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Characteristics of the practice of New Zealand osteopaths who use high velocity low amplitude spinal manipulation

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ABSTRACT

Context: Osteopaths are primary healthcare practitioners who manage musculoskeletal pain, including spinal pain, and many people worldwide consult osteopaths to help manage their pain. High velocity, low amplitude (HVLA) spinal manipulation is a technique used by physiotherapists, chiropractors and osteopaths as part of a treatment and management process, and its use varies globally. This is the first study to describe how New Zealand (NZ) osteopaths use HVLA manipulation during their management of patients with musculoskeletal pain.

Objective: To explore the practice, demographic and clinical management characteristics of New Zealand osteopaths who often use HVLA spinal manipulation in patient care.

Methods: A secondary analysis was performed on data from a New Zealand (NZ) practice-based research network. Participants were NZ registered osteopaths. Demographic, practice, and treatment characteristics was collected from osteopaths who *'often'* and *'not often'* use HVLA spinal manipulation in patient care. Analysis used inferential statistics and backward linear regression modelling.

Results: One hundred and sixty-eight (n = 168, 60.6%) of the two hundred and seventy-seven (n = 277) respondents reported *often* using HVLA manipulation when treating patients. Several statistically significant practice and clinical management characteristics were extracted for osteopaths who reported *often* using HVLA manipulation including being seven times more likely to be co-located with a chiropractor (aOR 6.80), receiving referrals from nutritionists (aOR 4.24) and often referring for imaging (aOR 2.46).

Conclusions: This is the first study to describe practice and clinical characteristics of osteopaths who frequently use HVLA manipulation during patient management. This emerging data provides new directions for future research to inform clinical decision making and pre-professional education.

1. Introduction

Musculoskeletal (MSK) complaints refer to pain that affects muscles, tendons and nerves, and are a significant contributor to disability and health service use (World Health Organization, 2022). Musculoskeletal complaints are often multifactorial, incorporating biomechanical,

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neurophysiological, and psychosocial elements (Cholewicki et al., 2016; Kiesel et al., 2024). Approximately 1.7 billion people experience a MSK condition worldwide with low back pain being the leading cause of years lived with disability (YLD) (Vos et al., 2017; Wu et al., 2020). Treatment approaches other than use of medication are important given reported drug side effects and the increased prescribing of addictive opioids for pain relief (Shipton et al., 2018). As part of the management of MSK complaints, international guidelines recommend manipulation within a package of care (Lin et al., 2020). Some patients choose to seek out conservative care, including manual therapy from a physiotherapist, chiropractor or osteopath.

Osteopathy is a regulated health profession in New Zealand, operating under the Health Practitioners Competence Assurance Act 2003. The Osteopathic Council of New Zealand (OCNZ) is the statutory body responsible for the registration and regulation of osteopaths, with a mandate to protect public health and safety. New Zealand osteopaths are primary contact practitioners, meaning patients may consult them directly without a referral from a medical practitioner, and are trained to assess, diagnose and manage a range of MSK complaints, and to recognise presentations that require referral to other health professionals. New Zealand osteopaths do not hold prescribing rights for medications, nor do they perform surgical procedures. With respect to diagnostic imaging, NZ osteopaths may refer patients for imaging; however, they do so through referral pathways rather than by independently ordering imaging in the manner of a medical practitioner.

Entry to the osteopathic profession in New Zealand has historically been achieved through a range of qualifications, reflecting the evolution of osteopathic education over time. Older practitioners may hold a Diploma or Advanced Diploma, which were the entry-level qualifications prior to the transition to degree-level programmes. A post-graduate degree is now the standard entry-level qualification for new graduates in New Zealand, delivered through accredited programmes (Osteopathic Council of New Zealand, 2026). This contrasts with the United States context, where osteopathic education leads to a Doctor of Osteopathic Medicine (DO) degree, which confers full medical practice rights equivalent to a Doctor of Medicine (MD), including prescribing rights and surgical privileges. The scope of practice of osteopaths in New Zealand is therefore more closely aligned with that of osteopaths in Australia and the United Kingdom than with their United States counterparts.

Osteopathic practice in New Zealand encompasses a range of manual therapy techniques applied to the assessment and management of MSK complaints (Steel et al., 2020). These include soft tissue technique, muscle energy technique, joint articulation, and high velocity low amplitude (HVLA) manipulation. HVLA manipulation is a technique also used by physiotherapists and chiropractors as part of a treatment and management process, and its use varies globally within the osteopathic profession, with figures reported at between 34 and 85% (Ellwood and Carnes, 2021). An HVLA manipulation aims to cause “separation (gapping) of opposing articular surfaces of a synovial joint by a force applied perpendicularly to those articular surfaces, that results in cavitation within the synovial fluid of that joint” (Evans et al., 2010). The mechanisms by which HVLA manipulation produces an effect are still being investigated (Gevers-Montoro et al., 2021).

