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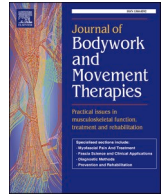
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New Zealand osteopaths and the management of sport-related injury: outcomes from a practice-based research network

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ABSTRACT

Background: Sports injuries are a significant burden to the health care system. Osteopaths situated in New Zealand regularly treat such injuries, yet little is understood about the practise characteristics of those who treat sports injuries often.

Methods: The results were derived from a secondary analysis of data from a New Zealand practice-based research network (ORC-NZ). Descriptive and inferential statistics were used to identify pertinent demographic, patient, practice and management characteristics associated with *often* managing sports injuries. Binary logistic regression with backward elimination was used to identify statistically significant practice characteristics associated with *often* treating sports injuries.

Results: One hundred and forty-one osteopaths (n = 141, 50.9 %) reported *often* to managing patients with sporting injuries. Statistically significant practice characteristics associated with *often* managing sport-related injuries were: *often* using sport taping (ORa 7.10), exercise prescription (ORa 2.51) and dry needling (ORa 7.59), as well as *often* treating work-related injury (ORa 8.00) and post-surgery (ORa 3.60) patients.

Conclusion: This work is the first to provide insight into the practise characteristics of New Zealand osteopaths who *often* treat sports injuries. These findings are important to guide future research and policy, as well as inform specific professional development and education programs.

1. Introduction

Sporting injuries occur commonly with estimates ranging from 0.5 to 34 injuries per 1000 h of sport (Gledhill et al., 2018). They are also the most common form of injury in youth, with estimates showing at least 20 % of children will miss one day of school per year due to these injuries (Emery and Pasanen, 2019). Additionally sport-related injuries significantly impact the adult population with one in three adults missing at least one day of work per year from them (Emery and Pasanen, 2019).

According to the New Zealand Accident Compensation Corporation (ACC), New Zealand's public injury insurance scheme, the number of

new sports injury cases has remained stable, yet significant over the past nine years, with an average of 404,962 cases per year (ACC, 2024). The most common sports contributing to these statistics are contact team sports, including rugby union, soccer/football, and individual sports, such as gym/fitness training. In comparison with non-contact sports like tennis, skiing and golf, rugby union players reportedly experience higher incidence injuries affecting the head/concussion (Prien et al., 2018), shoulder, thigh, knee and ankle more frequently, and necessitating hospitalisation or retirement from the sport (King et al., 2019, 2022). 76 % of these injuries are attributed to soft tissue injuries (sprains, strains and bruises) with players over 18 years being four times more likely to make a claim compared with rugby union players under 18 years (ACC,

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2024). Interestingly, the increased participation of females in rugby union has led to a corresponding increase in injuries for this group, with the most common injury site being the knee (King et al., 2019, 2022). Epidemiological data collected between 2011 and 2021 on injuries from gym and fitness training revealed nine of the 10 most common reported ICD codes used were soft tissue related injuries, predominantly to the lower back/spine and shoulder often stemming from exercises involving lifting, twisting and carrying (ACC, 2021).

Osteopathy is typically described as a therapy focusing on the neuromusculoskeletal system (Stark, 2013). Although osteopathy is practised differently across geographic regions, in Europe (Alvarez et al., 2020; van Dun et al., 2022), Australia and New Zealand osteopaths primarily treat musculoskeletal complaints (Steel et al., 2020). Traditionally based on principles of anatomy underpinned by biomedicalism (Hidalgo et al., 2024), modern osteopathy in these regions has built on these principles and currently operates in a biopsychosocial framework, with a goal of providing evidence-based and person-centred care (Smith, 2019). Osteopaths employ several manual techniques (e.g. soft tissue, stretch, etc.) in their management of patients as well as commonly prescribing exercise prescription and advice (Steel et al., 2020). Osteopaths also assess the general health drivers of a patient's pain, regularly giving advice around factors such as sleep, stress management, nutrition and smoking (Adams et al., 2018).

