventions, comparisons, measurement instruments, and clinical outcomes summarized descriptively in a table. Finally, quantitative synthesis was performed through a meta-analysis. Results: The studies pointed to positive effects favoring visceral manipulation in pain reduction. However, heterogeneity and high risk of bias were observed in crucial domains, in addition to limitations related to sample size and low recommendation for clinical practice. Conclusion: Visceral manipulation demonstrated great therapeutic potential represented in the meta-analyses; however, the methodological quality in one of the studies was at high risk of bias. It is worth considering that in the GRADE approach, one of these studies presented great fragility in its design, thus demonstrating a low level of recommendation in the outcome of pain improvement.

Keywords: Visceral manipulation; Osteopathic manipulative treatment; Visceral manual therapy.

INTRODUCTION

Visceral manipulation

Visceral manipulation is a manual therapeutic approach that aims to restore the mobility of internal organs and their myofascial relationships, with the goal of improving the overall function of the body. Developed based on the principles of osteopathy, this technique considers that the loss of mobility of the viscera can interfere with postural balance, muscle function, and autonomic tone. The clinical application of visceral manipulation has been growing in several areas of health, although its use still generates controversy regarding the scientific basis that supports it (FERNANDES, 2018).

One of the main objectives of osteopathic treatment is to normalize bodily

rhythms, aiming to restore the mobility of different tissues and parts of the body. The visceral system encompasses all systems located inside the thorax (digestive, respiratory, cardiovascular, and genitourinary systems), abdomen, pelvis, and anterior neck region (BORTOLAZZO et al., 2020).

Several factors, such as the structural condition of the viscera, the integrity of their innervation, blood supply, and venous and lymphatic drainage, are important for the viscera to perform their functions, such as visceral mobility, which occurs at different levels. Mobility is possible because the viscera are surrounded by serous tissue (e.g., parietal and visceral peritoneum), which allows one viscera to move in relation to another and in relation to a muscle wall. This freedom is important for proper functioning and caliber change (hollow viscera) that change depending on the amount of substances inside them (BORTOLAZZO et al., 2020).

When they are in somatic dysfunction, which is defined by the osteopathic terminology glossary as "decreased or altered mobility of the system," it can generate symptoms in the viscera itself, or in other viscera to which they are related anatomically, functionally, metabolically, neurologically, or vasculately, even musculoskeletal or lymphatic (BORTOLAZZO et al., 2020).

For visceral treatment, it is important to assess and treat various structures, using direct or indirect, reflex or induction techniques, in order to restore the system's motor function, mobility, motility, irrigation, and drainage, hoping that the techniques will stimulate visceral movement and thus have an effect on the tissue and repercute on its anatomical relationships (BORTOLAZZO et al., 2020).

The technique is performed through subtle touches and targeted pressure on specific visceral regions, with the aim of promoting the release of tension, improving the sliding between structures, and stimulating physiological self-regulation. These maneuvers are usually performed with the patient at rest, in sync with their breathing rhythm, and involve organs such as the liver, intestines, stomach, uterus, and bladder. Its therapeutic approach is integrative and considers the musculoskeletal, fascial, and nervous systems as interdependent (FERRAZ et al., 2013).

Clinical indications for visceral manipulation include a variety of conditions such as functional constipation, primary dysmenorrhea, chronic low back pain, digestive disorders, and viscerosomatic dysfunctions. In addition, the technique has been explored in non-pathological contexts, such as in healthy individuals with joint restrictions, suggesting a possible interdependence between visceral restrictions and musculo-articular mobility (FERNANDES, 2018; BARATELLA et al., 2022).

Although reports of clinical benefits are consistent, visceral manipulation also has important contraindications. It should not be used in cases of acute infectious processes, abdominal neoplasms, aneurysms, high-risk pregnancies, or active inflammatory conditions. Inappropriate application of the technique can cause discomfort, aggravate symptoms, or mask conditions that require immediate medical intervention (FERRAZ et al., 2013).

Physiological effects

Among the mechanisms proposed to explain the effects of visceral manipulation,

modulation of the autonomic nervous system stands out, especially in the balance between the sympathetic and parasympathetic systems. Manual stimulation of viscera innervated by autonomic plexuses can trigger neuroreflex responses that regulate organ function, peristalsis, and pain. Vagal activation, for example, is associated with improved digestion, reduced inflammatory processes, and increased parasympathetic tone (ALVES & MARTINS, 2021).

