Riley L. M., Satchell L., Stilwell L. M. et al.

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ORIGINAL RESEARCH

Effect of massage therapy on pain and quality of life in dogs: A cross sectional study

Lisa M. Riley[1,2] | **Liam Satchell**[3] | **Lisa M. Stilwell**[4] | **Natalie S. Lenton**[5]

[1] Centre for Animal Welfare, University of Winchester, Winchester, UK

[2] Sparsholt College Hampshire, University Centre Sparsholt, Winchester, UK

[3] Department of Psychology, University of Winchester, Winchester, UK

[4] Meryll House, Canine Massage Guild, Worcestershire, UK

[5] Meryll House, Canine Massage Therapy Centre Ltd, Worcestershire, UK

Correspondence
L.M. Riley, Centre for Animal Welfare, University of Winchester, Sparkford Road, Winchester SO22 4NR, UK.
Email: Lisa.Riley@winchester.ac.uk

Abstract

Background: Clinical canine massage involves muscle tissue manipulation and fascial release techniques to rehabilitate injured soft tissues. Quantitative efficacy data are lacking. This cross-sectional study aimed to determine how dogs respond to canine massage therapy practiced by Canine Massage Guild UK practitioners.

Methods: In 2018, case notes from a convenience sample of 527 dogs were shared, with permission from owners, by a self-selected sample of 65 practitioners. Changes in number and severity of issues for five pain indicators (gait, posture, daily activity, behaviour, performance) and quality of life score, reported by owner and practitioners, were investigated.

Results: Significant reductions in reported pain severity scores were recorded for all pain indicators over successive treatments ($p < 0.001$), with each treatment causing further significant reduction in pain severity. Number of pain indicators recorded over successive treatment sessions remained constant, in keeping with a cohort presenting with degenerative disease and chronic pain. All dogs and diagnostic variables responded similarly. Post-treatment a dog was significantly more likely to have a 'positive' quality of life.

Conclusions: This cross-sectional study indicates canine massage therapy may effectively reduce myofascial and musculoskeletal pain severity reported by owners and practitioners associated with gait, posture, behavioural and performance issues and reduction in daily activities. Although this is not a double-blind trial, and there is no control group, this study suggests massage therapy may be a valid treatment for myofascial and musculoskeletal pain typically derived from muscular injuries, arthritis/other orthopaedic conditions.

INTRODUCTION

Clinical Canine Massage Therapy (hereafter massage therapy or therapeutic massage) is achieved by the application of a range of manual techniques (e.g., effleurage, compression, friction, percussion and stroking)[1,2] to a dog's fascia and muscle by skilled practitioners[3] following veterinary consent or referral[4] to address musculoskeletal injury, disorder and/or disease.

Gait issues, muscle weakness, myalgia, localised tremors and postural changes typically caused, in dogs, by osteoarthritis, degenerative changes, neuropathies, post-surgical trauma and joint dysfunction,[3] overload muscles (or cause overuse of muscles) and initiate the formation of myofascial trigger points (MTPs) restricting motor output, inhibiting sensory input and reducing quality of life, leading to incapacitating pain.[5] Myofascial pain syndrome (MPS) results when MTPs activate muscle nociceptors and neuroplastic changes in dorsal horn neurons lead to hypersensitivity and allodynia.[6] Palpation is one diagnostic tool for recognising MTPs,[7] yet palpation is often overlooked during veterinary examinations[3] and in veterinary practice generally.[8] Similarly, muscle strain injury (in isolation or in conjunction with an orthopaedic pathology) may contribute to, or cause, acute lameness and is also under-diagnosed.[9] Therapeutic massage, via palpation, aims to rehabilitate injured soft tissues.[7]

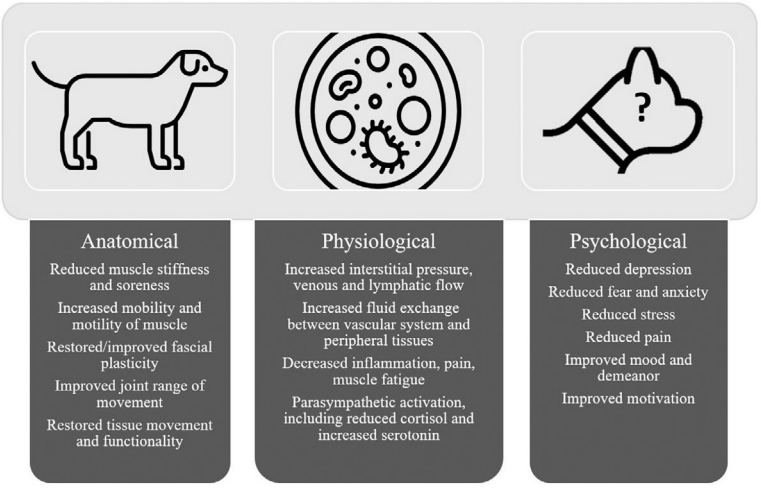

FIGURE 1 Potential therapeutic massage benefits in dogs (after Corti, 2014)