Although HVLA manipulation can be applied to most synovial joints in the body, research is predominantly directed at HVLA manipulation to the spine (Bini et al., 2022; Coulter et al., 2019; Rubinstein et al., 2019). Research into the outcomes of HVLA manipulation, particularly applied to the spine, are equivocal (Gross et al., 2015; Hinkeldey et al., 2020). However, there is a volume of evidence supporting the use of HVLA spinal manipulation as part of manual therapy interventions for low back and neck pain (Coulter et al., 2018, 2019; Wise, 2017). This evidence suggests HVLA manipulation may create local tissue and neurophysiological changes (Sampath et al., 2017, 2024) resulting in improved joint function (Branney and Breen, 2014) and decreased pain perception (Gevers-Montoro et al., 2021). Pain reduction is suggested to be immediately following the application of the technique (Bishop et al., 2011; Hegarty et al., 2021) and may influence various biochemical markers such as substance-p, neurotensin, oxytocin, interleukin and cortisol levels, post-intervention (Sampath et al., 2017, 2024). Additional evidence also supports the use of HVLA manipulation combined with other interventions such as exercise, for the management of these complaints (Hidalgo et al., 2017).

This study aims to identify osteopathic practice and patient management characteristics of NZ osteopaths associated with *often* using HVLA spinal manipulation during patient care and draws on data from the Osteopathy Research Connect-New Zealand (ORC-NZ) practice-based research network (PBRN) survey.

2. Methods

2.1. Ethics

Ethical approval for the collection of data for the PBRN was granted by the Human Research Ethics Committee at the University of Technology Sydney (reference number ETH19-3435). All participating osteopaths provided their informed consent.

2.2. Participants

The study's participants were osteopaths who completed the New Zealand osteopathy PBRN survey. The Osteopathy Research Connect-New Zealand (ORC-NZ) PBRN (Steel et al., 2020) was established in 2018, with participant recruitment taking place between August and December 2018. To participate, individuals needed to be registered osteopaths in New Zealand. A total of 277 osteopaths completed the ORC-NZ questionnaire and 253 agreed to become part of the PBRN, resulting in a 48.7% response rate from the profession. Data from the 277 respondents is analysed in the current study.

2.3. Questionnaire

The questionnaire employed in this study included items that were specifically designed for collecting baseline data within the context of the PBRN. Participants were required to provide information about various aspects related to themselves as practitioners, their practices, and clinical management. In terms of practitioner details, participants disclosed their age, gender, qualifications, and years of clinical experience. In terms of practitioner details, participants disclosed their age, gender, qualifications, and years of clinical experience. With respect to qualifications, participants selected from the following options: Diploma, Advanced Diploma, Bachelor degree, Master's degree, PhD, or Other. The Diploma and Advanced Diploma categories reflect qualifications awarded under earlier osteopathic education frameworks in New Zealand, prior to the transition to degree-level programmes. The “Other” category captured a small number of respondents who held qualifications not represented by the listed options, including overseas qualifications recognised by the Osteopathic Council of New Zealand. A post-graduate degree is the current standard entry-level qualification for new graduates in New Zealand (Osteopathic Council of New Zealand, 2026). Regarding practice details, participants reported the number of hours devoted to patient care per week, the average number of patients seen per week, the presence of other healthcare professionals at their workplace, and referrals to or from other healthcare professionals. The questionnaire also investigated patient management, with participants indicating the frequency of treating various body regions, their frequency of use of specific techniques and adjunctive therapies, and their approach to managing specific patient groups. Full details of the instrument used in the study have been reported previously (Steel et al., 2020).

2.4. Outcome variable and exposure variables

The primary outcome variable under examination in this study was the frequency of using HVLA spinal manipulation for patient management. Participants rated their frequency of using HVLA manipulation for patient management using a four-point scale: never, rarely, sometimes, and often. The first three options were categorized as "less often," while "often" was treated as the opposite binary outcome (Vaughan et al., 2024). The exposure variables in this study encompassed information related to the previously mentioned demographic and practice characteristics, which were collected using frequency, binary (yes/no) responses, or continuous data.