The physiological effects attributed to visceral manipulation include improved tissue mobility, increased local vascularization, reduced adhesions, autonomic modulation, and improved visceral functioning. In addition, manual stimulation of deep fascial structures is believed to contribute to the release of long-held tension patterns, promoting self-regulation of the neurovegetative system (ALVES & MARTINS, 2021).

In the field of pain, visceral manipulation has been shown to be effective in reducing chronic symptoms, especially when associated with changes in intestinal motility or the female reproductive system. In women with primary dysmenorrhea, for example, a significant reduction in pain was observed after the application of maneuvers directed at the uterus and ovaries, reinforcing the hypothesis that the technique can modulate nociceptive afferents (ALVES & MARTINS, 2021).

Tozzi, Bongiorno, and Vitturini (2012) intervened on the mobility of the right kidney of volunteers with low back pain and found increased mobility (assessed by ultrasound), and after osteopathic treatment, they found a decrease in low back pain assessed by a low back pain analog scale.

Scientific evidence

There is evidence that manipulation of tense structures can decrease sympathetic hyperactivity, promoting vasodilation, normalization of associated muscle tone, and analgesic effects. This autonomic influence can be observed even in regions distant from the treated viscera, through neurophysiological connections called viscerosomatic and visceroarticular arcs, which support the integrative approach of osteopathy (BARATELLA et al., 2022).

Recent studies suggest that this technique can promote noticeable changes in the range of motion of joint segments, even in asymptomatic individuals. The hypothesis is that the release of visceral restrictions reduces interference in fascial chains and allows greater freedom of joint movement, as demonstrated by Baratella et al. (2022) in healthy adults after intervention on the liver and stomach.

Despite promising findings, the scientific literature on visceral manipulation is still limited by methodological factors, such as small samples, lack of blinding, and heterogeneity of protocols. Nevertheless, the results indicate that the technique may represent a valuable complementary approach, provided it is used judiciously, based on anatomical knowledge and supported by growing clinical evidence (FERRAZ et al., 2013; FERNANDES, 2018).

JUSTIFICATION

Visceral manipulation is a manual intervention that acts beyond local anatomical structures, seeking to influence systemic functions by modulating the autonomic ner-

vous system. It is based on the premise that visceral mobility and motility are essential for body homeostasis, with visceral dysfunctions potentially triggering altered somatic patterns via complex neurophysiological mechanisms. Organs such as the intestine, liver, and uterus, innervated by autonomic plexuses, respond to manual stimuli with viscerosomatic and visceroarticular reflexes, interfering with basal autonomic tone.

This therapeutic approach acts on the regulation of the sympathetic-parasympathetic axis, with an emphasis on vagal activation, promoting anti-inflammatory responses, visceral relaxation, and analgesia. Techniques applied in sync with breathing stimulate parasympathetic afferents, while the release of visceral tension can attenuate sympathetic hyperactivity associated with chronic pain. Thus, visceral manipulation goes beyond the traditional biomechanical perspective, inserting itself as a neuroregulatory resource with potential for systemic clinical repercussions. Therefore, research into its measurable effects on organic function and autonomic balance is justified, especially in contexts of pain and persistent functional dysfunctions.

Although these effects still lack objective validation by instrumental examinations, the existing literature offers evidence that visceral interventions may contribute to autonomic modulation and symptom improvement in musculovisceral dysfunctions. This reinforces the importance of investigating, with rigorous methodology, the potential sympathetic-parasympathetic effects of visceral manipulation in the clinical context.

The growing adoption of visceral manipulation in clinical practice, even in the face of limited evidence of its effectiveness, reveals a significant gap between the therapeutic use and scientific validation of the technique. Systematic investigation of available clinical trials is necessary to clarify whether the reported benefits are supported by robust and reproducible methodologies. This study was conducted based on the need to critically synthesize scientific findings on visceral manipulation, contributing to evidence-based clinical decisions. That said, the objective of this systematic review was to investigate the effects of osteopathic visceral manipulation in different pathological conditions on outcomes such as pain, functional capacity, and quality of life compared to other interventions.