Empirical studies on canine patients are sparse but have found massage therapy mobilises endogenous basal mesenchymal stem cells into circulation,[10] which are associated with anti-inflammatory responses and healing of hip osteoarthritis[11] and spinal cord injury.[12] As part of rehabilitation therapy, therapeutic massage enhanced postoperative recovery following cervical disk herniation repair.[13] However, isolating effects of canine massage therapy remains a challenge, and in the human literature only 'low strength evidence' that massage therapy had a therapeutic effect on pain was found.[14] It was anecdotally reported by Corti[1] that massage therapy in small mammals (including dogs) caused local changes in muscle condition and systemic changes relating to activation or suppression of endocrine, lymphatic and digestive systems, including reduced pain response (Figure 1). Quantitative research is required to understand the potential uses and effects of massage therapy in canine veterinary practice.

The current cross-sectional study aimed to investigate quantitative changes in pain (across multiple indicators) reported by dog owners and practitioners of the Canine Massage Guild UK (hereafter the Guild) in a large sample of dogs who were referred by veterinarians due to soft tissue damage/injury or myofascial/musculoskeletal pain. Data were extracted from case files for over 500 dogs who received 1–3 treatments using the Lenton Method of massage therapy. It was hypothesised that pain, both number of issues and severity, would significantly reduce post-massage therapy, and quality of life would improve.

METHOD

This work was approved by the Ethics Committee, University Centre Sparsholt UK (ref Riley: Canine Massage Project). Guild practitioners only treat with veterinary consent and after veterinary referral in compliance with the Veterinary Surgeons Act 1966 and the Veterinary Surgery (Exemptions) Order 2015.

Dogs

Data from a convenience sample of 527 dogs from the UK, Ireland, Channel Isles and Spain were collected (40 additional dogs' data were omitted as these records were incomplete). No inclusion criteria were set, although practitioners were asked to provide data on 'a representative sample of dog types routinely seen in practice'. While an a priori target sample size was not calculated, the large sample of 527 dogs is sufficient to detect even small, standardised effects of $r = 0.09$ for simple effects and $f = 0.07$ for comparisons between successive massage therapy sessions. Data on dog age, life stage, sex, neuter status, breed (later coded into Kennel Club grouping) and role were requested (Table 1). Seventy-one breeds were represented, although cross breeds were most numerous (28%). Most dogs were 'pets', 'adult', neutered and not on medication related to the referral diagnosis. Males and females were equally represented.

Practitioner training, massage method and treatment procedure

Guild practitioners train for 2 years in Clinical Canine Massage Therapy delivered by Canine Massage Therapy Centre Ltd (LANTRA accredited). Practitioners must achieve high standards of competency in veterinary anatomy and physiology, soft tissue, orthopaedic and neurological pathologies and palpatory literacy. Practitioners master 60 techniques spanning Myofascial Release, Sports, Swedish and Deep Tissue massage and the Lenton Method (Figure 2), a unique three-tiered approach to treat musculoskeletal pain in dogs. Tier 1 involves full body advanced palpation. The practitioner will utilise their palpatory literacy to assess a minimum of approximately 60 pairs of muscles and regions of fascia to find frequently observed muscular and fascial issues (including trigger points and strains). Issues are summarised and classified in Tier 2, body mapping. The bodymap is an anatomical map of the canine muscular system used to precisely locate muscular and fascial issues. Generalised tissues

TABLE 1 Dog life history variables. $N = 527$. Data presented in total counts followed by percentage of total N (n, %N). Age in months

Breed	Kennel club group	Role	Age	Life Stage	Sex	Neuter status	On medication
Cross breed (149, 28)	Mixed (149, 28)	Pet (360, 68)	Average (88.25)	Adult (400, 76)	Female (264, 50)	Neutered (449, 85)	No (309, 59)
Border Collie (66, 13)	Pastoral (130, 25)	Sporting (122, 23)	Standard Deviation (42.2)	Senior (106, 20)	Male (263, 50)	Entire (77, 15)	Yes (218, 41)
Retriever Labrador (51, 10)	Gundog (124, 24)	Retired Sporting (21, 4)		Adolescent (21, 4)		Not listed (1, < 1)	
German Shepherd Dog (28, 5)	Terrier (31, 6)	Show (11, 2)					
English Springer Spaniel (19, 4)	Working (29, 6)	Working (10, 2)					
Golden Retriever (17, 3)	Hound (28, 5)	Retired Show (2, <1)					
Greyhound (16, 3)	Utility (20, 4)	Retired Working (1, <1)					
Unclassified Collie (15, 3)	Toy (16, 3)						
Cocker Spaniel (12, 2)							
Jack Russell (6, 1) / Staffordshire Bull Terrier (6, 1)							