Currently, there are 565 registered osteopaths in New Zealand (2022), and although there is emerging evidence osteopaths across Australia and New Zealand commonly manage sports injuries (Adams et al., 2018; Steel et al., 2020), little is known about how osteopaths specifically manage patients with sport-related injuries. This study aims to describe the characteristics of New Zealand osteopaths who report often treating sports injuries as part of their routine clinical practice.

2. Methods

This study is a secondary analysis of data sourced from a practice-based research network (PBRN) exclusively focused on the osteopathic profession in New Zealand. Ethical clearance for this research was granted by the Human Research Ethics Committee at the University of Technology Sydney under reference number ETH19-3435. Every osteopath participating in the PBRN provided informed consent.

2.1. Participants

The study recruited participants from the New Zealand osteopathy PBRN, known as the Osteopathy Research Connect-New Zealand (ORC-NZ) PBRN, established in 2018. Participants were enlisted between August and December 2018, and eligibility criteria required them to be registered osteopaths in New Zealand. A total of 253 osteopaths completed the ORC-NZ questionnaire and agreed to become part of the PBRN, resulting in a response rate of 48.7 % from the osteopathic profession.

2.2. Questionnaire

The questionnaire used in this study was specifically designed for the collection of baseline data within the framework of the PBRN. Participants were asked to provide details about various aspects related to their roles as practitioners, their practices, and clinical management. These included disclosing information about their age, gender, qualifications, and years of experience in their practice. Regarding practice specifics, participants reported the number of hours devoted to patient care, the average number of patients seen weekly, the presence of other healthcare professionals at their workplace, and referrals to or from other healthcare professionals. The questionnaire also delved into patient management, with participants indicating the frequency of treating various body regions, the use of specific techniques and adjunctive therapies, and their approach to managing distinct patient groups.

2.3. Outcome variable and exposure variables

The primary outcome variable in this study centred on the frequency of managing patients with sport-related injuries. Participants were asked to rate their frequency of managing such patients on a four-point scale, comprising options of "never," "rarely," "sometimes," and "often". The first three choices were combined into a "less often" category, while "often" was treated as the contrasting binary outcome. The exposure variables in this study encompassed demographic and practice characteristics, which were collected in the form of frequency, binary (yes/no) responses, or continuous data.

2.4. Statistical analysis

The study utilised inferential statistics to explore the relationships between individual practice characteristics and the frequency of managing sport-related injury patients. Frequency responses were analysed using independent measures t-tests, while binary responses underwent chi-square tests with continuity correction. Variables with a significance level of $p < 0.20$ were selected and subsequently incorporated into a multivariate logistic regression model. Backward elimination was employed to identify the principal predictors of osteopaths who frequently manage sport-related injuries. Adjusted odds ratios (ORa) with 95 % confidence intervals (CI) and p-values were derived from this regression analysis. The threshold for statistical significance was set at $p < 0.05$, and the inferential statistical analyses were carried out using JASP (version 0.18), with the regression analysis performed using SPSS.

3. Results

Just over half of New Zealand osteopaths who participated in the PBRN reported often treating patients with sport-related injuries ($n = 141$, 50.9 %). New Zealand osteopaths who reported often treating patients with sport-related injuries were more likely to indicate male gender compared with osteopaths who less often treat sport-related injuries (Table 1). New Zealand osteopaths who reported often treating patients with sport-related injuries were statistically significantly older ($p = 0.04$, $d = 0.24$) and reported a greater number of years in practice ($p = 0.01$, $d = 0.30$) compared with osteopaths who less often treat sport-related injuries, with medium effect sizes (Table 1).

Regarding discussions with patients, New Zealand osteopaths who reported often (Table 2) treating patients with sport-related injuries were more likely to often discuss smoking (OR 2.98), physical activity (OR 2.08), Occupational Health & Safety (OR 1.94) and medications (OR 2.10) compared with osteopaths who less often treat sport-related injuries (Table 3). New Zealand osteopaths who reported often treating patients with sport-related injuries were more likely to report often treating patients of Maori descent (OR 3.07) and ACC patients (OR 2.53) compared with osteopaths who less often treat sport-related injuries (Table 3). With respect to musculoskeletal complaints treated often by New Zealand osteopaths who reported often treating patients with sport-related injuries, these practitioners were more likely to often treat upper and lower extremity complaints (OR 2.40–4.64), and tendinopathies (OR 3.84) compared with osteopaths who less often treat sport-related injuries (Table 3). New Zealand osteopaths who reported often treating patients with sport-related injuries were more likely to often use exercise prescription (OR 4.02), soft tissue techniques (OR 3.24), joint manipulation (OR 2.77), and spinal manipulation (OR 2.29) compared with osteopaths who not often treat sport-related injuries (Table 3).