2.5. Statistical analysis

Inferential statistics were employed to explore the relationships between individual practice characteristics and the frequency of use of HVLA spinal manipulation for patient management. Prior to analysis, continuous variables (age, years in clinical practice, patient care hours per week, and patient visits per week) were assessed for normality using the Shapiro-Wilk test. The Shapiro-Wilk test indicated statistically significant departures from normality for all four variables (W range 0.958–0.983, all $p < 0.05$). However, given that the Shapiro-Wilk test is known to produce statistically significant results even for negligible departures from normality at moderate to large sample sizes (Ghasemi and Zahediasl, 2012), and that the W statistics observed were all close to 1.0, indicating near-normal distributions, the independent samples *t*-test was retained as the primary inferential test for continuous variables. This decision is further supported by the central limit theorem, which justifies the use of parametric tests at the sample sizes used in the current study (Norman, 2010), and by the Brown-Forsythe test, which confirmed homogeneity of variances across groups for all four variables (all $p > 0.05$), satisfying a key assumption of the independent samples *t*-test. Cohen's d effect sizes with 95% confidence intervals were calculated to characterise the magnitude of observed differences. Binary and categorical responses were analysed using chi-square tests, and unadjusted odds ratios (OR) with 95% confidence intervals were calculated for statistically significant variables. Variables with a significance level of $p < 0.20$ (Hosmer et al., 2013) were selected and subsequently included in a multivariate logistic regression model. Backward elimination was used to identify the main predictors of osteopaths who frequently use HVLA for patient management. Adjusted odds ratios (aOR) with 95% confidence intervals (CI) and p-values were computed through this regression analysis. Statistical significance was set at $p < 0.05$, and inferential statistical analyses were conducted using JASP (version 0.18), while the regression analysis was performed using SPSS (IBM Corp, USA).

3. Results

Two hundred and seventy-seven respondents (n = 277) to the ORC-NZ practice questionnaire. Of these, one hundred and sixty-eight NZ osteopaths (n = 168, 60.6%) indicated *often* using HVLA spinal manipulation in patient care. New Zealand osteopaths who reported using HVLA *often* were younger, reported fewer years in clinical practice, indicated greater patient care hours and patient visits per week, compared to osteopaths who reported *not often* using HVLA spinal manipulation (Table 1). Demographic variables were significantly different with medium effect sizes. Female NZ osteopaths reported less frequently using HVLA spinal manipulation compared to their male counterparts (Table 1). No significant differences were observed between the two groups with respect to involvement in clinical supervision of students ($p = 0.80$), clinical supervision of associates ($p = 0.40$), volunteer work ($p = 0.10$), or research activity ($p = 0.08$) (Table 1).

With respect to practice characteristics, NZ osteopaths who reported using HVLA spinal manipulation *often* were nearly seven times more likely to be co-located in practice with a chiropractor (OR 6.80), compared to osteopaths who *not often* use HVLA spinal manipulation (Table 2). No significant association was observed between the two groups for co-location with the majority of other health professional types, including general practitioners ($p = 0.37$), physiotherapists ($p = 0.98$), psychologists ($p = 0.38$), and massage therapists ($p = 0.64$).

Table 1
Demographic characteristics of New Zealand osteopaths who report *often* using HVLA spinal manipulation compared to those who *not often* use HVLA.

	Often (n = 168)	Not often (n = 109)	p-value
Gender			
Male	91 (54.2%)	39 (35.8%)	<0.01
Female	76 (45.3%)	70 (64.2%)	
Other	1 (0.6%)	0	
Age (years)			
Mean (±SD)	43.4 (±11.5)	48.5 (±11.9)	<0.01[a]
Years in clinical practice			
Mean (±SD)	14.0 (±10.2)	17.0 (±10.7)	0.02[b]
Patient care hours per week			
Mean (±SD)	28.7 (±11.3)	25.6 (±10.5)	0.02[c]
Patient visits per week			
Mean (±SD)	34.9 (±24.0)	28.7 (±18.9)	0.03[d]
Qualification (n, %)			
Diploma	19 (11.3%)	24 (22.0%)	<0.01
Advanced Diploma	2 (1.1%)	1 (0.9%)	
Bachelor degree	51 (30.4%)	22 (20.2%)	
Master's degree	83 (49.4%)	45 (41.3%)	
PhD	1 (0.6%)	0	
Other	7 (4.2%)	11 (10.1%)	
Involved in as an osteopath			
Clinical supervision (students)	14 (8.3%)	10 (9.2%)	0.80
Clinical supervision (associates)	23 (13.7%)	19 (17.4%)	0.40
Volunteer	27 (16.1%)	23 (21.1%)	0.10
Research	9 (5.3%)	12 (11.0%)	0.08

[a] d = 0.44 (95%CI[0.19-0.68]).
[b] d = 0.30 (95%CI[0.05-0.54]).
[c] d = 0.28 (95%CI[0.04-0.53]).
[d] d = 0.28 (95%CI[0.03-053]).

Osteopaths in NZ who use HVLA spinal manipulation *often* were more likely to report sending referrals to (OR 2.19), and receiving referrals from (OR 4.24) nutritionists, compared to NZ osteopaths who do *not often* use HVLA spinal manipulation (Table 2). The majority of other referral relationships, both sending and receiving, were not significantly associated, including referrals to and from general practitioners, physiotherapists, chiropractors, and massage therapists. New Zealand osteopaths who use HVLA spinal manipulation *often* were more likely to refer for diagnostic imaging compared to NZ osteopaths who *not often* use HVLA spinal manipulation (OR 2.46) (Table 2). Those practitioners who use HVLA spinal manipulation *often* were more likely to utilise diagnostic imaging to investigate unknown pathologies (OR 1.86), to investigate a suspected diagnosis (OR 3.01), and to rule out risk factors prior to treatment (OR 1.82). No significant association was observed for the use of diagnostic imaging for general screening of the spine ($p = 0.76$) or investigation of potential fractures ($p = 0.20$).