are superficially warmed and prepared using techniques from Swedish massage (Effleurage, Petrissage, Vibrations, Frictions and Tapotements). As in sports massage, these same techniques are subsequently used to focus on distinct anatomical areas of injury. Deep Tissue techniques then engage the tissue barrier targeting deep layers of musculature. Through discriminative touch the practitioner checks their palpation against the map to improve accuracy and palpatory literacy. Tiers 1 and 2 enable the practitioner to formulate and clinically justify a bespoke treatment plan. Tier 3 applies 'the 7 Protocols', advanced myofascial release techniques which address myofascial pain and dysfunction characterised by 'Five Principles of Pain', pain associated with Gait, Posture, Daily Activities, Behaviour and (when relevant) Performance. Practitioners use specific grip modulations and apply force control through a series of hand positions and access points to accurately engage the fascia, completing the treatment. The three tiers are followed in order for all dogs, however tiers 1 and 2 lead to discernment and clinical justification of the type, duration and intensity of tier 3 techniques used; hence specific grips and force for example are tailored to the dog (size, tolerance of therapy) and injury (location, size, severity, nature [acute/chronic/degenerative]). This creates an appropriate clinical treatment method rather than a general massage relaxation technique.

During the initial massage therapy session, following veterinary consent, the practitioner consults with the owner to review medical history of the dog and learn the owner's subjective concerns and observations of the dog. The practitioner will then conduct a full dynamic gait analysis and a static postural analysis before commencing Tier 1 of the Lenton Method. Pain is therefore assessed before (and throughout) Tier 2. Three sessions of clinical massage therapy are provided over 3–4 weeks to allow tissue yield. Pain re-evaluation occurs before each session to gauge the effects of the previous session.

Data collection

Data were collected between July-September 2018. An information sheet, consent forms (for practitioners and dog owners) with a standardised case report form were emailed to Guild practitioners. No incentives were offered. Sixty-five practitioners (a self-selected sample) provided data. Practitioners could complete the case report form for current or retrospective cases using client case files. Information requested included life and medical history of the dog, referral diagnosis, cause and timescale that led to referral, list of presenting issues and severity of each issue (measured on Likert scale 1 [mild] to 5 [severe]) for five pain indicators: Gait - defects in limb configuration while walking, for example, reduced range of movement, lame, limb abduction or rotation, hopping, crabbing; Posture - defects in configuration of body while stationary, for example, kyphosis, idiopathic tremors,