Statistically significant predictors of New Zealand osteopaths who report often treating patients with sport-related injuries are described in Table 4. Often treating patients with sport-related injuries was associated with often using sport taping (ORa 7.10), exercise prescription (ORa 2.51) and dry needling (ORa 7.59). With respect to patient populations, significant predictors of often treating sport injury patients were often treating work-related injury (ORa 8.00) and post-surgery

Table 1

Demographic characteristics for New Zealand osteopaths who report *often* treating sport-related injuries compared to *not often* treating sport-related injuries.

	Often (n = 141)	Not often (n = 136)	p-value
Gender			
Male	79 (56.0 %)	51 (37.5 %)	<0.01
Female	62 (43.9 %)	84 (61.7 %)	
Other	0	1 (0.7 %)	
Age (years)			
Mean (±SD)	44.0 (±12.2)	46.9 (±11.5)	0.04
Years in clinical practice			
Mean (±SD)	13.6 (±10.1)	16.8 (±10.6)	0.01*
Patient care hours per week			
Mean (±SD)	28.5 (±11.3)	26.4 (±10.8)	0.11
Patient visits per week			
Mean (±SD)	35.1 (±24.8)	29.9 (±19.4)	0.07
Range	0–130	0–95	
Qualification (n, %)			
Diploma	15 (10.8 %)	28 (21.0 %)	0.10
Advanced Diploma	1 (0.8 %)	2 (1.5 %)	
Bachelor degree	36 (25.9 %)	37 (27.8 %)	
Master's degree	76 (54.7 %)	52 (39.1 %)	
PhD	1 (0.7 %)	0	
Other	10 (7.2 %)	14 (10.5 %)	
Involved in as an osteopath			
Clinical supervision (students) ¹	14 (9.9 %)	10 (7.3 %)	0.58
Clinical supervision (associates) ²	25 (17.7 %)	17 (12.5 %)	0.29
Volunteer ³	29 (20.5 %)	21 (15.4 %)	0.34
Research ⁴	8 (5.6 %)	13 (9.6 %)	0.32

¹d = 0.24 (95%CI[0.01–0.48]); * d = 0.30 (95%CI[0.07–0.55]); 1 – supervision of pre-professional osteopathy students either in a teaching clinic or the respondents own clinic; 2 – supervision of qualified osteopaths engaged at the respondents own clinic; 3 – volunteering as an osteopath; 4 – conducting research.

(ORa 3.60) patients.

4. Discussion

Just over half of New Zealand osteopaths report often treating sport-related injuries in their practice. This result suggests patients with sport-related injuries comprise a significant number of presentations to osteopaths. Sport-related injuries are common in New Zealand, and subsequently, this patient population is likely to present to an osteopath for musculoskeletal care (ACC, 2024). The current study highlights how osteopaths who frequently manage sport-related injuries treat this patient population.

New Zealand osteopaths who reported often treating patients with sport-related injuries were more likely to refer their patients to a specialist medical practitioner. This may be due to sporting injuries more often encompassing rarer/complicated diagnoses, such as stress fractures or ligament and tendon ruptures (Breathnach et al., 2020; Ekstrand et al., 2020) Such injuries often require multidisciplinary management and specialist medical referral (i.e. sports medicine) for further investigation and additional care (Edouard and Ford, 2020). The higher specialist referral rates seen in this subset of New Zealand osteopaths could also be a function of them having a higher number of years in practise and hence more widespread referral networks. Future research appraising the specific types of sporting-related injury referrals and the clinical reasoning for doing so would allow clearer inferences to be made from this data.