With respect to patient assessment approaches, no significant associations were observed for orthopaedic testing ($p = 0.31$), neurological testing ($p = 0.77$), clinical assessment algorithms ($p = 0.41$), or cranial nerve testing ($p = 0.91$). Osteopaths who *often* use HVLA spinal manipulation were significantly less likely to use a diagnostic screening questionnaire (OR 0.35).

New Zealand osteopaths who often use HVLA spinal manipulation were significantly less likely to discuss stress with their patients (OR 0.60) compared to colleagues who not often use HVLA spinal manipulation (Table 3). No significant differences were observed between the two groups for discussion of diet and nutrition ($p = 0.37$), smoking and alcohol ($p = 0.60$), physical activity ($p = 0.12$), occupational health and

Table 2
Practice characteristics of New Zealand osteopaths who report *often* using HVLA spinal manipulation compared to those who *not often* HVLA spinal manipulation.

	Often (n = 168)	Not often (n = 109)	p-value	OR [95% CI]
Practice location				
Urban practice	150 (89.3%)	93 (85.3%)	0.32	-
More than one practice location	60 (35.7%)	33 (30.3%)	0.35	-
Co-located with other health professionals ('yes')				
Osteopath	97 (57.7%)	54 (49.5%)	0.18	-
General Practitioner	14 (8.3%)	6 (5.5%)	0.37	-
Specialist Medical Practitioner	5 (2.9%)	0	0.07	-
Podiatrist	13 (7.7%)	5 (4.6%)	0.30	-
Physiotherapist	23 (13.7%)	15 (13.8%)	0.98	-
Chiropractor	10 (5.9%)	1 (0.9%)	0.03	6.8 [0.86-54.18]
Exercise Physiologist	3 (1.8%)	1 (0.9%)	0.55	-
Occupational Therapist	1 (0.60%)	3 (2.8%)	0.14	-
Psychologist	20 (11.9%)	17 (15.6%)	0.38	-
Massage Therapist	54 (32.1%)	38 (34.9%)	0.64	-
Acupuncturist	48 (28.6%)	24 (22.0%)	0.22	-
Naturopath	15 (8.9%)	19 (17.4%)	0.03	0.46 [0.22-0.95]
Dietician	1 (0.60%)	5 (4.6%)	0.03	0.12 [0.01-1.08]
Nutritionist	8 (4.8%)	12 (11.0%)	0.05	-
Send referrals to other health professionals ('yes')				
Osteopath	97 (57.7%)	74 (67.9%)	0.09	-
General Practitioner	149 (88.7%)	96 (88.1%)	0.87	-
Specialist Medical Practitioner	132 (78.6%)	75 (68.8%)	0.07	-
Podiatrist	68 (40.5%)	41 (37.6%)	0.63	-
Physiotherapist	75 (44.6%)	50 (45.9%)	0.84	-
Chiropractor	12 (7.1%)	10 (9.2%)	0.54	-
Exercise Physiologist	12 (7.1%)	9 (8.3%)	0.73	-
Occupational Therapist	15 (8.9%)	11 (10.1%)	0.74	-
Psychologist	46 (27.4%)	41 (37.6%)	0.07	-
Massage Therapist	107 (63.7%)	69 (63.3%)	0.95	-
Acupuncturist	121 (72.0%)	70 (64.2%)	0.17	-
Naturopath	69 (41.1%)	45 (41.3%)	0.97	-
Dietician	10 (6.0%)	11 (10.1%)	0.20	-
Nutritionist	41 (24.4%)	14 (12.8%)	0.02	2.19 [1.13-2.45]
Receive referrals from another health professionals ('yes')				
Osteopath	122 (72.6%)	83 (76.1%)	0.51	-
General Practitioner	152 (90.5%)	90 (82.6%)	0.05	-
Specialist Medical Practitioner	57 (33.9%)	32 (29.4%)	0.42	-
Podiatrist	35 (20.8%)	18 (16.5%)	0.37	-
Physiotherapist	75 (44.6%)	47 (43.1%)	0.80	-
Chiropractor	14 (8.3%)	7 (6.4%)	0.56	-
Exercise Physiologist	11 (6.5%)	5 (4.6%)	0.50	-
Occupational Therapist	14 (8.3%)	11 (10.1%)	0.62	-
Psychologist	24 (14.3%)	19 (17.4%)	0.48	-
Massage Therapist	127 (75.6%)	73 (67.0%)	0.19	-
Acupuncturist	85 (50.6%)	55 (50.5%)	0.98	-
Naturopath	60 (35.7%)	41 (37.6%)	0.75	-
Dietician	6 (3.6%)	2 (1.8%)	0.40	-
Nutritionist	18 (10.7%)	3 (2.8%)	0.01	4.24 [1.22-14.76]
Diagnostic imaging				
Referral for imaging ('often')	50 (29.8%)	16 (14.7%)	<0.01	2.46 [1.32-4.60]
Investigation of unknown pathologies	134 (79.8%)	74 (67.9%)	0.03	1.86 [1.07-3.23]
Investigation of suspected diagnosis	157 (93.5%)	90 (82.6%)	<0.01	3.01 [1.37-6.16]
Investigation of potential fractures	144 (85.7%)	87 (79.8%)	0.20	-
Rule out risk factors prior to treatment	76 (45.2%)	34 (31.2%)	0.02	1.82 [1.10-3.02]
General screening of the spine	14 (8.3%)	8 (7.3%)	0.76	-
Patient assessment ('yes')				
Orthopaedic testing	164 (97.6%)	104 (95.4%)	0.31	-
Clinical assessment algorithm	54 (32.1%)	30 (27.5%)	0.41	-
Neurological testing	159 (94.6%)	104 (95.4%)	0.77	-
Screening questionnaire	144 (85.7%)	103 (94.5%)	0.02	0.35 [0.14-0.89]
Cranial nerve testing	113 (67.3%)	74 (67.9%)	0.91	-