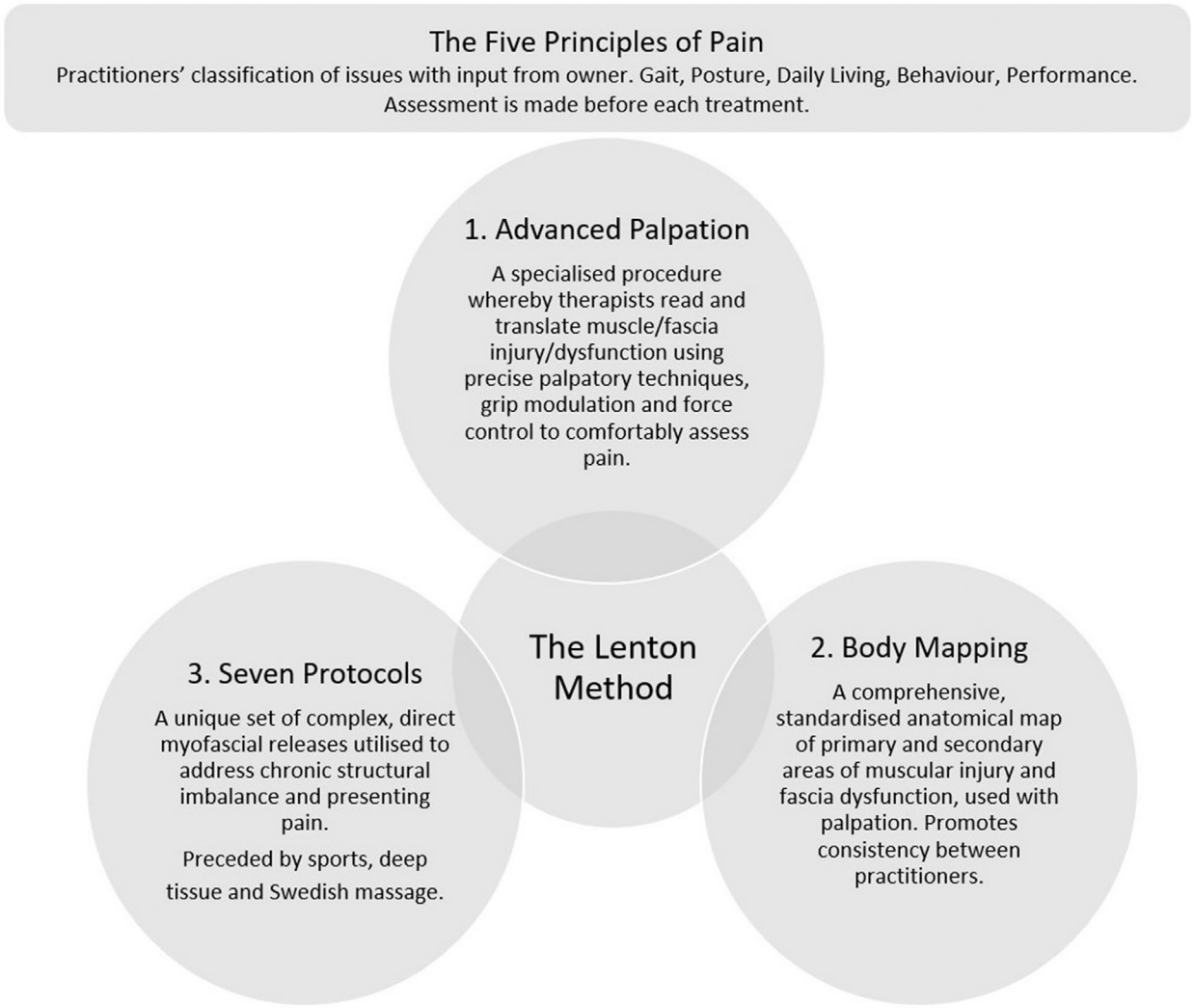

FIGURE 2 The Lenton Method of Canine Therapeutic Massage

atypical tail carriage, pronation or supination of paw; Daily activities - changes in performance of routine tasks that restrict ability to complete that task, for example, reluctance/slowing on walks, difficulty getting up or down stairs or in and out the car, difficulty standing up or lying down; Behaviour - changes in typical behavioural expression, or development of atypical behaviour, for example, reluctance to be petted, groomed or examined, self-mutilation, compulsive behaviour, aggression, depression, anxiety, agoraphobia, scooting (without anal gland issue) and; Performance - specific to sporting (including agility), working and gun dogs, any worsening of typical performance when actively working, competing or exercising, for example, knocking down poles or missing contact points, early onset fatigue, retrieval issues, reluctance to work or exercise. Qualitative data on quality of life were also collected (practitioners were asked to summarise the dog's quality of life with a word or phrase of their choice). Overall response to massage therapy as determined by the practitioner was listed as 'Yes' (dog did respond to treatment) or 'No' (dog did not respond to treatment).

As practitioners' client case files are a combination of veterinary notes provided on a consent form, practitioners' observations, and evaluations following application of massage therapy and owner reports (e.g., an account of how the dog copes with arthritic or other pain climbing the stairs), data were derived from an amalgamation of sources.

Statistical methods

Data were extracted into Microsoft Excel (2016) and diagnosis-centric variables categorised by the primary author, sense-checked by the third author (Table 2). Categories were discussed and agreed upon without the need for triangulation. Analysis was performed in R v3.6.2 and Rstudio v1.2.5033. A zero-inflated Poisson random effect regression with the 'glmmTMB'[15] package for R was used to investigate changes in the reported number of issues for the five pain indicators (gait, posture, daily activity, behaviour and performance) across successive therapy sessions. To investigate reported changes in pain severity for the five pain indicators, linear mixed effect modelling with the

TABLE 2 Categorisation of diagnosis-centric variables for meaningful statistical analysis

Diagnosis-centred variable	Reported in data	Category (definition)
Primary anatomical area affected	e.g., 'fore', 'carpus', 'wrist', 'shoulder', 'elbow'	Forelimb(s) (anything from forelimb toe to shoulder inclusive)
	e.g., 'hind', 'cruciate', 'patella', 'mid metatarsus', 'pelvis'	Hindlimb(s) (anything from hindlimb toe to hip and pelvis inclusive)
	e.g., 'shoulder and hip'	Forelimb(s) and Hindlimb(s) (any combination of forelimb and hindlimb)
	e.g., 'hernia', 'stomach'	Ventral aspect (Abdomen and ventral thorax)
	e.g., 'disc(s)', 'back', 'epaxial muscles'	Musculature associated with the vertebral column (anything associated with thoracic to lumbar spine)
	e.g., 'general trauma', 'all over body tension'	Generalised areas (systemic disease or no specific area of clinical concern)
Cause of referral condition	e.g., 'collision', 'racing injury', 'sudden', 'spinal stroke' 'operation'	Acute trauma (sudden onset, associated with a clear accident or incident)
	e.g., 'age-related', 'present for a long time', 'intermittent'	Chronic (long term stable condition, not progressive but could be recurring)
	e.g., 'osteoarthritis', 'elbow dysplasia', 'hip dysplasia', 'general slowing down', 'worse over time'	Degenerative (progressive condition, associated with one or more joints)

'lme4'[16] was used and where omnibus effects were required, ANOVA were fitted using base R.