Referring for diagnostic imaging was also found to be a significant predictor of New Zealand osteopaths reporting often treating sport-related injuries. This finding could be due to injuries in sporting people requiring more imaging than would be required for many musculoskeletal complaints, potentially as a flow-on effect from the high imaging rates for injuries in professional athletes (Bordalo et al., 2023;

Table 2

Practice characteristics of New Zealand osteopaths who report *often* treating sport-related injuries compared to osteopaths who *not often* treat sport-related injuries.

	Often (n = 141)	Not often (n = 136)	p-value	OR [95 % CI]
Practice location				
Urban practice	121 (85.8 %)	122 (89.7 %)	0.42	–
More than one practice location	50 (35.4 %)	43 (31.6 %)	0.58	–
Co-located with other health professionals ('yes')				
Osteopath	75 (53.2 %)	76 (55.8 %)	0.74	–
General Practitioner	10 (7.1 %)	10 (7.3 %)	1.00	–
Specialist Medical Practitioner	4 (2.8 %)	1 (0.7 %)	0.39	–
Podiatrist	10 (7.1 %)	8 (5.8 %)	0.87	–
Physiotherapist	23 (16.3 %)	15 (11.1 %)	0.27	–
Chiropractor	8 (5.6 %)	3 (2.2 %)	0.24	–
Exercise Physiologist	2 (1.4 %)	2 (1.4 %)	1.00	–
Occupational Therapist	2 (1.4 %)	2 (1.4 %)	1.00	–
Psychologist	19 (13.4 %)	18 (13.2 %)	1.00	–
Massage Therapist	50 (35.4 %)	42 (30.9 %)	0.49	–
Acupuncturist	38 (26.9 %)	34 (25.0 %)	0.81	–
Naturopath	14 (9.9 %)	20 (14.7 %)	0.30	–
Dietician	3 (2.1 %)	3 (2.2 %)	1.00	–
Nutritionist	9 (6.4 %)	11 (8.1 %)	0.75	–
Send referrals to other health professionals ('yes')				
Osteopath	87 (61.7 %)	84 (61.7 %)	1.00	–
General Practitioner	127 (90.1 %)	118 (86.7 %)	0.50	–
Specialist Medical Practitioner	117 (82.9 %)	90 (66.1 %)	<0.01	2.49 [1.41–4.38]
Podiatrist	63 (44.7 %)	46 (33.8 %)	0.08	–
Physiotherapist	62 (43.9 %)	63 (46.3 %)	0.78	–
Chiropractor	12 (8.5 %)	10 (7.3 %)	0.89	–
Exercise Physiologist	10 (7.0 %)	11 (8.1 %)	0.93	–
Occupational Therapist	13 (9.2 %)	13 (9.6 %)	1.00	–
Psychologist	45 (31.8 %)	42 (30.9 %)	0.95	–
Massage Therapist	93 (65.7 %)	93 (61.0 %)	0.47	–
Acupuncturist	100 (70.9 %)	91 (66.9 %)	0.55	–
Naturopath	62 (43.9 %)	52 (38.2 %)	0.40	–
Dietician	15 (10.7 %)	6 (4.4 %)	0.08	–
Nutritionist	36 (25.5 %)	19 (13.9 %)	0.02	–
Receive referrals from another health professionals ('yes')				
Osteopath	107 (75.9 %)	98 (72.1 %)	0.55	–
General Practitioner	123 (87.2 %)	119 (87.5 %)	1.00	–
Specialist Medical Practitioner	48 (34.0 %)	41 (30.1 %)	0.57	–
Podiatrist	33 (23.4 %)	20 (14.7 %)	0.09	–
Physiotherapist	70 (49.6 %)	52 (38.2 %)	0.07	–
Chiropractor	13 (9.2 %)	8 (5.8 %)	0.41	–
Exercise Physiologist	10 (7.1 %)	6 (4.4 %)	0.48	–
Occupational Therapist	15 (10.6 %)	10 (7.3 %)	0.45	–
Psychologist	22 (15.6 %)	21 (15.4 %)	1.00	–
Massage Therapist	108 (76.6 %)	92 (67.6 %)	0.13	–

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Table 2 (continued)

