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Kevin O'Brien*

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A Literature Review of The Effects of Manipulative Manual Therapy Techniques on Pain and Functional Outcomes of Individuals with Sacroiliac Back Pain

Kevin O'Brien

University of North Dakota School of Medicine and Health Sciences Department of Physical Therapy.

***Correspondence Author:** Kevin O'Brien, University of North Dakota School of Medicine and Health Sciences Department of Physical Therapy.

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Abstract

Sacroiliac joint dysfunction is frequently cited as a mechanism of lower back pain, yet its precise biomechanical contribution remains debated in the medical community. This literature review examines the relationship between manipulative manual therapy, specifically high-velocity low-amplitude (HVLA) thrust techniques, and patient outcomes in pain and functional disability for individuals with sacroiliac dysfunction. A systematic search of Cinahl, Embase, PEDro, and Pubmed yielded 563 articles, of which 12 met inclusion criteria. These studies consistently demonstrated statistically significant improvements in pain and functional outcomes following HVLA manipulation. Comparative analysis suggests HVLA manipulation is at least as effective, if not more, than other interventions like exercise and muscle energy techniques, with some studies showing greater benefits when manipulation is combined with exercise. However, limitations include small sample sizes and a lack of long-term efficacy data. Future research should focus on large-scale, longitudinal studies, and comparisons between specific manipulative techniques to enhance clinical application and training.

Key words: Pain ; Sacroiliac Back Pain

Chapter I

Introduction

Sacroiliac joint dysfunction is a commonly occurring, functionally debilitating mechanism of lower back pain. The biomechanical mechanism of dysfunction as well as the extent to which the sacroiliac joint contributes to back pain patterns are frequently debated among the medical community. Although controversy regarding the pathology mechanism and sacroiliac joint contribution to lumbosacral regional back pain exists, the individual and societal effects that lumbosacral back pain has on those that suffer from it is beyond dispute. Lumbosacral back pain has been identified as the leading cause for years lived with a disability on a global level.1 A Global Burden on Disease study conducted in 2017 showed an age-standardized point in time prevalence of 7.50% (CI 95%, SD +/- 0.75%) of the world population having active lumbosacral back pain.1 Although this study did identify global patterns in back pain by gender, age groups, and nation, it was found that back pain was prevalent and had risk for disability globally across all groups.

Given the frequency in the population, lumbosacral back pain is a condition that leads a great number of individuals to seek medical care. A study by Simopoulos et al, published in 2012, hypothesized 25% of patients with symptoms of low back pain have symptoms originating from dysfunction of the sacroiliac joint.2 There exists difficulty for practicing clinicians to of the sacroiliac joint to the pain pattern. In part, this is due to lack of standardization and debate about the accuracy of sacroiliac assessment techniques. Complicating the issue, the region of the sacroiliac joint is also a common referral zone for lumbar mechanical and radicular symptoms,3 as well as hip joint and musculature dysfunctions.4 This often requires extensive testing to rule out these other areas as the primary source of pain generation, or as a secondary source that is mechanically creating abnormal movement patterns and force distribution at the sacroiliac joint leading to sacroiliac dysfunction and pain.

Methods to effectively treat sacroiliac dysfunction, once diagnosed, have been equally debated. Traditional interventions such as rest, physical agent modalities, and sacroiliac support orthoses have been increasingly being deferred in favor of exercise-based intervention. Mobility and stretching exercises are frequently implemented to restore normal mobility of hypomobile lumbar, sacroiliac, or hip structures. Strengthening of the core, pelvic, and hip musculature is also common practice with the goal of providing biomechanical control and stabilization to the sacroiliac and surrounding regions. Clinicians are additionally utilizing manual therapy as

a method to reduce pain and restore mobility. These manual techniques vary widely, from non-specific to specific directional high-velocity low-amplitude (HVLA) thrust manipulations, muscle energy (MET) techniques, passive joint mobilizations, and soft tissue mobilization techniques.

Although numerous studies have examined the use of exercise5 and manual therapy6 treatment for lumbar back pain, markedly fewer exist specifically for the treatment of sacroiliac joint pain and dysfunction. Although it is prevalently used clinically as an intervention, research regarding the effectiveness of HVLA sacroiliac manipulation remains comparatively low. The purpose of this review is to utilize analysis of existing research to answer the question of what relationship exists between the application of manipulative manual therapy treatment for sacroiliac dysfunction with patient pain and function outcome measures. A secondary goal of this review is to utilize examination and compilation of existing study data to compare manipulation techniques to other interventions to assist in identifying areas for further research.

