

OSTEOPATHIC MANIPULATIVE THERAPY (OMT) TO PREVENT INJURIES
IN COMPETITIVE SLED DOGS AND ENHANCE LIFELONG PERFORMANCE

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1. INTRODUCTION: CONTEXT AND ORIGIN OF THE RESEARCH PAPER

This research paper in animal osteopathy, with a specialization in dogs, is closely connected to my personal and professional experience. As a musher, or sled dog driver, I have been involved in the competitive sled dog world for more than thirty years. Over that time, I have assumed many roles in relation to my canine athletes, including trainer, mental coach, nutritionist, and caregiver. These responsibilities have continually encouraged me to seek out, evaluate, and apply the most effective practices in each of these areas.

Because I have long recognized the importance of massage in supporting recovery in my dogs, I have used these techniques for many years. My interest in manual therapy was further strengthened through my involvement with the veterinary team at the Pedigree Stage Stop Race in Wyoming, which included manual therapists and chiropractors. During the seven years in which I participated in this race, their generosity and willingness to share knowledge proved decisive. Their influence ultimately inspired the topic of this thesis: an examination of whether osteopathic manipulative therapy (OMT) may help prevent injuries in competitive sled dogs.

The following sections examine the proportion of musculoskeletal injuries in competitive sled dogs, as these injuries play a major role in the health, welfare, and performance of canine athletes during competition. This research paper describes the types of injuries most commonly observed, their prevalence, and their potential effects on a dog's ability to compete and maintain a long, healthy athletic career.

Injuries That May Be Addressed with OMT in Competitive Sled Dogs

The discussion first examines the types of injuries that sled dogs may experience during competition in order to assess whether OMT may be useful before events and throughout the athletic career.

Causes of Musculoskeletal Injuries

The thesis then briefly reviews the potential causes of these injuries, drawing connections between the demands of competitive racing and the physical strain placed on the dogs. Understanding the origins of musculoskeletal injury is essential for evaluating the possible role of OMT in prevention and in maintaining the long-term health of the canine athlete.

Evaluating Osteopathic Treatment for Injury Prevention

Finally, this research paper analyzes whether the implementation of a preventive osteopathic approach could reduce the incidence of injuries during sporting competition. By evaluating the potential effectiveness of such an approach, the study aims to determine its value in protecting the health, performance, and longevity of sled dogs throughout their athletic careers.

2. INJURIES THAT MAY BE ADDRESSED WITH OMT IN COMPETITIVE SLED DOGS

2.1 Proportion of musculoskeletal injuries in competitive sled dogs

Extensive research has been conducted on sled dog competitions over the years, particularly long-distance races such as the Iditarod in the United States and the Yukon Quest in Canada. These studies have provided valuable insight into the health, performance, and challenges experienced by sled dogs during these demanding events. The findings are especially meaningful because they are based on large datasets. For example, several hundred dogs underwent veterinary examinations before races, and more than 500 records were analyzed (Hattendorf et al., 2024; Trudova et al. 2021).

Overall, the reviewed studies report highly consistent results. Among dogs that completed the competition, orthopedic injuries were the most common health problem, exceeding gastrointestinal and cardiorespiratory disorders, with a proportion of 32.9% (Hattendorf et al., 2024), 50.6% (Von Pfeil et al., 2015), and 40% (Trudova et al., 2021).

More specifically, orthopedic injuries occurred predominantly in the thoracic limb, accounting for more than 30% of reported injuries (Hattendorf et al., 2024; Trudova et al. 2021; Von Pfeil et al., 2015). Carpal injuries appeared to be more prevalent on slower, long-distance trails, whereas shoulder injuries seemed to predominate on faster trails or in the presence of equipment-related deficiencies

Although stage races involve shorter and faster courses, their results are comparable to those reported in long-distance events: orthopedic injuries, most often located in the thoracic limb, remain the principal health problem observed in racing sled dogs. In a personal interview, Dr. Veronica C. Duvall (23/09/2025), lead veterinarian at the Pedigree Stage Stop Race, shared the injury profile observed during the 2025 event.

“Shoulder strains injuries predominated (25%) particularly the brachiocephalic unit, followed by a lower incidence of biceps injuries. Very few triceps strains were noted and on occasion, the teres minor and latissimus muscles were involved.”