	Often (n = 141)	Not often (n = 136)	p-value	OR [95 % CI]
Acupuncturist	76 (53.9 %)	64 (47.0 %)	0.30	–
Naturopath	59 (41.8 %)	42 (30.8 %)	0.08	–
Dietician	6 (4.2 %)	2 (1.4 %)	0.30	–
Nutritionist	14 (9.9 %)	7 (5.1 %)	0.20	–
Diagnostic imaging				
Referral for imaging ('often')	46 (36.6 %)	20 (14.7 %)	<0.01	2.81 [1.55–5.07]
Investigation of unknown pathologies	105 (74.5 %)	103 (75.7 %)	0.92	–
Investigation of suspected diagnosis	128 (90.8 %)	119 (87.5 %)	0.49	–
Investigation of potential fractures	119 (84.4 %)	112 (82.3 %)	0.77	–
Rule out risk factors prior to treatment	64 (45.4 %)	46 (33.8 %)	0.07	–
General screening of the spine	9 (6.4 %)	13 (9.6 %)	0.45	–
Patient assessment ('yes')				
Orthopaedic testing	136 (96.4 %)	132 (97.1 %)	1.00	–
Clinical assessment algorithm	42 (29.8 %)	42 (30.8 %)	0.94	–
Neurological testing	135 (95.7 %)	128 (94.1 %)	0.73	–
Screening questionnaire	125 (88.6 %)	122 (89.7 %)	0.93	–
Cranial nerve testing	101 (71.6 %)	86 (63.2 %)	0.17	–

Guermazi et al., 2018). The increased referrals may be driven by return-to-play time pressures and the financial impact associated with time out of competition (Eliakim et al., 2020). That said, this survey did not assess if this group of osteopaths were following the appropriate radiological referral guidelines, which is important given the cost to public health systems incurred from radiology, and the known overuse of these imaging modalities (Muskens et al., 2022). Further work is required to understand how New Zealand osteopaths are using diagnostic imaging in the context of sport-related injury care.

Often using exercise prescription was also a significant predictor of New Zealand osteopaths reporting often treating patients with sports-related injuries. Exercise rehabilitation is a mainstay in the treatment and successful return to sport for almost all sports injuries (Yung et al., 2022). Further, exercise combined with manual therapy has been shown beneficial for a wide range of musculoskeletal complaints. Results from the current work suggest New Zealand osteopaths appear to be using exercise prescription as a key element of their management of patients with sport-related injuries. This is consistent with work from the Australian osteopathy PBRN identifying exercise prescription being frequently used in patient care. Although there is not the same evidence-base underpinning the use of sport taping (Dehghan et al., 2024), the often-reporting group of osteopaths did appear to use this more frequently than their less often counterparts. This finding appears logical given the frequent use of taping in both professional and amateur sports (Utku et al., 2024). However, further research on which areas/injuries osteopaths use sport-taping and which type of tape (i.e. rigid vs pliable) they use would be useful to better understand this aspect of practise and ensuring its inclusion in pre-professional education.

The current work also identified osteopaths who reported often treating sports injuries were more likely to treat both upper and lower limb injuries and tendinopathy. Tendinopathy is conceptualised as pain associated with tendon load capacity (Tripodi et al., 2021), and its rehabilitation and management are closely aligned with general sport injury principles (Cardoso et al., 2019). Hence, it is logical New Zealand osteopaths who treat more sports injuries see a greater number of tendinopathy patients and this outcome is consistent with Australian

Table 3

Clinical management characteristics of New Zealand osteopaths who report often treating sport-related injuries compared to osteopaths who not often treating sport-related injuries.