METHODOLOGY

This study is a systematic review of the literature, with an attempt at meta-analysis, with the aim of evaluating the clinical efficacy of visceral manipulation in different pathologies. The review followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines and used the RoB 2.0 (Risk of Bias 2.0) risk of bias assessment tool (STERNE et al., 2019). In addition, the GRADE (Grading of Recommendations, Assessment, Development and Evaluation) approach was applied to classify the quality of evidence for the main clinical outcomes identified.

Null hypothesis

The null hypothesis (H_0) of this study establishes that visceral manipulation has no significant clinical effect on the outcomes evaluated, such as pain, function, and quality of life, when compared to placebo, absence of treatment, or other manual interventions.

Alternative hypothesis

In contrast, the alternative hypothesis (H_1) considers that visceral manipulation has a significant clinical effect, being effective in reducing symptoms and improving function in different clinical conditions.

Search strategy

The search strategy was performed in the PubMed (NCBI) database, using the following descriptors and Boolean operators: ("Visceral Manipulation" OR "Visceral Manual Therapy") AND ("Osteopathic Manipulative Treatment") The search was restricted to articles published in English, Portuguese, or Spanish, available in full text, and classified as randomized controlled clinical trials.

Inclusion criteria

Studies that investigated visceral manipulation as an isolated or primary intervention, with quantitative clinical outcomes such as pain, functional disability, mobility, or quality of life, were included. Only studies that used validated measurement instruments, such as the Visual Analog Scale (VAS), the Roland-Morris and Short-Form 36 (SF-36) questionnaires, the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire, or goniometric measurements, were considered. The samples analyzed should be composed of adult individuals aged 18 years or older, regardless of the presence of specific pathologies.

Exclusion criteria

Review studies, case reports, research protocols, or case series were excluded. Trials that used combined interventions were also discarded when it was not possible to isolate the specific effects of visceral manipulation. Studies with insufficient methodological description, lack of comparable data for statistical analysis, or use of unvalidated instruments were also not considered.

The article selection process was carried out in three stages: screening by titles and abstracts, full-text reading, and application of eligibility criteria. Data extraction included information on authors, year of publication, sample characteristics, type of intervention performed, instruments used, primary and secondary outcomes, main results, and any methodological limitations. The results were organized into comparative tables, structured by population, intervention, outcomes, instruments used, and main findings. Specific tables were also prepared with a detailed description of the techniques used in each study.

Risk of bias analysis

The risk of bias in the included randomized clinical trials was assessed using the Risk of Bias 2.0 (RoB 2.0) tool (STERNE et al., 2019). This tool was specifically designed to assess the risk of bias in randomized clinical trials in relation to a specific outcome. The assessment was conducted according to the five domains of RoB 2.0: Bias arising from the randomization process; Bias due to deviations from intended interventions; Bias due to missing outcome data; Bias in measurement of the outcome; Bias in selection of the reported result. For each domain, responses were assigned according to the categories standardized by the instrument: "low risk of bias," "some concerns," or "high risk of bias." The final classification of the risk of bias in each study was determined automatically by the RoB 2.0 decision algo-

rithm, taking into account the assessment of the individual domains. The results of the assessment were presented descriptively and visually using summary graphs (risk-of-bias plots) generated with the help of Excel provided by Cochrane.

Analysis of the certainty of the evidence

To assess the certainty or confidence in the effect estimates obtained, the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach was used. For each result, the evidence in the domains of risk of bias, inconsistency, indirectness, imprecision, and publication bias was assessed and classified as "high," "moderate," "low," or "very low." Summary of Findings tables will be created to present the main outcomes, effect estimates, and the assessed certainty of the evidence.

Statistical analysis

The quantitative synthesis of the outcomes of each study was performed through a meta-analysis conducted using specific software (Meta-Mar v4.0.2), adopting the mean difference (MD) as a measure of effect. The combination of studies was conducted using the inverse variance method, which inversely weights individual estimates according to the precision of the respective studies.

The variance between studies (τ^2) was estimated using the restricted maximum likelihood (REML) method, as proposed by Viechtbauer (2005). The Hartung-Knapp method was used to construct confidence intervals for the combined effect in the random effects model. Similarly, prediction intervals were calculated using the Hartung-Knapp method, also without ad hoc corrections in both analyses.