safety (p = 0.47), pain counselling and education (p = 0.09), nutritional supplements (p = 0.09), or medication (p = 0.80).

With respect to patient subgroups, New Zealand osteopaths who report *often* using HVLA spinal manipulation, when compared to colleagues who *not often* use HVLA spinal manipulation, were more likely to report often treating older adults (OR 2.12) and less likely to treat those up to 3 years of age (OR 0.45) (Table 3). No significant differences were observed between the two groups for patients aged four to eighteen years (p = 0.53), pregnant patients (p = 0.49), non-English speaking patients (p = 0.22), traffic injury patients (p = 0.22), or post-surgical patients (p = 0.46).

For conditions treated *often*, NZ osteopaths who *often* use HVLA spinal manipulation were more likely to report *often* treating back pain (OR 9.72) and tendinopathies (OR 2.39), compared to osteopaths who *not often* use HVLA spinal manipulation. Conversely, NZ osteopaths who *often* use HVLA spinal manipulation were less likely to report treating non-musculoskeletal complaints compared to osteopaths who *not often* use HVLA spinal manipulation (OR 0.34) (Table 3). No significant differences were observed between the two groups for neck pain (p = 0.06), thoracic pain (p = 0.14), hip pain (p = 0.91), knee pain (p = 0.79), shoulder pain (p = 0.32), or headache disorders (p = 0.39).

Soft tissue (OR 8.73) and muscle energy techniques (OR 3.30) were favoured by NZ osteopaths who *often* use HVLA spinal manipulation compared to those who *not often* use HVLA spinal manipulation (Table 3). No significant differences were observed between the two groups for counterstrain (p = 0.12), myofascial release (p = 0.28), visceral techniques (p = 0.68), lymphatic pump (p = 0.24), or breathing (p = 0.65).

New Zealand osteopaths who report *often* using HVLA spinal manipulation were significantly less likely to report using osteopathy in the cranial field (OCF) techniques (aOR 0.23) or discuss stress with their patients (aOR 0.37), compared to colleagues who *not often* use HVLA spinal manipulation (Table 4). Muscle energy techniques (aOR 2.66) and joint manipulation (aOR 2.50) were more likely to be used by NZ osteopaths who *often* use HVLA spinal manipulation, compared to osteopaths who not *often* use HVLA spinal manipulation.

4. Discussion

This is the first study to identify a series of practitioner

Table 3
Clinical management characteristics of New Zealand osteopaths who report *often* using HVLA spinal manipulation compared to those who *not often* HVLA spinal manipulation.