	Often (n = 141)	Not often (n = 136)	p-value	OR [95 %CI]
Discuss with patients ('often')				
Diet/nutrition	64 (45.4 %)	49 (36.0 %)	0.14	–
Smoking	27 (19.1 %)	10 (7.3 %)	<0.01	2.98 [1.38–6.44]
Physical activity	126 (89.3 %)	109 (80.1 %)	0.04	2.08 [1.05–4.11]
Occupational Health & Safety	69 (48.9 %)	45 (33.1 %)	0.01	1.94 [1.19–3.15]
Pain counselling/education	33 (23.4 %)	24 (17.7 %)	0.30	–
Stress	75 (53.2 %)	74 (54.4 %)	0.93	–
Nutritional supplements	41 (29.1 %)	30 (22.0 %)	0.23	–
Medication	62 (43.9 %)	37 (27.2 %)	<0.01	2.10 [1.27–3.47]
Patient subgroups (treat 'often')				
Up to 3 years of age	34 (24.1 %)	41 (30.1 %)	0.32	–
4–18 years of age	56 (39.7 %)	37 (27.2 %)	0.04	1.76 [1.06–2.92]
Older adults	101 (71.6 %)	87 (64.0 %)	0.21	–
Pregnancy	44 (31.2 %)	36 (26.5 %)	0.46	–
Non-English speaking	11 (7.8 %)	2 (1.5 %)	0.03	5.67 [1.23–26.07]
Chronic pain	77 (54.6 %)	61 (44.8 %)	0.13	–
Work injury	125 (88.6 %)	56 (41.2 %)	<0.01	11.16 [5.99–20.80]
Traffic injury	52 (36.9 %)	20 (14.7 %)	<0.01	3.39 [1.89–6.08]
Post-surgery	33 (23.4 %)	5 (3.6 %)	<0.01	8.00 [3.02–21.21]
Maori (indigenous population)	30 (21.2 %)	11 (8.1 %)	<0.01	3.07 [1.47–6.41]
Accident Compensation Commission (ACC)	130 (92.2 %)	112 (82.3 %)	0.02	2.53 [1.19–5.40]
Conditions Treated ('often')				
Neck pain	139 (98.5 %)	133 (97.7 %)	0.96	–
Thoracic pain	126 (89.3 %)	120 (88.2 %)	0.91	–
Back pain	140 (99.2 %)	130 (95.6 %)	0.11	–
Hip pain	102 (72.3 %)	85 (62.5 %)	0.10	–
Knee pain	86 (60.9 %)	51 (37.5 %)	<0.01	2.60 [1.60–4.23]
Ankle pain	68 (48.2 %)	36 (26.4 %)	<0.01	2.59 [1.56–4.28]
Foot pain	55 (39.0 %)	23 (16.9 %)	<0.01	3.14 [1.79–5.51]
Shoulder pain	129 (91.5 %)	95 (69.8 %)	<0.01	4.64 [2.31–9.30]
Elbow pain	43 (30.5 %)	21 (15.4 %)	<0.01	2.40 [1.33–4.32]
Wrist pain	32 (22.9 %)	18 (13.2 %)	0.06	–
Hand pain	26 (18.4 %)	9 (6.6 %)	<0.01	3.19 [1.43–7.09]
Postural disorders	82 (58.1 %)	62 (45.5 %)	0.04	1.66 [1.03–2.67]
Degenerative spine disorders	75 (53.2 %)	54 (39.7 %)	0.03	1.72 [1.07–2.78]
Headache	125 (88.6 %)	110 (80.8 %)	0.10	–
Migraine disorders	72 (51.0 %)	35 (25.7 %)	<0.01	3.01 [1.81–5.00]

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Table 3 (continued)