Chapter II

Methods

A search of existing literature was performed utilizing the electronic databases Cinahl, Embase, PEDro, and Pubmed. A single reviewer performed the literature search and analysis of the returned database articles for criteria for inclusion or exclusion and quality of study. The database search was globally limited to English language articles and human subject trials. Keywords for the search performed are listed in Table 1. Boolean search tactics were applied during this search, using various combinations of the terms listed with "AND", "OR", "NOT" modifiers in various combinations. Attention was paid to include terminology that reflected broad terminology within the fields of medical practice for diagnosis and intervention techniques. Search terms also included different measures of dependent variables such as "pain" or "functional gait" to assist in finding literature that did not focus on any one specific area of patient response to intervention as a measure of comparison.

Table 1: Keywords used in the literature search.

Sacroiliac	Exercise	Dysfunction
Sacral	Pain	Radicular
Innominate	Gait	Sacrum
Manipulation	Functional	Ilium
Mobilization	Directional	Pubic Symphysis
Muscle Energy	Specific	Core Strength
Manual Therapy	Non-Specific	Pelvic

Table 1: Keywords used in the literature search.

The initial search yielded 563 citations. Following an initial assessment and categorization of literature, inclusion and exclusion criteria were developed for this literature review. Articles primarily selected for inclusion were studies directly comparing manipulative sacroiliac manual therapy with exercise-based interventions. These were deemed most pertinent to the research question at hand. Secondary inclusion were studies comparing joint mobilization or muscle energy manual therapy techniques to exercise-based intervention. Lastly, studies comparing manipulative treatment to other forms of treatment such as physical agent modalities or sacroiliac joint injections were reviewed to provide an additional assessment of manipulative therapy effect without the effect of exercise interventions.

Exclusion factors focused mainly on study design, sample size, and scope of the published article. Literature reviews and meta-analysis articles were excluded to allow this literature review to focus on primary research sources. Case studies, case analysis, and priori / trial study articles were likewise excluded due to sample size constraints. Large sample size research on this topic was limited, so for this case report focus was given to randomized controlled trials with sample sizes greater than 30 participants. Articles were also scanned for the scope of the study, with some studies being excluded for having numerous independent and dependent factor categories that diluted the sample sizes into small samples for each factor. Studies that were not specific to the sacroiliac joint, such as studies including non-specific lumbar back pain, were not included to maintain the scope of this literature review. Lastly, studies performed prior to 1990 were excluded to provide a current analysis of the available literature regarding sacroiliac joint manipulation and assist in identifying areas of need for additional research.

Chapter III

Results

Following critical review of title and abstract information and removal of duplicate search returns, of the initial search result of 563 articles, 31 were retained for full-text review. Inclusion and exclusion criteria and analysis of study design quality were applied to the complete article analysis and yielded 12 studies for inclusion in this literature review. Manipulative technique studies performed by physical therapists that met the inclusion and exclusion criteria were preferred for the scope of this review, but manipulation interventions performed in the setting of chiropractic or osteopathic medicine were considered if they met the inclusion criteria. Once selected for inclusion, the 12 articles were categorized by inclusion and exclusion criteria, intervention independent variable subgroups and outcome measures applied to the study participants.

Upon review, there were similarities in study inclusion design that became evident. 11 of the 12 studies utilized sacroiliac provocation testing7-17 and 8 utilized sacroiliac mobility testing7,8,13-18 as a means of identifying the sacroiliac joint as the source of pathology. Regarding sacroiliac provocation testing, a majority utilized an inclusion requirement that at least 3 provocative tests must be positive.7-10,12-14,17 Of these, most utilized provocation tests included Laslett's cluster, a battery of tests based on Laslett's work19 in diagnosing sacroiliac dysfunctions, consisting of Gaenslen's test, sacroiliac distraction, thigh thrust, sacroiliac compression, and sacral thrust. Also commonly included were sacroiliac motion tests such as the Gillette test, standing forward bend test, and functional leg length seated flexion test. Of the observed inclusion criteria, Gaenslen's test was the most common, followed by Gillette's test, and pain complaints greater than 3 out of 10 on a ten-point visual analogue or numeric scale. Measures of outcome assessment also demonstrated similarities across studies. The most common outcome measure utilized was pain rating assessment, either through the Visual Analogue Scale (VAS)8,9,11-13,15-17 or the Numeric Pain Rating Scale (NPRS).10,14,18 Both scales measure subject pain levels on a 1 to 10 rating scale, providing simple comparison between studies. The second most common outcome measure utilized were results of a functional disability rating questionnaire. The Oswestry Disability Index was the most frequently utilized in eight of the twelve studies,7-9,13-16,18 followed by utilization of the 36-Item Short Form Survey (SF-36)7,10,12 and Roland-Morris Disability Questionnaire8,10,11 in 3 studies each. Other studies

included objective functional measures such as the Timed Up and Go test,8 pressure sensitivity threshold,11,17,18 anxiety 16 and depression inventories,18 and lumbar range of motion assessment10,17 as dependent variables in outcome assessment.