As reported in studies on canine agility injuries, shoulder and carpal injuries were among the most frequent. Shoulder injuries are associated with rapid turns, sudden changes in direction, and slippery surfaces. These conditions increase mechanical stress on the muscles and ligaments of the shoulder, thereby increasing the risk of injury.

This distribution can be explained by the biomechanical role of the thoracic limb, which supports approximately 60% of body weight and is responsible primarily for stabilization, steering, turning, and part of propulsion (Zink & Schlehr, 2020; Fourriez-Lablée, 2004; Trudova et al., 2021). By contrast, the pelvic limb, which bears about 40% of body weight, is mainly responsible for thrust and power. These functional differences help explain why the thoracic limb is more predisposed to injury than the pelvic limb (Hattendorf et al., 2024).

2.2 Affected areas of the thoracic limb

2.2.1 The shoulder girdle

The shoulder joint is formed by the articulation between the scapula and the humerus, creating a ball-and-socket joint. The scapula is a flat, triangular bone that supports the shoulder and plays an essential role in thoracic limb movement, while also limiting lateral displacement during weight bearing. It also contributes to lateral flexion of the neck. Importantly, in dogs the scapula has no direct bony attachment to the axial skeleton and is instead connected solely through muscular attachments. The group of muscles commonly referred to as the shoulder girdle provides attachment, stability, and mobility to the scapula, which makes this region particularly susceptible to injury (Alexander, 2020).

Within the thoracic limb, shoulder injuries are among the most common. More specifically, several components of the shoulder girdle appear to be affected, including the brachiocephalic unit (Duvall, 2025), the biceps, the triceps, the pectoral muscles (Trudova et al., 2021), and, less frequently, the teres minor and latissimus muscles (Duvall, 2025).

2.2.2 The carpal joint

The carpal joint is located between the radius and ulna proximally and the metacarpal bones distally. One of its primary functions is to absorb shock, thereby protecting and supporting the limb. In addition, the carpus provides attachment sites for certain forelimb muscles and

contributes to limb movement. Repetitive high-impact stress on this joint may lead to swelling because of increased production of inflammatory joint fluid (Alexander, 2020).

Carpal disorders are recognized as a major concern in sled dogs, yet they are often underestimated. If left untreated, these conditions can lead to compensatory movement patterns that progress proximally and may eventually affect the spinal column. Conversely, compensation originating in the shoulder or elbow may also contribute to the development of carpal problems. Carpal hyperextension injuries are another major challenge in sporting dogs (Henneman, 2018). At high speed, the load bear by the thoracic limb can place this joint at risk of overstretching.

2.2.3 The forepaws and hindpaws

Proper paw function is essential to canine mobility. In the mushing community, it is often said: “no feet, no dog.” Distal to the metacarpals and metatarsals are the phalangeal bones, which make up the five digits. Digits two through five each contain three phalanges, whereas the first digit, commonly called the dewclaw, contains two phalanges and, in the forepaw, has a bony attachment. Paw injuries are relatively common in sled dogs and may include split pads, fissures, keratinization disorders, abrasions, sprains, tendon ruptures leading to dropped toes, interdigital disorders, nail bed infections, and similar conditions. Any injury affecting the paw may have wider biomechanical consequences, as compensatory mechanisms can alter the dog's overall movement pattern.

2.3 Soft tissue injuries and common issues in sled dogs

2.3.1 Muscle strains

Muscle strain is the most common type of muscular injury and involves tearing of muscle fibers or tendons as a result of overstretching, excessive load (Duvall, 2025), or an unusual effort (Fourriez-Lablée, 2004). Strains may be chronic, often arising from repetitive activity, or acute, typically caused by events such as slipping or abrupt changes in direction. Severity ranges from mild (grade 1) to severe (grade 3). After the inflammatory phase, repair occurs through the formation of scar tissue. This scar tissue is more vulnerable to recurrent injury and may reduce muscle flexibility by as much as 50%. In sled dogs, commonly affected muscles include superficial pectorals, infraspinatus, external abdominal obliques, lumbar epaxial muscles, gluteals, and gracilis.

2.3.2 Tendon issues

Tendons connect muscles to bones and are extremely strong, allowing them to withstand considerable tension. Nevertheless, repetitive use or sudden, forceful movements may lead to inflammation, pain, and swelling, a condition referred to as tendinitis or tendinopathy. In sled dogs, the biceps brachii and Achilles tendons appear to be the most commonly affected (Henneman, 2018).