The uncertainty associated with the estimate of (τ^2) was quantified using the Q-profile method for calculating confidence intervals. Statistical heterogeneity between studies was assessed using Cochran's Q test and the statistic (I^2), which expresses the proportion of total variability attributed to true heterogeneity rather than sampling error. The grouping method implemented was inverse variance weighting and was reported in a *fixed-effects* model in this manuscript.

RESULTS

Included studies

Figure 1 illustrates the PRISMA access flowchart of the records found as a result of the search strategy. Initially, 72 records were identified. After removing 7 duplicates, 65 studies were screened for titles and abstracts, of which 48 were excluded because they did not meet the eligibility criteria. Of these 48, 17 studies were selected for full-text reading. Of these, 15 were excluded, mainly due to combined intervention, non-clinical outcomes, or lack of complete data . Thus, 2 studies met all inclusion criteria and were considered eligible for this review.

Risk of bias analysis

Figure 2 illustrates the analysis of bias risk using a tool developed by Cochrane RoB 2.0, which reveals a contradiction in relation to the methodological quality of the included studies. The study by Alves and Martins (2021) was judged to show a high risk of bias due to the domain that assesses

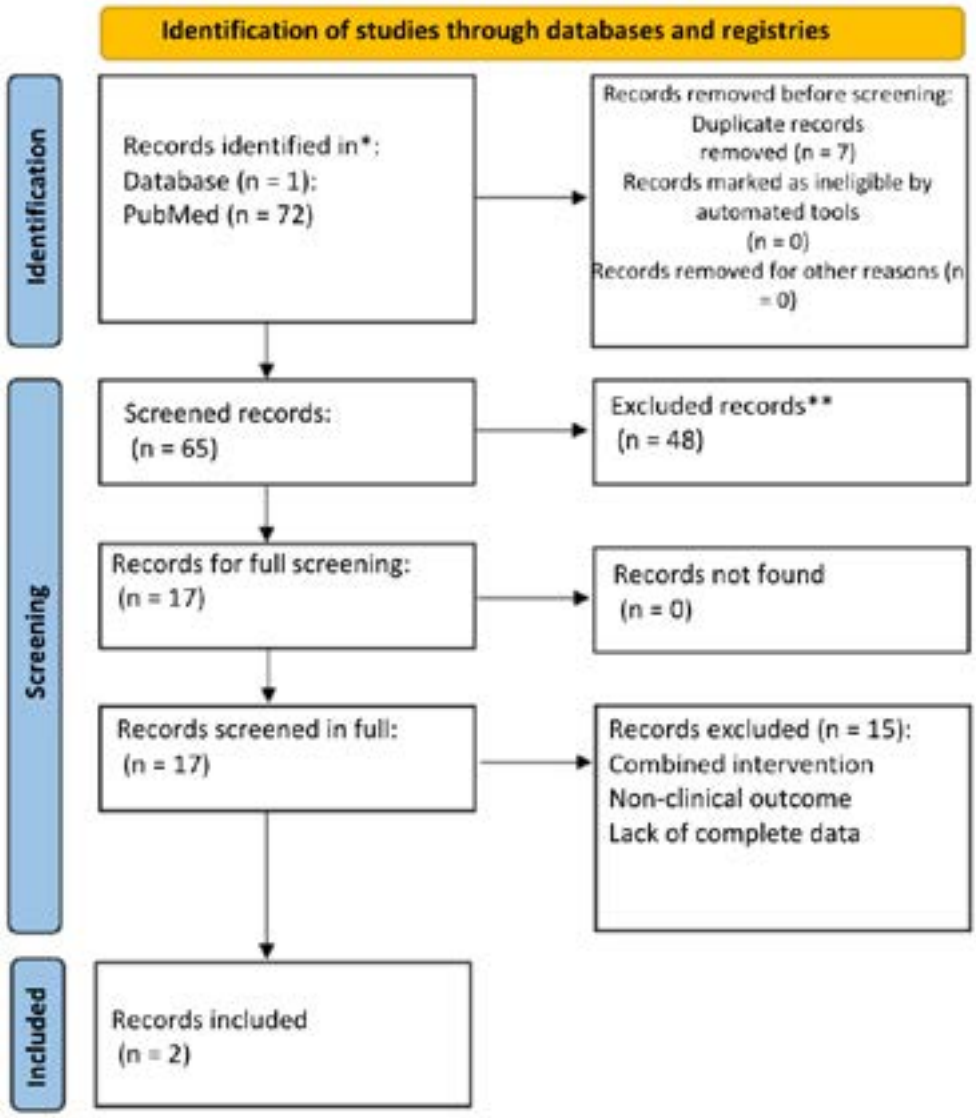


Figure 1. Access flowchart (PRISMA).