Of the 12 studies included in this literature review, all of them included an intervention grouping that involved treatment of sacroiliac dysfunction via the application of high-velocity low-amplitude (HVLA) joint manipulation technique.7-18 Eight of the studies involved 2 distinct intervention groups,9-11,13-17 with the remaining 4 studies being 3 group design.7,8,12,18 Of the 3 group design studies, 2 involved the third group "C" serving as a combination of interventions applied to groups "A" and "B". In the studies with distinct intervention groups, the outcome effects of sacroiliac HVLA manipulation was most frequently compared to those of lumbopelvic exercise,7-9,12,13,16,18 followed by muscle energy techniques (MET),14,15,18 myofascial release,10 electrical stimulation,11 and therapeutic sacroiliac joint injection12 interventions. Only 1 of the studies had a true control (no intervention) group.17 The most utilized interval from variable baseline assessment to post-intervention assessment was 4 weeks, utilized in 6 of the 12 studies.7,9,11,13,16,18 Two week14,15,18 and 12 week8,10,12 assessment intervals were utilized in 3 studies each. The remaining studies utilized intervals ranging from 1 day to 24 weeks post-intervention. In addition, 6 of the published articles noted the use of repeat measure designs taken at multiple intervals during the study.7,8,12,15,16,18

Regarding the effect of sacroiliac HVLA manipulation on subject's pain rating scale scores, all 12 studies that assessed pain showed a statistically significant ($p<.05$) improvement in pain rating on the VAS or NPRS pain scales over the intervals outlined by the study.7-18 A high level of significance, ($p<.001$) was noted in 5 of the 6 studies with reassessment intervals of 4 weeks or less.11,13,14,17,18 A statistically significant improvement ($p<.05$) on standardized disability questionnaire scores such as the Oswestry, Roland-Morris, and SF-36 was also calculated on 10 of the 11 studies that utilized one of these questionnaires as a measure of outcome assessment.7-14,16,18 As with pain scale scores, high level of significance ($p<.003$) in functional outcome scale change was noted in 5 of the 6 shorter term studies of 4 weeks or less.11,13,14,18

In addition to pain and functional disability effects, statistically significant effects in other variables were noted in some of the articles. Castro-Sanchez et al, noted significant improvement ($p<.001$) in lumbar flexion range of motion and abdominal isometric muscle contraction control.10 Elimination of positive sacroiliac abhorrent motion and provocation tests were also noted in the study by Nejati et al, with Gillette's, posterior shear, and sacroiliac compression testing showing significant improvement ($p<.05$).8 Two of the 3 studies including pain pressure threshold assessment showed significant improvement in this factor ($p<.05$),7 ($p<.001$),18 with the third study by Vaseghnia et al noting no significant change ($p = .15$-$.53$)17

Besides directly assessing the effects of sacroiliac HVLA manipulation, comparisons between manipulation and other interventions need to be made. Of the 12 studies included in this review, 7 directly compared manipulation to lumbosacral exercise intervention.7-9,12,13,16,18 With the exception of the study by Kamali et al in 2019 which showed no significant difference,9 the other 6 studies showed significance ($p<.05$) in improvement in pain rating and functional disability questionnaire scores favoring intervention effect of manipulation over exercise.7,8,12,13,16,18 Of these, the studies by Javadov et al7 and Nejati et al8 also included a third group consisting of combined exercise with manipulative intervention. The study by Nejati et al in 2019, demonstrated significant improvement in pain rating and Oswestry scores in subjects in manipulative therapy and manipulative therapy combined with exercise groups compared to exercise only groups at 6 and 12 weeks. This effect was no longer significant at the final 24 week interval, when there was no significant difference in pain or Oswestry scores between the 3 groups.8 Following this, the research published by Javodov et al in 2021, demonstrated significant improvement ($p<.05$) at 4 and 12 week intervals in both VAS pain scale and SF-36 functional disability scores in a group combining manipulation with sacroiliac specific exercise, when compared to two other groups consisting of manipulation with lumbar exercise and lumbar exercise alone.7