Severity of pain indicators were conceptually and statistically (in number and pattern) similar for all indicators, hence for efficient analysis severity of pain was formatted into a single factor ('common pain score'), which excluded severity of performance as this was not reported in most cases (Table 3), an artefact of the specialist population. Common pain score was the empirical product of the covariances between severity of gait, posture, activity and behaviour pain issues. The 'psych'[17] package was used to conduct an oblimin exploratory factor analysis with a one-factor solution, an efficient summary of the variance in the severity measures (RMSEA = 0.13, 90% CI [0.10, 0.15], TLI = 0.93) and weighted by the variance in Gait (0.84), Posture (0.73), Activity (0.76) and Behaviour (0.46) pain severity. Common pain score is a standardised score with M = 0.00, SD = 0.92, Min = −1.63 and Max = 2.30, where a higher score reports generally higher pain severity. Dog-centric (sex, age and if the dog were on medication) and diagnosis-centric variable (original cause of referral, primary anatomical area effected) effects on common pain score were analysed using a series of linear mixed models, testing for an interaction effect with the linear model of successive treatments.

Quality of life was qualitatively analysed using deductive thematic analysis to achieve three themes: Positive; Fair; Negative according to words traditionally associated with indicators of poor, ambiguous, or good welfare. Themes were converted into an ordinal scale (1 = negative, 2 = fair, 3 = good) to allow quantitative analysis. Change in quality of life score over successive treatments was evaluated using cumulative linked mixed modelling using the 'ordinal'.[18] Due to the number of tests being conducted, a conservative $p \leq 0.001$ criterium was used.

RESULTS

Of the 527 dogs whose data were included in this study, practitioners provided data on overall success of treatment for 515 dogs. Of these, 492 dogs (95.5%) were considered by practitioners to have 'responded to treatment'. No discernible difference in life history variables existed between dogs who did respond to treatment and dogs that did not. Both groups were of similar age (No [did not respond]: M = 88.5 months, SD = 42.1 months; Yes [did respond]: M = 88.4 months, SD = 42.1 months), were similar breeds (all breeds that did not respond were represented in the list of breeds that did respond), had proportionately similar numbers on medication (No 35%, Yes 42%) with similar diagnoses (primary anatomical area affected: 1) musculature of the vertebral column No 17%, Yes 15%; Hindlimb(s) No 48%, Yes 46%; Forelimb(s) No 17%, Yes 24%; Fore and Hindlimb(s) No 9%, Yes 2%; General Areas No 9%, Yes 12%).

For each indicator of pain, number of issues reported over successive treatments remained consistent throughout the study (Gait = 2, Posture = 1, Daily Activity = 2, Behaviour = 1, Performance = < 1) (Table 3). Gait and daily activity issues were reported to be more numerous than posture, behaviour and performance issues, irrespective of treatment. In tests of both an overall linear effect of treatment, and of

TABLE 3 Descriptive statistics for the number and severity of pain issues over successive treatments. Baseline = initial presentation prior to treatment

	Median (minimum/maximum) number of issues				Mean (SD) severity of pain			
Pain type	**Baseline**	**Post-treatment 1**	**Post-treatment 2**	**Post-treatment 3**	**Baseline**	**Post-treatment 1**	**Post-treatment 2**	**Post-treatment 3**
Gait	2 (0, 9)	2 (0, 9)	2 (0, 9)	2 (0, 9)	2.96 (1.36)	2.53 (1.31)	2.03 (1.18)	1.61 (1.06)
Posture	1 (0, 7)	1 (0, 7)	1 (0, 7)	1 (0, 7)	2.42 (1.58)	2.14 (1.46)	1.73 (1.29)	1.45 (1.19)
Activity	2 (0, 7)	2 (0, 6)	2 (0, 6)	2 (0, 6)	2.62 (1.6)	2.16 (1.47)	1.7 (1.25)	1.40 (1.09)
Behaviour	1 (0, 5)	1 (0, 6)	1 (0, 6)	1 (0, 6)	1.83 (1.75)	1.54 (1.54)	1.15 (1.26)	0.93 (1.04)
Performance	0 (0, 7)	0 (0, 5)	0 (0, 5)	0 (0, 5)	0.90 (1.57)	0.67 (1.33)	0.51 (1.11)	0.37 (0.88)
Common pain score					0.46 (0.95)	0.15 (0.9)	-0.21(0.79)	-0.48 (0.71)

changes from treatment to treatment, no significant differences in the number of reported issues were found (Table 4).

For each indicator of pain, reported severity score reduced indicating a marked improvement after treatment (Table 3). After referral, the sample's combined median pain severity was 2.4 (moderate), after three treatments this reduced to 1.4 (mild). Gait was consistently the highest pain severity score followed by either Daily Activity (up to the second treatment) or Posture (after the second treatment). A highly significant decrease in reported severity of all pain indicators across treatments was observed (Table 5). By the time treatment was complete, and severity scores for all pain indicators had approximately halved (Gait 54% reduction, Posture 60% reduction, Daily Activity 54% reduction, Behaviour 51% reduction and Performance 41% reduction). Further, significant decreases in reported pain severity scores were observed from initial referral to post-treatment 1 and continued to decline significantly with each subsequent treatment (Table 5). Over 93% of dogs showed improvement in reported pain severity score for one or more pain indicator after one or more treatments.