D1: Randomization process; D2: Deviations from intended interventions; D3: Missing outcome data; D4: Outcome measurement; D5: Selection of reported outcome.

Figure 2. Risk of bias analysis.

the deviation from the intended interventions, showing that it did not use appropriate analyses such as "intention to treat" to evaluate the data from the study participants' results. Thus, there may be a flaw in analyzing them in the group to which they were initially randomly assigned during the conduct of the study. In addition, the risk of bias for domains 5 and 1 was judged as "some concerns," which further reduces the methodological quality. Fernandes (2018), on the other hand, presented a low risk of bias in all five domains of the tool, reflecting rigorous and assertive methodological quality.

Summary of the characteristics of the included studies

Two randomized clinical trials published between 2018 and 2021 were included, involving patients with primary dysmenorrhea and nonspecific low back pain lasting between 4 and 6 weeks, evaluating the effects of visceral manipulative techniques on the uterus, ovaries, and other types on the pain outcome assessed by the VAS scale.

Meta-analyses on pain outcome

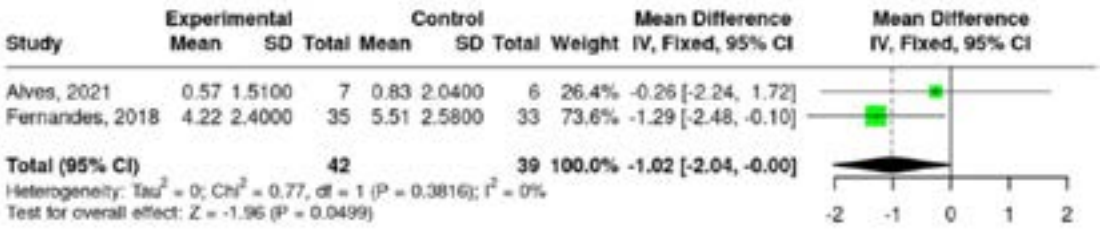
In the forest plot comparing osteopathic visceral manipulation *vs.* control group on pain outcome assessed by the VAS scale, there was a statistically significant difference in favor of the intervention, evidenced by the diamond, improving pain in an average time of 5 weeks.

Certainty of evidence and GRADE recommendation level

The synthesis of findings suggests that osteopathic visceral manipulation, when compared to other interventions in adults with different painful conditions, indicates a possible reduction in pain in favor of the intervention. However, the certainty of the evidence was classified as very low, mainly due to:

Study characteristics		Populatio		Intervention			Comparator			Outcome of interest	
Study ID ID	Environme --	Average age	Pain condition	Type	Duration of protocol (weeks/months)	Women/ men (n)	Type	Protocol duration (weeks/months)	Women/ men (n)	Domain (e.g., pain, quality of life)	Measure (e.g., VAS)
Alves, 2021	Catholic University of Pernambuco, School of Health and Life Sciences, Physiotherapy course	21.7	Primary dysmenorrhea	Placebo osteopathic visceral manipulation	4 weeks	9/0	Transcutaneous electrical nerve stimulation (TENS) in Burst mode	4 weeks	9/0	Pain	EVA
Fernandes, 2018	Physical therapy clinic in the city of Rondonópolis/MT	44,11	Nonspecific low back pain for more than 3 months Functional constipation according to the criteria Roma III	Placebo osteopathic visceral manipulation	6 weeks	3.0/35	Placebo osteopathic visceral manipulation	6 weeks	5.0/33	Pain	EVA

Table 1. Summary of the characteristics of the included studies



*Negative values favor the intervention group

Figure 3. Forest plot comparing osteopathic visceral manipulation *vs.* control on pain outcome (VAS) at up to 6 weeks (fixed effects)*

Ostheopathic visceral manipulation compared to other interventions for adults with different pain conditions

Patient or population: adults with different pain conditions
Setting: Not specified
Intervention: Osteopathic visceral manipulation
Comparison: other interventions

Outcomes	Anticipated absolute effects* (95% CI) Risk with other interventions	Risk with Ostheopathic visceral manipulation	Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
Pain assessed with: Visual Analog Scale Scale from: 0 to 10 follow-up: mean 5 weeks	The mean Pain was **4.79** points	MD **1.02 points lower** (2.04 lower to 0)		81 (2 RCTs)	⊕OOO Very low[a,b,c]	Osteopathic visceral manipulation may reduce/have little to no effect on Pain but the evidence is very uncertain.