	Often (n = 141)	Not often (n = 136)	p-value	OR [95 %CI]
Spine health maintenance	73 (51.7 %)	55 (40.4 %)	0.07	–
Tendinopathies	60 (42.5 %)	22 (16.1 %)	<0.01	3.84 [2.18–6.75]
Temporomandibular joint	24 (17.0 %)	12 (8.8 %)	0.06	–
Non-musculoskeletal	27 (19.2 %)	17 (12.5 %)	0.17	–
Manual therapy (use ‘often’)				
Counterstrain	33 (3.4 %)	37 (27.2 %)	0.55	–
Muscle energy technique	90 (63.8 %)	77 (56.6 %)	0.27	–
Spinal manipulation	99 (70.2 %)	69 (50.7 %)	<0.01	2.29 [1.40–3.75]
Joint manipulation	93 (65.9 %)	56 (41.1 %)	<0.01	2.77 [1.70–4.51]
Soft tissue technique	131 (92.9 %)	109 (80.1 %)	<0.01	3.24 [1.50–7.00]
Myofascial release	93 (66.0 %)	73 (53.7 %)	0.05	–
Visceral techniques	43 (30.5 %)	22 (16.2 %)	<0.01	2.27 [1.27–4.06]
Lymphatic pump	16 (11.3 %)	10 (7.3 %)	0.35	–
Autonomic balancing	29 (20.5 %)	26 (19.1 %)	0.88	–
Biodynamics	19 (13.4 %)	31 (22.7 %)	0.06	–
Functional technique	63 (44.7 %)	61 (44.8 %)	1.00	–
Osteopathy in the Cranial Field	66 (46.8 %)	72 (52.9 %)	0.37	–
Balanced ligamentous tension	63 (44.6 %)	70 (51.5 %)	0.31	–
Chapman’s reflexes	9 (6.3 %)	2 (1.5 %)	0.07	–
Trigger point therapy	53 (37.6 %)	29 (21.3 %)	<0.01	2.22 [1.30–3.79]
Osteopathy in the Cranial Field	91 (48.4 %)	47 (52.8 %)	0.57	–
Breathing	40 (28.4 %)	25 (18.3 %)	0.07	–
Facilitated positional release	34 (24.1 %)	35 (25.7 %)	0.86	–
Dry needling	12 (8.5 %)	2 (1.5 %)	0.02	6.23 [1.37–28.39]
Exercise prescription	126 (89.3 %)	92 (67.6 %)	<0.01	4.02 [2.11–7.65]
Shockwave therapy	1 (0.7 %)	1 (0.7 %)	1.00	–
Ultrasound	1 (0.7 %)	0	1.00	–
TENS	5 (3.5 %)	2 (1.5 %)	0.47	–
Instrument-assisted soft-tissue	2 (1.5 %)	0	0.49	–
Sport taping	24 (17.0 %)	4 (2.9 %)	<0.01	6.77 [2.28–20.08]

osteopathy workforce data (Vaughan et al., 2021). The higher reported management rates of upper and lower limb injury may demonstrate differences in peripheral injuries between the non-sporting and sporting population, or that osteopaths who often treat sports injuries naturally develop a special interest in these, given the number of peripheral injuries that happen exclusively or predominately in the sporting population compared with the general population (e.g. muscle strains/tears, ligament strains, stress fractures) (Ekstrand et al., 2020). It may also have been the case that the respondents did not separate tendinopathy from upper and lower limb injuries, which may have skewed the data. Further surveys with more specific injury-type questions may be more helpful in elucidating the self-reported answers in this cohort of osteopaths.

The participants in this study who responded often to treating sports injuries were more likely to treat ACC patients when compared with

Table 4

Statistically significant variables and their associated adjusted odds ratios for Australian and New Zealand osteopaths who report treating sport-related injuries often.

	Odds Ratio (aOR)	95 % Confidence Interval		p-value
		Lower	Upper	
Age	0.96	0.93	0.99	0.007
Send referrals to a medical specialist*	0.36	0.16	0.79	0.011
Discuss smoking^	4.18	1.38	12.63	0.011
Treat work-related injury patients ^	8.00	3.64	17.59	<0.001
Treat post-surgery patients =	3.60	1.00	12.92	0.049
Treat knee musculoskeletal complaints^	2.54	1.27	5.10	0.008
Use peripheral joint manipulation^	2.71	1.34	5.47	0.006
Use dry needling^	7.59	1.24	46.35	0.028
Use exercise prescription^	2.51	1.00	6.27	0.049
Use sport taping^	7.10	1.25	40.48	0.027

Outcome variable: * - yes; ^ - often.

their less often counterparts. The most recent data from 2022 shows there were 105,009 osteopathic claims to the ACC for all conditions (ACC, 2023). Considering that in the same year, there were 421,620 new ACC claims and 502,802 existing ACC claims related to sports and recreational injuries (ACC, 2024), the findings from this study appear to be congruent with those of the ACC. However, the current survey did not specify what proportion of ACC patients were presenting with injuries related to sport, which could make for intriguing future research. The often group also reported more frequently discussing occupational health and safety, physical activity, medication and smoking with their patients. This points to this group of osteopaths being more engaged in general and public health screening, which may stem from their greater involvement in the ACC scheme more broadly, rather than being influenced by their co-location with other health professionals, in which there was no significant difference between the often and less often groups. These findings also align with those found in the Australian equivalent PBRN (Adams et al., 2018).