Using a common pain score of overall severity, a main effect of medication (est. = –0.32, $p < 0.001$) was found. An interaction effect between treatments and medication (est. = –0.83, $p < 0.001$) highlights reported pain severity for dogs on medication (M = 0.86, SD = 0.86) was most different to reported pain severity for dogs not on medication (M = 0.17, SD = 0.90, t(479.95) = 8.82, $p < 0.001$) during initial assessment. It is reasonable to expect dogs in more pain would be on medication. Once treatment was complete, this difference was smaller though still significant (dogs on medication M = –0.24, SD = 0.72; dogs not on medication M = –0.66, SD = 0.64, t(375.55) = 6.30, $p < 0.001$).

Increased dog age generally predicted increased general pain severity measured by common pain score (est. = 0.01, $p < 0.001$), although there was no interaction effect over successive treatments (est. = –0.00, $p = 0.086$), suggesting older dogs presented with more severe pain on initial assessment but both older and younger dogs responded to treatment similarly as both groups experience decreased pain severity. Sex had neither a general effect on common pain score (est. = 0.12, $p = 0.134$) nor were there any significant effects of sex on common pain score over successive treatments (est. = –0.03, $p = 0.029$), both male and female dogs respond equally well to treatment.

Dogs with degenerative causes of referral had significantly higher common pain scores (M = 0.33, SD = 0.90) than those with chronic (M = 0.06, SD = 0.90; est. = 0.63, $p < 0.001$) and acute (M = 0.00, SD = 0.93; est. = 0.32, $p = 0.003$) causes. There was no significant difference between the acute and chronic groups (est = 0.01, p = 0.903). The original cause did not interact with the improvement in common pain score across successive treatments (all est ≤ 0.0.03,

TABLE 4 Overall linear and categorical treatments zero-inflated poisson random effects models predicting number of pain issues over successive treatments across the pain indicators. Estimate (p value)

		Treatments as categories					
	Treatments as scale[a]	Vs baseline[b]		Vs post-treatment 1[b]			Vs post-treatment 2[b]
No. issues	Overall	Post-treatment 1	Post-treatment 2	Post-treatment 3	Post-treatment 2	Post-treatment 3	Post-treatment 3
Gait	-0.02 (0.265)	-0.01 (0.727)	-0.03 (0.490)	-0.05 (0.288)	-0.02 (0.731)	-0.03 (0.466)	-0.02 (0.691)
Posture	-0.01 (0.356)	-0.01 (0.842)	-0.03 (0.583)	-0.04 (0.423)	-0.02 (0.727)	-0.03 (0.541)	-0.01 (0.782)
Activity	-0.01 (0.389)	-0.03 (0.536)	-0.04 (0.397)	-0.04 (0.421)	-0.01 (0.817)	-0.01 (0.833)	0.00 (0.990)
behaviour	-0.01 (0.665)	-0.02 (0.775)	-0.02 (0.702)	-0.03 (0.679)	-0.01 (0.922)	-0.01 (0.888)	-0.00 (0.963)
Performance	-0.06 (0.080)	-0.15 (0.134)	-0.17 (0.092)	-0.17 (0.096)	-0.02 (0.841)	-0.03 (0.806)	-0.01 (0.957)

[a]Treatment points treated as a scale of 1–4 for a linear omnibus test.
[b]Treatment points treated as discrete categories (baseline [initial presentation prior to treatment], post-treatment 1, post-treatment 2 and post-treatment 3) for change over entire treatment period.

TABLE 5 Overall linear and categorical treatments liner mixed models predicting severity of pain issues over successive treatments across pain indicators. Estimate (p value)

		Time as categories					
	Treatment as Scale [a]	Vs baseline[b]			Vs post-treatment 1[b]		Vs post-treatment 2[b]
Pain severity	Overall	Post-treatment 1	Post-treatment 2	Post-treatment 3	Post-treatment 2	Post-treatment 3	Post-treatment 3
Gait	-0.50 (***)	-0.44 (***)	-1.00 (***)	-1.48 (***)	-0.56 (***)	-1.04 (***)	-0.48 (***)
Posture	-0.37 (***)	-0.29 (***)	-0.74 (***)	-1.07 (***)	-0.45 (***)	-0.78 (***)	-0.33 (***)
Activity	-0.47 (***)	-0.46 (***)	-0.98 (***)	-1.38 (***)	-0.52 (***)	-0.92 (***)	-0.40 (***)
behaviour	-0.33 (***)	-0.30 (***)	-0.70 (***)	-0.98 (***)	-0.41 (***)	-0.68 (***)	-0.27 (***)
Performance	-0.16 (***)	-0.20 (***)	-0.35 (***)	-0.49 (***)	-0.15 (***)	-0.29 (***)	-0.14 (***)

***$p < 0.001$.
[a]Treatments treated as a scale of 1–4 for a linear omnibus test.
[b]Treatment points treated as discrete categories (baseline [initial presentation prior to treatment], post-treatment 1, post-treatment 2 and post-treatment 3) for change over entire treatment period.