	Often (n = 168)	Not often (n = 109)	p-value	OR [95% CI]
Discuss with patients ('often')				
Diet/nutrition	65 (38.7%)	48 (44.0%)	0.37	-
Smoking/drugs/alcohol	21 (12.5%)	16 (14.7%)	0.60	-
Physical activity	147 (87.5%)	88 (80.7%)	0.12	-
Occupational Health & Safety	72 (42.9%)	42 (38.5%)	0.47	-
Pain counselling/ education	29 (17.3%)	28 (25.7%)	0.09	-
Stress	82 (48.8%)	67 (61.5%)	0.04	0.60 [0.37-0.97]
Nutritional supplements	37 (22.0%)	34 (31.2%)	0.09	-
Medication	61 (36.3%)	38 (34.9%)	0.80	-
Patient subgroups (treat 'often')				
Up to 3 years of age	35 (20.8%)	40 (36.7%)	<0.01	0.45 [0.26-0.78]
4 to 18 years of age	54 (32.1%)	39 (35.8%)	0.53	-
Older adults	125 (74.4%)	63 (57.8%)	<0.01	2.12 [1.27-3.55]
Pregnancy	46 (27.4%)	34 (31.2%)	0.49	-
Non-English speaking	10 (6.0%)	3 (2.8%)	0.22	-
Sport-related injuries	99 (58.9%)	42 (38.5%)	<0.01	2.29 [1.40-3.75]
Work injury	128 (76.2%)	53 (48.6%)	<0.01	3.38 [2.02-5.67]
Traffic injury	48 (28.6%)	24 (22.1%)	0.22	-
Post-surgery	21 (12.5%)	17 (15.6%)	0.46	-
Maori (indigenous population)	29 (17.3%)	12 (11.0%)	0.15	-
Accident Compensation Commission (ACC)	156 (92.9%)	86 (78.9%)	<0.01	3.48 [1.65-7.33]
Conditions Treated ('often')				
Neck pain	167 (99.4%)	105 (96.3%)	0.06	-
Thoracic pain	153 (91.1%)	93 (85.3%)	0.14	-
Back pain	167 (99.4%)	103 (94.5%)	0.01	9.72 [1.15-81.96]
Hip pain	113 (67.3%)	74 (67.9%)	0.91	-
Knee pain	82 (48.8%)	55 (50.5%)	0.79	-
Ankle pain	58 (34.5%)	46 (42.2%)	0.20	-
Foot pain	45 (26.8%)	33 (30.3%)	0.53	-
Shoulder pain	139 (82.7%)	85 (78.0)	0.32	-
Elbow pain	41 (24.4%)	23 (21.1%)	0.52	-
Wrist pain	25 (14.9%)	25 (22.9%)	0.09	-
Hand pain	20 (11.9%)	15 (13.8%)	0.65	-
Postural disorders	96 (57.1%)	48 (44.0%)	0.03	1.69 [1.04-2.75]
Degenerative spinal complaints	90 (53.6%)	39 (35.8%)	<0.01	2.07 [1.26-3.40]
Headache disorders	145 (86.3%)	90 (82.6%)	0.39	-
Migraine disorders	75 (44.6%)	32 (29.4%)	0.01	1.94 [1.16-3.24]
Spine health maintenance or prevention	82 (48.8%)	46 (42.2%)	<0.01	2.96 [1.81-4.83]
Tendinopathies	61 (36.3%)	21(19.3%)	<0.01	2.39 [1.35-4.22]
Temporomandibular joint	17 (10.1%)	19 (17.4%)	0.07	-
Non-musculoskeletal	17 (10.1%)	27 (24.8%)	<0.01	0.34 [0.17-0.66]
Manual therapy (use 'often')				
Counterstrain	48 (28.6%)	22 (20.2%)	0.12	-
Muscle energy technique	120 (71.4%)	47 (43.1%)	<0.01	3.30 [1.99-5.47]
Peripheral joint manipulation	109 (64.9%)	40 (36.7%)	<0.01	3.19 [1.93-5.27]
Soft tissue technique	161 (95.8%)	79 (72.5%)	<0.01	8.73 [3.67-20.76]
Myofascial release	105 (62.5%)	61 (56.0%)	0.28	-
Visceral techniques	38 (22.6%)	27 (24.8%)	0.68	-
Lymphatic pump	13 (7.7%)	13 (11.9%)	0.24	-
Autonomic balancing	23 (13.7%)	32 (29.4%)	<0.01	0.38 [0.21-0.70]
Biodynamics	30 (17.9%)	30 (27.5%)	<0.01	0.35 [0.19-0.67]
Functional technique	65 (38.7%)	59 (54.1%)	0.01	0.53 [0.33-0.87]
Balanced ligamentous tension	65 (38.7%)	68 (62.4%)	<0.01	0.46 [0.28-0.75]
Chapman's reflexes	9 (5.4%)	2 (1.8%)	0.14	-
Trigger point therapy	63 (37.5%)	19 (17.4%)	<0.01	2.84 [1.85-5.10]
Osteopathy in the Cranial Field	63 (37.5%)	75 (68.8%)	<0.01	0.27 [0.16-0.45]
Breathing	41 (24.4%)	24 (22.0%)	0.65	-
Facilitated positional release	37 (22.0%)	32 (29.4%)	0.17	-
Dry needling	12 (7.1%)	2 (1.8%)	0.05	-
Exercise prescription	141 (83.9%)	77 (70.6%)	<0.01	2.17 [1.21-3.89]
Shockwave therapy	2 (1.2%)	0	0.25	-
Ultrasound	1 (0.6%)	0	0.42	-
TENS	7 (4.2%)	0	0.05	-
Instrument-assisted soft-tissue	2 (1.2%)	1 (0.9%)	0.25	-
Sport taping	22 (13.1%)	6 (5.5%)	0.04	2.59 [1.01-6.60]

characteristics that are significantly associated with the frequent use of HVLA spinal manipulation by osteopaths in patient care. Over 60% of the respondents to the PBRN survey reported *often* using HVLA in patient care. This finding is consistent with the results from a similar survey conducted by the Australian osteopathy PBRN, where nearly 64% reported *often* using HVLA spinal manipulation (Steel et al., 2020). Overall, these results add to the research showing HVLA spinal manipulation is commonly used by osteopathic practitioners worldwide, although the extent of its use varies dependent on geographical location (Ellwood and Carnes, 2021). A strength of the current study is its use of a nationally representative PBRN dataset, the application of multivariate logistic regression to identify independent predictors of HVLA spinal manipulation use, and that it is the first study of its kind to describe these characteristics within the NZ osteopathic profession.