***The risk in the intervention group** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: confidence interval; **MD:** mean difference

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

Explanations

a. Based on the RoB 2.0 assessment, the risk of bias of Alves et al., 2021 was judged as "High risk"
b. The population forms both studies are quite heterogeneous ranging from LBP + constipation to dysmenorrhea
c. Relative small sample size in Alves et al., 2021. The overall MD favours the experimental group [-1.02], with CI's 95% barely touching the zero line [-2.04, -0.00] for the fixed-effects model, however, the CI's 95% are wide and crossing the zero barrier for the random-effects model [-6.79, 4.75] suggesting little to no effect

Table 1. *Summary of Findings*

(a) High risk of bias in one of the included trials (ALVES & MARTINS, 2021);

(b) Relevant clinical heterogeneity among participants (conditions ranging from low back pain associated with constipation to primary dysmenorrhea);

(c) Small sample size.

DISCUSSION

Pain is one of the main outcomes analyzed in studies evaluating the effectiveness of manual therapies, especially in the context of visceral manipulation. The studies by Alves & Martins (2021) and Fernandes (2018) investigated different clinical conditions, but both observed promising results related to pain reduction after the application of osteopathic visceral techniques.

The results of this study indicated a significant reduction in menstrual pain in patients undergoing the intervention, reinforcing the hypothesis that visceral manipulation can act to modulate the nociceptive response in gynecological structures (ALVES & MARTINS, 2021). This reduction is especially important in clinical contexts where the continuous use of analgesics may not be desirable or effective.

On the other hand, Fernandes (2018) evaluated the impact of visceral manipulation in patients with chronic nonspecific low back pain associated with functional constipation. The technique was applied to abdominal structures, such as the cecum, colon, and liver, in six consecutive sessions. The outcomes evaluated included low back pain, also measured by VAS, and bowel function based on the Rome III criteria.

In this study, the intervention resulted in a statistically significant decrease in low back pain compared to the control group. Pain was consistently reduced throughout the sessions, suggesting a cumulative effect of visceral manual intervention on pain perception (FERNANDES, 2018). In addition, the improvement in bowel function may have influenced the pain response, given the viscerosomatic component present in both clinical conditions.

Both studies reinforce the role of visceral manipulation as a potential tool in the approach to chronic pain, even when applied in different clinical contexts. The authors suggest that the effects of the technique are related not only to local action but also to autonomic modulation and the release of deep fascial tensions, which can directly impact nociceptive circuits.

Despite the positive results, it is important to highlight the methodological limitations present in both studies. Among them, in the study by Alves and Martins (2021), the number of participants and follow-up time may compromise the generalization of the findings. In Fernandes (2018), although the sample was larger, the absence of blinding and the reliance on self-reported measures are factors that increase the risk of bias.

Nevertheless, the consistency in the improvement of pain scores, verified through VAS in both studies, provides initial support for considering visceral manipulation as a complementary pain management strategy. The use of standardized instruments strengthens the credibility of the findings and contributes to the construction of an evidence base in the area.

Finally, the pain outcomes observed in both studies point to the need for further investigations with greater methodological rigor, which explore not only immediate efficacy but also the duration of therapeutic effects.

In addition, studies that combine subjective and objective measures of pain, such as biomarkers of inflammation or functional imaging tests, may elucidate the mechanisms underlying the action of visceral manipulation.

CONCLUSION

Visceral manipulation has demonstrated great therapeutic potential in meta-analyses; however, the methodological quality of one of the studies was at high risk of bias. It is worth considering that, in the GRADE approach, one of these studies presented great fragility in its design, thus demonstrating a low level of recommendation in the outcome of pain improvement.

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