2.3.3 Muscle-related disorders

Suzanne Alexander (2020) describes several muscular problems that may occur in sporting dogs. The following concepts are particularly relevant to the present discussion. Each of them could be addressed with OMT.

Trigger Points. *A band of taught fibres within a muscle, commonly referred to as a knot. Can cause debilitating levels of pain and lead to 'fake fatigue' in the muscle.*

Hypertonicity. *Too much resting tone in the muscle fibres, the muscle is unable to relax and thus more vulnerable to injury. A hypertonic muscle may or may not be tight.*

Tight muscle. *A 'sick' muscle. One which is held in an abnormally shortened state and also more vulnerable to injury. It may or may not be hypertonic.*

Myofascial pain syndrome. *Fascia is the environment in which the nervous system lives. It is continuous throughout the body, like a giant web, encompassing all the internal organs, bones, muscles and skin. Fascia can become dysfunctional for many reasons such as injury, surgical procedures, repetitive activities, dehydration, emotional trauma, conformational weakness, orthopaedic/neurological conditions and daily*

activities. It can also stick to itself and other structures, this is known as adhesion.

2.3.4 Ligament sprains

Ligaments connect bones and are strong structures with limited flexibility; however, overstretching or tearing results in a sprain. Sprains range from minor tears to complete rupture with bone involvement. In sled dogs, the carpal and tarsal joints are the most affected.

Taken together, the available research in competitive sled dog racing provides a detailed overview of the anatomical regions and soft-tissue structures that are most vulnerable to injury.

3. CAUSES OF INJURIES: RISK FACTORS

Research indicates that several risk factors contribute to orthopedic injuries in sled dog competitions. In her doctoral thesis, Fourriez-Lablée (2004) identifies a number of intrinsic risks, including genetic predisposition, the dog's upbringing and environment, nutrition, and training. In addition, extrinsic factors such as trail conditions, race format, and musher influence may also play an important role in the development of musculoskeletal injuries. This paper focuses on three major groups of factors.

3.1 Health status prior to competition

One important risk factor is the presence of recent or ongoing musculoskeletal problems before competition. Research shows that thorough veterinary evaluations, including regular physical examinations, are commonly performed before endurance sled dog races. Consequently, the detection of a health problem may lead to a dog's withdrawal from competition for medical reasons (Hattedorf et al., 2024, Duvall, 2025). Dogs that enter races with pre-existing health concerns are more likely to sustain injuries, including muscle strains, joint problems, and other disorders. Studies in human athletes likewise suggest that musculoskeletal symptoms may arise from infections, arthritis, or a range of other conditions (Villa-forte, 2025). In her interview, Duvall also emphasized that even a toe injury can trigger compensatory patterns that may ultimately result in lasting orthopedic damage.

During the Yukon Quest (2018–2020), thirty dogs with a history of health problems or previous injuries subsequently participated in later races. Although these cases were considered resolved during the year according to their owners, five recurrent injuries at the

same anatomical location were identified in four dogs (13%) (Hattendorf et al., 2024). While this proportion may be lower than expected, recurrence at the same site highlights the need for careful monitoring and targeted intervention once a specific weakness has been identified.

Working and sporting dogs are bred for drive and determination, and they often continue to perform despite pain or discomfort during training. There may therefore be a stage of dysfunction that precedes visible musculoskeletal injury. For example, Fourriez-Lablée (2004) identified a group of muscular disorders without visible lesions that may progress to true muscle injury if left untreated. According to the author, canine athletes may experience soreness, tightness, or cramping related to factors such as training and nutrition. As a result, a low sensitivity to pain may allow minor problems to progress into more serious conditions. These findings underscore the importance of entering competition in good health and suggest that poor pre-race conditions substantially increase the risk of injury. They also support the value of regular musculoskeletal monitoring and maintenance in canine athletes.

3.2 Physical preparation and training

Inadequate training is a recognized factor that increases a dog's susceptibility to injury. When sled dogs do not undergo appropriate conditioning, their musculoskeletal system does not adapt sufficiently to the specific demands of racing, making them more vulnerable to strains and other musculoskeletal disorders (Hattendorf et al., 2024; Henneman, 2018-2019, Fourriez-Lablée, 2004).