HVLA spinal manipulation is one of the manual therapy techniques

Table 4
Statistically significant variables and their associated adjusted odds ratios for New Zealand osteopaths who *often* utilise high velocity, low amplitude spinal manipulation with patients.

	Odds Ratio (aOR)	95% Confidence Interval		p-value
		Lower	Upper	
Age	0.96	0.93	0.99	0.010
Patient visits	1.02	1.00	1.04	0.017
Work with a nutritionist (yes)	6.79	1.53	30.14	0.012
Receive referrals from a nutritionist (yes)	0.10	0.01	0.67	0.018
Diagnostic screening questionnaire (yes)	6.17	1.17	23.58	0.008
Discuss stress (often)	0.37	0.17	0.80	0.011
Treat work injury patients (often)	3.35	1.47	7.66	0.022
Treat Maori patients (often)	4.46	1.20	16.67	0.026
Treat wrist complaints (often)	0.23	0.07	0.73	0.013
Treat spine health (often)	2.52	1.15	5.52	0.020
Use muscle energy technique (often)	2.66	1.25	5.67	0.011
Use peripheral joint manipulation (often)	2.50	1.16	5.34	0.019
Use soft tissue techniques (often)	6.96	2.00	24.22	0.002
Use Osteopathy in the Cranial Field techniques (often)	0.23	0.11	0.49	<0.01

that osteopaths may frequently use in patient care. However, osteopathic care typically goes beyond the application of a single manual technique, often incorporating multiple techniques in a single consultation (Roberts et al., 2022) informed by clinical reasoning (Clifford et al., 2022; McIntyre et al., 2018). Although osteopaths are trained in a variety of manual therapy techniques, in the current study NZ osteopaths who report *often* using HVLA spinal manipulation were significantly more likely to report using soft tissue and muscle energy techniques (MET) during patient care compared to osteopaths who report *not often* using HVLA spinal manipulation. There is evidence supporting the notion of combinations of treatment techniques being used, both in research (Ceballos-Laita et al., 2023; Ruffini et al., 2022) and practice (Feehan et al., 2017; Kilic et al., 2023) settings. The current study points to the need for more research to understand the clinical reasoning behind the combinations of techniques commonly used by osteopaths, and their associated patient outcomes.

New Zealand osteopaths who *often* use HVLA spinal manipulation are over 70% less likely to use osteopathy in the cranial field (OCF) in patient care. OCF is a gentle, low-force approach to osteopathic treatment that focuses on subtle movements of the cranial bones and sacrum and is distinct from the structural techniques such as HVLA spinal manipulation. Evidence for diagnostic reliability and clinical effectiveness associated with OCF are equivocal (Guillaud et al., 2018). From a historical and research perspective, practitioners who use OCF have used this approach in isolation (Gesslbauer et al., 2018) or as part of other 'fluid' models of practice.(McPartland and Skinner, 2005). There is a purported 'structural' and 'cranial' divide, whereby some practitioners primarily use structural techniques (e.g. articulation, HVLA manipulation, MET, and soft tissue technique), while others predominantly use OCF and related approaches (Norrie, 2011). Despite the lack of evidence for the proposed mechanisms of OCF, it continues to be a popular form of treatment, particularly in Europe (Ellwood and Carnes, 2021). The findings from the current study may provide support for this 'structural/cranial' notional divide. Osteopaths who *often* use OCF and those who *often* use HVLA spinal manipulation tend to see different patient profiles. These findings suggest a need to further explore why osteopathic practitioners choose to use HVLA over OCF (and vice-versa), for specific patient groups or complaints, to better understand the care provided by practitioners and to potentially inform patient care choices. It is possible that this divide reflects differences in philosophical orientation towards osteopathic practice (Thomson et al., 2014), differences in the patient populations that practitioners attract, or both. Further qualitative and quantitative research is needed to examine these possibilities.

The co-location of NZ osteopaths who *often* use HVLA spinal manipulation with chiropractors is a notable finding. Chiropractors are health professionals whose practice is also centred on the use of spinal manipulation (Adams et al., 2017), and co-location may reflect shared professional values around manipulation-based approaches to patient care and a similar patient population. It is plausible that practitioners who share a clinical environment with chiropractors are more likely to be exposed to, and influenced by, a manipulation-focused model of care, or alternatively that practitioners with a preference for HVLA spinal manipulation are more likely to seek out practice environments where such an approach is valued. The direction of this relationship cannot be determined from the current data, and further research is warranted to understand the nature of this association.