4.1. Limitations

Our study has several limitations that must be acknowledged when interpreting the findings. One key concern is the reliance on self-reported data, which is inherently subject to multiple forms of bias. Recall bias may have affected participants’ ability to accurately report past clinical experiences or details of patient encounters, particularly in retrospective estimations (Van de Mortel, 2008). This is especially pertinent in clinical settings where precise recall of diagnoses, treatment types, or injury mechanisms may be limited by time elapsed and subjective interpretation. Additionally, social desirability bias may have influenced respondents to provide answers they believed would be viewed more favourably, rather than those that most accurately reflected their clinical behaviour or attitudes (Grimm, 2010; Larson, 2019). This can be particularly pronounced in healthcare professions where professional identity and perceived competence are closely tied to self-presentation. Other potential biases include non-response bias, where those who chose not to participate differ systematically from those who did (Elston, 2021), as exemplified by the total 48.7 % response rate, and also sampling bias, where the respondents may not be representative of all New Zealand osteopaths (Wang and Cheng, 2020).

Despite these limitations, this study offers valuable insights into the factors influencing New Zealand osteopaths’ decision-making when treating sport-related injuries. Building on this foundation, future research should delve into the specific types of sports injuries commonly

seen by New Zealand osteopaths, the effectiveness of different osteopathic treatment modalities for these injuries, and the patient outcomes associated with osteopathic care in this context. Additionally, investigating the cost-effectiveness of osteopathic treatment for sports injuries in the New Zealand healthcare system could provide valuable information for both practitioners and policymakers. To gain a deeper understanding of these issues, further research using diverse methods like interviews or case studies to explore the clinical reasoning of New Zealand osteopaths in sport-related injury care is recommended.

5. Conclusion

Sport injuries, which osteopaths regularly see in clinical practice, occur frequently and place a significant burden on the health across the world. Despite their commonality, there is little known about the practice characteristics of osteopaths who often treat sports injuries in New Zealand. Through data from the ORC-NZ PBRN it was established there are several different practitioner characteristics between those osteopaths who often treat sports injuries and those who do not. Namely, those who often treat sports injuries are more likely to refer to a medical specialist and for radiology, employ exercise rehabilitation and taping, treat tendinopathy and peripheral injuries and treat ACC patients. There may be several explanations for these findings, including the complexity and specificity required to successfully treat conditions across the sports injury spectrum. Future research should be targeted at more detailed survey responses in this demographic, as well as evaluating the effectiveness of osteopathic clinical interventions in this patient cohort. More broadly, the results of this study can be used as a foundation for practitioners, educators and policy makers to inform the integration of best-practice sport-injury management strategies within osteopathy.

Clinical relevance

- Little is known about the characteristics of osteopaths who treat sports injuries
- Around half of New Zealand osteopaths treat sports injuries often
- Those who answered often are more likely to prescribe exercise rehabilitation
- Those who answered often are more likely to refer to medical specialists
- These findings inform future research, education and policy decisions

New Zealand osteopaths who reported *often* treating patients with sport-related injuries were more likely to report sending referrals to specialist medical practitioners (OR 2.49) and *often* refer for diagnostic imaging (OR 2.81) compared with osteopaths who *less often* treat sport-related injuries.

CRediT authorship contribution statement

Nicholas Tripodi: Writing – review & editing, Writing – original draft, Project administration, Formal analysis. **Michael Fleischmann:** Writing – review & editing, Writing – original draft, Resources, Formal analysis, Data curation. **Lee Muddle:** Writing – review & editing, Writing – original draft. **Gopi McLeod:** Writing – review & editing, Writing – original draft. **Loic Treffel:** Writing – review & editing, Writing – original draft. **Brett Vaughan:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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