Another common intervention for sacroiliac pathology is muscle-energy techniques (MET). Comparison to of HVLA manipulation to MET was made in three of the included studies.14,15,18 In 2015, a study by Patel et al. showed a statistically significant difference in improvement in subject sacroiliac seated forward flexion test, standing forward flexion test, and Gillet test results.15 In this study, HVLA manipulation of the sacroiliac joint was compared to an MET intervention group and a control group receiving a sham MET intervention. Both the HVLA and MET intervention groups showed statistically significant improvement ($p<.05$) in the test variables, but HVLA showed to be more effective ($p<.032$ - $.191$) than MET.15 Hatik et al. demonstrated similar results in 2022, showing that manipulation, MET, and therapeutic exercise all significantly ($p<.001$) improved subject pain, Oswestry scores, and pain pressure threshold at 2 and 4 week intervals.18 Comparative analysis determined that HVLA manipulation of the sacroiliac joint was significantly better ($p<.001$) at improving previously noted variables than MET or therapeutic exercise.18 A study by Fatima et al. in 2020 also showed statistically significant improvement ($p<.001$) in the variables of pain rating and Oswestry scores for both intervention groups of HVLA sacroiliac manipulation and MET, but in this case did not detect statistically a statistically significant difference between intervention groups.14

Of the remaining studies, manipulation was shown to be statistically better ($p<.05$) at reducing pain and improving Oswestry scores than treatment with electrical stimulation.11 No significant difference ($p>.05$) was detected in improvement of pain, disability index scores, or lumbar mobility when compared to intervention with myofascial release10 or sacroiliac injection.12

Chapter IV

Discussion

The results of this literature review show consistency in the research that HVLA manipulation of the sacroiliac joint is an effective intervention at reducing pain and improving self-rated functional disability questionnaire ratings. Subjects in all of the studies meeting the criteria for this review showed improvement in selected test variables with intervention with HVLA sacroiliac manipulation. These results provide clarity providing an answer that sacroiliac manipulation does have direct positive clinical effect for patients with sacroiliac dysfunction, which was the primary research question this literature review was designed to address.

The secondary goal of this review was to determine the comparative efficacy of utilizing manipulation for sacroiliac dysfunctions versus other intervention options. Reviewing the literature available, manipulation seems to be at least as effective and possibly more effective than the other commonly interventions of exercise and muscle energy techniques. The review of literature did not demonstrate cases of significant adverse reactions, indicating some level of confidence in the safety HVLA intervention can be assumed. In addition, application of HVLA manipulation was applied throughout the literature to a variety of subject

population characteristics (age, gender, activity level, chronicity) with a defined presentation (provocation testing, mobility testing, pain patterns) that should allow for more ease of prescription as an intervention clinically. There is a consistent theme across the literature that therapeutic exercise seems to provide benefits to patients with sacroiliac dysfunction. Given that most of the articles are demonstrating fairly equivalent effects of manipulative treatment to exercise,8,9,12,15,18 and some demonstrating increased efficacy when the two interventions are combined,7 the potential for use of sacroiliac manipulation as an adjunct to therapeutic exercise, or to attempt to treat non-responders to exercise based intervention, cannot be overlooked. Although more studies are needed, it is also encouraging to see similar results in intermediate duration pain and disability scores when compared to sacroiliac injection under fluoroscopy. Potential manipulative benefits of cost-effectiveness and invasive procedure risk avoidance would warrant further comparison studies in this area.

The primary limitations of the existing studies on manipulation for sacroiliac dysfunction are low sample size and lack of long-term effect analysis. This was present to some degree in many of the studies included in this review, and in the case of sample size, was a primary cause of exclusion for many more. Opportunities certainly exist for development of larger scale studies and studies that longitudinally follow subjects over six to twelve-month post-intervention to help in determining long-term efficacy of utilization of HVLA sacroiliac manipulation as a treatment intervention.

Another area that would benefit additional study would be direct effect comparison of specific manipulative techniques. In reviewing articles for inclusion, it became evident that very few studies exist comparing specific manipulative interventions, and that most of the studies comparing manipulation to other forms of intervention frequently are utilizing different techniques of manipulating the sacroiliac joint. Some utilize more global “non-directional” thrust techniques, while others implement specific “directional” thrusts to correct a perceived innominate or sacral malpositioning or mobility restriction. Comparison of these subgroups may prove beneficial in determining the level of training needed for the clinician to effectively perform sacroiliac manipulation, as well as assist in increasing the adoption of HVLA manipulation by practicing clinicians.

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