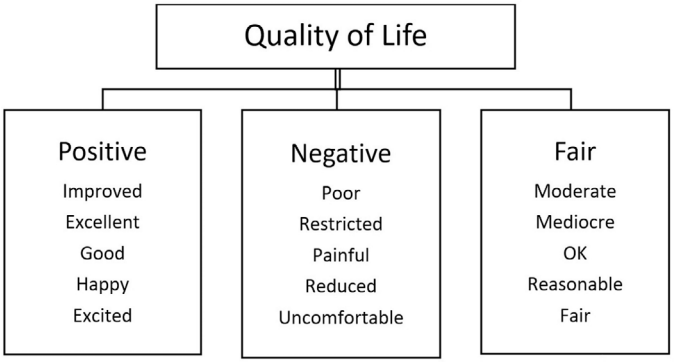

FIGURE 3 Dendrogram showing thematic analysis of quality of life. Themes shown in larger font, followed by examples of words recorded by practitioners

all $p \geq 0.152$). While some variability in common pain score was noted between primary affected areas ($F(5,1926) = 9.70$, $p = 0.001$), the primary area affected did not affect common pain score over successive treatments ($F(15, 1926) = 0.55$, $p = 0.915$).

Quality of life ratings were coded into predetermined themes of 'Positive', 'Fair', 'Negative' (Figure 3). With quality of life as a linear predictor, the omnibus effect of successive treatments was a significant, positive, predictor (est. = 0.58, $p < 0.001$), suggesting a general improvement in practitioner reported quality of life over the course of massage therapy. A significant improvement in reported quality of life between initial assessment and treatment 1 (est. = 0.67, $p < 0.001$), between first and second treatments (est. = 0.54, $p < 0.001$) and between second and third treatments (est. = 0.48, $p < 0.001$) was found. At initial assessment, 40% of dogs were considered to have a positive quality of life, this increased to 66% post first treatment, 83% post second treatment and 92% post third treatment.

DISCUSSION

This study, in line with the aims, has shown massage therapy may be an effective treatment for myofascial/musculoskeletal pain in dogs, as reported by practitioners, and owners. All types of dog and anatomical areas affected responded to massage therapy as reported severity of pain indicators significantly reduced in all cases, as hypothesised. Efficacy of massage therapy was quick – reported severity scores reduced after the first massage treatment and all subsequent treatments. Reported severity scores reduced across all indicators of pain.

Several veterinary practitioners and academics have anecdotally reported a reduction of pain following massage therapy in dogs,[1,2,3] and massage therapy is a recognised part of rehabilitation therapy[19] where, it is speculated, massage can reduce pain by decreasing mechanoreceptor sensitivity or reducing inflammation (by increasing fluid removal from tissues into lymph and circulatory systems).[20] Clinical trials of the combined therapeutic effects of acupuncture and massage therapy to alleviate canine musculoskeletal pain showed a highly significant improvement in pain measured by owner reports of daily activity.[21] In this published trial, owners were blinded to the treatment protocol. The authors used a robust experimental design, but causal relationship between massage therapy (alone) and pain reduction could not be isolated. In equines, clinical experiments showed one treatment of massage increased mechanical nociceptive thresholds by 8%.[22] Similarly, a meta-analysis of clinical trials involving humans with musculoskeletal disorders[23] found massage therapy reduced shoulder and knee pain. The results achieved currently corroborate previous research.

Of 527 dogs, 23 were considered by practitioners to have shown no discernible response to massage therapy. There were no identifiable differences in dog type between those who responded to canine massage and those who did not respond. For example, both groups had a sample that sustained new injury (unrelated to the massage therapy), both responders and non-responders were diagnosed by the referring veterinarian to have degenerative and therefore progressive causes of soft-tissue damage. Many factors affect pain, for example, MPS (and therefore hypersensitivity to pain) can occur,[6] and owner compliance with home-care plans issued by Guild practitioners can differ. Recording these and similar factors that could account for differences in overall response to massage therapy were beyond the scope of the current study but warrant further research. It may be that this type of massage therapy did not suit these dogs – this is unlikely due to the bespoke nature of the massage application as tier 3 techniques are tailored to each dog, but it cannot be ruled out. These dogs may have had undiagnosed conditions. Musculoskeletal therapies are aimed at rehabilitation and support of muscular, skeletal and neurological conditions. How effective the therapy is can often depend on which system the problem is weighted, if the problem is muscular better results will typically be seen than if the problem is neurological due to the nature of the disorder.