By contrast, appropriate training programs play an important role in improving the quality and resilience of ligaments and tendons. Effective conditioning not only strengthens muscles, but also enhances anaerobic power and maximal aerobic capacity, all of which contribute to performance and may reduce the risk of injury. For example, the threshold for muscle soreness appears to increase with training (Fourriez-Lablée, 2004). Von Pfeil et al. (2015) statistically associated carpal injuries with greater prerace and race distances traveled, suggesting that overuse of this joint may occur in some dogs.

On the other hand, over conditioning may increase the likelihood that a dog enters competition with pre-existing musculoskeletal discomfort, injury, or general fatigue (Hattendorf et al., 2024; Von Pfeil et al., 2015). The same authors also observed a trend suggesting that greater training distances before the race were associated with fewer shoulder injuries. This may reflect improved conditioning, as increased contractile work in the shoulder muscles could better prepare soft tissues for racing.

In summary, well-designed training is essential to prepare canine athletes for the demands of the course while minimizing the risk of injury.

3.3 Extrinsic risk factors

The third group of risk factors concerns the conditions encountered on the trail and the way the sled dog team is managed during the race. Following the 2025 Pedigree Stage Stop Race, the veterinary team conducted an unofficial survey to explore the relationship between orthopedic injuries and trail conditions. Their observations indicate that downhill sections, sharp turns, and uneven or punchy trails were predominantly associated with shoulder

injuries (Duvall, 2025). These course characteristics often require abrupt directional changes, which may increase the risk of orthopedic injury. In some years, increased ice accumulation also leads to slips and reduced traction during tight turns. During snowstorms, heavy snowfall may obscure groomed trails and cause dogs to deviate from the course, potentially resulting in thoracic limb injuries (Hattendorf et al. 2024).

Von Pfiel et al. (2015) documented orthopedic injuries sustained by dropped dogs during the 2011 Iditarod and associated these injuries with several risk factors, including travelling speed and age. Race format and the specific challenges encountered during an event may also affect canine health in different ways. Sprint races require maximal speed, stage races combine speed and endurance, and long-distance races demand exceptional stamina. Because each format emphasizes somewhat different movement patterns (trot, canter, gallop), canine athletes must possess different physical capacities.

The musher's individual decisions, together with trail conditions, contribute substantially to a team's vulnerability to injury. It is therefore essential for mushers to manage their canine athletes in a way that respects both training status and current health. Key management factors include regulating average speed, planning appropriate rest-to-run schedules, and controlling downhill speed. Pushing athletes beyond their limits inevitably increases the likelihood of injury, making careful management and respect for each dog's capacities essential for safety and welfare.

Ultimately, both environmental conditions and musher judgement influence whether a dog sustains an injury (Hattendorf et al. 2024).

In summary, orthopedic injuries may result from the interaction of high physical demands, inadequate trail conditions, musher skill and decision-making. In addition, the overall health status of the dog remains a major determinant of injury risk. Better health and more appropriate preparation are therefore associated with a lower likelihood of musculoskeletal injury.

The following chapter examines whether OMT may contribute to the prevention of musculoskeletal problems in light of the evidence discussed in Sections 2 and 3.

4. EVALUATING OSTEOPATHIC MANIPULATIVE THERAPY (OMT) FOR INJURY PREVENTION

As discussed in the previous sections, orthopedic injuries are the most frequently reported health problems in racing sled dogs. Dogs diagnosed with orthopedic injuries are less likely to start and/or complete a race than dogs without such conditions. Nevertheless, these injuries vary in severity, and many affected dogs are able to recover and return to competition within the same race (Hattendorf et al. 2024) or later in the season. This section examines whether diligent musculoskeletal maintenance, including osteopathic manipulative therapy (OMT), may contribute to injury prevention in sled dogs.

Although manual therapy and other complementary approaches are becoming increasingly common in the mushing community and, more broadly, in the world of sporting dogs, very few studies have examined these practices specifically in sled dogs. For that reason, the literature review for this thesis was broadened to include evidence from human medicine, agility dogs, other sporting dogs, and pet dogs receiving musculoskeletal treatment.

4.1 OMT as a treatment for musculoskeletal injuries in dogs

Before assessing OMT as a preventive intervention, it is important to consider its effectiveness as a treatment modality. Research in dogs suggests that OMT may improve mobility and overall comfort in both sporting and companion animals, although its therapeutic efficacy remains difficult to measure with precision.

For example, one rehabilitation study in sled dogs reported that, among ten huskies with shoulder girdle myopathosis, five dogs in the treatment group achieved full recovery following a protocol that combined low-frequency magnetic therapy with manual therapy, whereas the five dogs in the control group did not achieve complete restoration. However, the very small sample size limits the strength of these findings (Trudova et al., 2021).

Similarly, Spinella et al. (2021) observed that a multimodal physiotherapy approach—including adequate rest, manual therapies, adjunctive modalities, and owner education—may positively influence muscle healing and reduce clinical signs. In that study, the primary lesion involved the iliopsoas muscles; however, the sample again consisted of only ten sporting dogs.

Lane and Hill (2016) expanded this body of evidence by studying a larger group of 47 pet dogs with lameness. All dogs responded favorably to a combined acupuncture and manual therapy protocol, showing immediate short-term improvements in comfort and mobility.

Finally, Gulda and Lik (2018) reported improved movement parameters in 36 agility dogs. Their findings suggest that systematic manual therapy may support anatomical function, reduce muscle tension, and increase metabolic activity within the musculoskeletal system.

4.2 Evidence on the efficacy of OMT in human health

In human health care, the efficacy of osteopathic manipulative therapy (OMT) continues to be assessed through a growing body of research. A comprehensive review of studies published between 2011 and 2020 (Liot, 2023) found no significant difference between

treatment groups and placebo, except in cases of rachialgia (spinal pain), in which improvements in pain and function were reported within the treated group.

A meta-analysis by Ceballos-Laita (2024), based on nine scientific articles, likewise found no substantial evidence supporting the effectiveness of OMT for the health conditions examined. Importantly, this review did not focus exclusively on musculoskeletal injuries but considered the broader range of pathologies for which OMT may be proposed.

By contrast, a scoping review by Molinari (2025), which examined the effects of OMT on balance, quality of life, and pain management in geriatric patients, concluded that OMT may represent a valuable therapeutic approach within personalized care for this population. According to that review, integrating OMT into osteopathic clinical practice may support well-being and healthy aging in older adults.

These suggest that OMT may be beneficial for musculoskeletal conditions despite persistent limitations in the evidence base. The authors of these papers consistently note methodological weaknesses, including limited datasets and heterogeneity among studies, which may affect the interpretation of outcomes.

4.3 OMT as a preventive tool for musculoskeletal injuries

Working dogs often have a high pain threshold and may continue performing despite early discomfort. As a result, minor musculoskeletal problems can go unnoticed until they develop into more serious injuries. From a preventive perspective, caregivers therefore need reliable ways to identify dysfunction early and intervene before performance declines or structural

damage worsens. In this context, the central hypothesis of this thesis is that regular manual therapy maintenance may support the health, performance, and longevity of canine athletes. The evidence reviewed in Sections 4.1 and 4.2 suggests that osteopathic manual therapy (OMT) may help manage musculoskeletal injuries, even if the strength of the evidence remains variable. In sled dogs, this preventive potential becomes especially relevant because the main injury patterns, risk factors, and frequently affected muscle groups are already relatively well defined. This makes it possible to apply OMT in a more targeted way, with attention to the regions most exposed to strain during training and competition.

From an osteopathic perspective, preventive care is not limited to treating an obvious injury after it appears. Instead, it aims to maintain tissue mobility, support circulation, and preserve balanced function throughout the body. This broader view is especially useful in canine athletes, where a subtle restriction, compensation pattern, or loss of structural balance may precede the visible injury itself. For that reason, integrative manual approaches may play an important role not only in rehabilitation, but also in ongoing body maintenance designed to reduce vulnerability to future injury (Gulda & Lik, 2018; Henneman, 2018).

In practical terms, this means that prevention should not focus only on restoring function after tissue damage. It should consider whether the dog's pre-injury movement patterns, workload distribution, or structural balance may already have increased the risk of injury. Seen in this way, OMT may contribute to preventive care by identifying dysfunction earlier, addressing compensation before it becomes more severe, and helping maintain a more efficient musculoskeletal system throughout the racing season.

5. CONCLUSION

In summary, the evidence reviewed in this paper suggests that preventive osteopathic manipulative therapy may help dogs enter competition in better musculoskeletal condition and could therefore lower the risk of injury. In a preventive approach, the thoracic limb should receive particular attention.

OMT may be a valuable supportive approach in musculoskeletal care, with possible benefits for the health, performance, and long-term athletic longevity of canine athletes. However, more research focused specifically on sled dogs is needed to better define its preventive value and clarify its role in athletic management.

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