Regardless of species, studies on the therapeutic effects of massage have investigated relative changes in pain indicators rather than absolute changes. If the aim of massage therapy is to reduce pain this is appropriate, however it seems reasonable to consider that some indicators of pain could be resolved if the fascial tissues containing MTPs are fully mobilised. To the authors' knowledge, the current study is the first to consider if the number of pain-related issues reduces

after massage therapy. Across the five pain indicators, no significant reduction in reported number of pain issues was found. This could be a genuine therapeutic outcome. Massage therapy is used to treat over-loaded muscles,[3] not the cause(s) of muscle overload. Multiple disorders lead to muscular and fascial dysfunction, either by direct injury or as secondary responses to chronic degenerative joint issues like osteoarthritis. Treatment of the soft tissues cannot directly treat underlying bone disease but aims to address overcompensation and habitual patterns of tension. In this study, a cause for referral was included in extracted data for 379 dogs. Of these, 250 dogs (66%) had chronic or degenerative disease/issues. The lack of a significant difference in pain issues may alternatively be due to an artefact of data recording. Severity in several cases was recorded as 1 (mild) indicating the pain issue remained relevant, yet additional notes provided by the practitioner indicated the issue was no longer relevant. The case report form did not allow severity to be graded 'zero'. It was intended that if an issue were no longer relevant, practitioners would leave the form blank, although this was not specified and evidently caused confusion. If the issue was listed by the practitioner as 1 or more, it was considered an issue and included in analysis, regardless of supplementary information from the practitioner.

Independency of data may be questioned by some in the current study as Guild practitioners provided data on their own applications of canine massage from client files and extracted the assessments of owners. Clinical reports are an important and well-established data source in veterinary research,[24] and in the veterinary profession, owner reports are an integral part of diagnostics. Epstein reports, for dogs, owner assessment is scientifically and clinically the most useful chronic pain scoring tool.[25] The owners' role in canine massage therapy is therefore important as symptoms that lead to referral are often the observable outcomes of pain, and both veterinary and massage practitioner assessments rely heavily on owner reports of changes in a dog's movement, behaviour and daily activities.[26] Pain, particularly chronic pain, is a genuine welfare concern, diminishing quality of life, mobility and inhibiting performance of daily activities;[25] hence the range of pain indicators used currently and need for massage practitioners to be skilled and knowledgeable.[3,19] While pain scores in this study were reported by massage practitioner and owner, evidence of bias is limited. It is reasonable to assume both parties would want to see significant improvement in pain severity scores following treatment, as was recorded here. It is further reasonable to consider both parties would want to see a significant reduction in number of pain-related issues across the five pain indicators (if an improvement was clinically possible given the referral diagnosis), yet this was not found. Also, number of cases, of practitioners and the diversity of dogs/referral conditions makes subconscious bias unlikely. The large sample size and multiple dog types studied suggest these results are generalisable beyond the sample.

Current results suggest canine massage using the method described may be a valid treatment for myofascial/musculoskeletal pain; however here the causal effects of massage are not discernible – without experimental control groups or conditions, the causes of significant effects remain attributable to massage therapy, time in recovery or an artefact of increased human contact which is important for dog well-being.[27] Time is an unlikely contributing factor given the number of dogs with degenerative conditions associated with secondary fascial tissue formation, thus time is likely to worsen any presenting issues or pain severity. In this study, dogs with degenerative issues consistently scored higher for pain severity compared to dogs with acute or chronic issues. Neither owners nor practitioners were blind to the treatment protocol; Lane and Hill acknowledge how difficult this would be to achieve,[21] however, as dogs on medication in the current study consistently presented with higher pain scores and showed greater reductions in pain scores after massage therapy, this would corroborate the need for a double-blind clinical trial to further understand the efficacies of canine massage therapy.

Musculoskeletal issues are the third most common reason (after enteropathic and dermatological issues) to attend a veterinary clinic for mid-level diagnoses.[28] Yet muscle pain remains poorly recognised in veterinary medicine.[8] Previous research[2] and this current study show the versatility and potential range of effectiveness of canine massage therapy means this is becoming an increasingly relevant treatment option for dogs exhibiting myofascial/musculoskeletal pain.

CONCLUSIONS

Across multiple dog types and diagnoses, clinical canine massage therapy was associated with a significant reduction in practitioner, and owner reported pain severity scores in all pain indicators (Gait, Posture, Behaviour, Daily Activity, Performance). Although the number of pain-related issues reported was consistent throughout treatment, practitioners reported significantly more dogs had a positive quality of life post treatment. Double blind clinical trials are needed to elucidate cause and effect; however, this large-scale quantitative analysis suggests canine therapeutic massage may be an efficacious treatment for muscle pain in dogs.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

Two members of The Canine Massage Guild (L.M. Stilwell and N.S. Lenton) co-authored this study. N.S. Lenton is the Director of the Canine Massage Therapy Centre, Founder and Chairperson of the Canine Massage Guild and developed the Lenton Method. L.M. Stilwell provided technical support to L.M. Riley when diagnoses variables were being categorised. Neither L.M. Stilwell or N.S. Lenton was involved with analysing data or interpretation of results.

AUTHOR CONTRIBUTIONS

Riley led the research (including data extraction) and wrote the manuscript. Satchell performed data analysis in Rstudio and helped to write the Results section. Stilwell and Lenton helped to develop the Introduction and liaised with Guild members to provide data. Stilwell sense-checked categorisation of diagnostic-centric variables and both Stilwell and Lenton provided information on the Lenton Method and massage protocols. All authors agree contributions as stated here.

ORCID

Lisa M. Riley https://orcid.org/0000-0003-1918-4623

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