The association between often using HVLA spinal manipulation and referral networks involving nutritionists is less immediately intuitive. NZ osteopaths who *often* use HVLA spinal manipulation were more likely to both send referrals to and receive referrals from nutritionists. One possible explanation is that practitioners who adopt a more biomedically oriented, evidence-based approach to patient care, may also be more likely to engage with other practitioners such as nutritionists as part of a broader multidisciplinary approach to patient management (Cuomo and Parascandolo, 2024). Another explanation is NZ osteopaths who *often* use HVLA spinal manipulation recognising the role of nutrition in musculoskeletal health (Dominguez et al., 2025; Lewis et al., 2019). However, this interpretation is speculative, and the wide confidence intervals associated with this finding (aOR 6.79, 95% CI 1.53–30.14) indicate that it should be interpreted with caution. Further research is required to better understand this association.

Treating work injury patients was significantly associated with NZ osteopaths *often* using HVLA spinal manipulation in our study. In the New Zealand context, payments for treatment of injuries (including work-related injuries) are covered by the Accident Compensation Corporation (ACC), a government, nation-wide no-fault injury payment scheme (Hill et al., 2023). The association observed in the current work suggests that HVLA spinal manipulation is a common manual therapy intervention used by NZ osteopaths for this population. This is an important finding given that spinal injuries (e.g. lumbar spine, thoracic spine and cervical spine) make up 74% of conditions treated by NZ osteopaths that are funded by the ACC (Accident Compensation Commission, 2023). The ACC has recommended practitioners apply evidence-based approaches for patient care (Accident Compensation Commission, 2024). Given the evidence supporting the use of HVLA manipulation for spinal complaints (Chaibi et al., 2021; Masaracchio et al., 2019; Rubinstein et al., 2019), and its inclusion in clinical practice guidelines (World Health Organization, 2023), osteopaths may include HVLA spinal manipulation to ensure they are using an evidence-based approach to patient care. Whether this assertion holds, requires additional research to better understand how HVLA spinal manipulation is used as part of manual therapy care for a work-related injury patient.

The finding that NZ osteopaths who *often* use HVLA spinal manipulation were more likely to often treat patients of Māori descent warrants consideration. Māori are the indigenous people of New Zealand and experience a disproportionate burden of musculoskeletal conditions relative to the general population (Gurney et al., 2020). The association observed in the current study may reflect the geographic distribution of practitioners who often use HVLA spinal manipulation, or the health needs of Māori communities (Sheehy et al., 2025), including higher rates of musculoskeletal conditions (Saywell et al., 2025) for which HVLA manipulation may be indicated. It is also possible that this association reflects the ACC funding context described above, given that Māori are disproportionately represented in work-related injury claims (Saywell et al., 2025). As with the nutritionist finding, the wide confidence intervals for this variable (aOR 4.46, 95% CI 1.20–16.67) indicate that this

finding should be interpreted cautiously, and further research is required to understand this relationship.

4.1. Study limitations

Several additional variables analysed in the current study were identified as being significantly associated with often using HVLA spinal manipulation: use of a diagnostic screening questionnaire; often treating patients who are of Maori (indigenous) descent; and working with a nutritionist. Although statistically significant, the wide 95% confidence intervals for these variables limits the interpretation. However, these associations provide an opportunity for additional research to better understand the relationship between use of HVLA spinal manipulation by NZ osteopaths and these patient and practice characteristics. Other limitations of the secondary analysis are recall, response and social desirability biases that are inherent in survey studies. The cross-sectional design of the study precludes causal inference, and the associations reported here should be interpreted accordingly. Although the PBRN dataset is nationally representative, the response rate of 48.7% means that non-response bias cannot be excluded. Finally, the study was conducted in the New Zealand context, and the findings may not be directly generalisable to osteopathic practice in other countries, given the differences in regulatory frameworks, scope of practice, and health system contexts.

5. Conclusion

This secondary analysis is the first study to describe the demographic, practice, and clinical management characteristics associated with the frequent use of HVLA spinal manipulation by osteopaths in New Zealand. The data demonstrate that NZ osteopaths who often use HVLA spinal manipulation represent a distinct practitioner profile: they are younger, see more patients per week, are more likely to be co-located with a chiropractor, maintain referral relationships with nutritionists, and favour structural manual therapy techniques including soft tissue technique and muscle energy technique. These practitioners are less likely to use osteopathy in the cranial field. The association between frequent HVLA spinal manipulation use and the management of work-related injury patients is consistent with the ACC funding context in New Zealand and the evidence base supporting HVLA manipulation for spinal complaints. Several associations, including those with nutritionist referral networks, Māori patient populations, and diagnostic screening questionnaire use, were statistically significant but characterised by wide confidence intervals, indicating that these findings should be interpreted with caution and warrant further investigation. Together, these findings provide a foundation for future research into the clinical reasoning underlying HVLA spinal manipulation use, the outcomes associated with its application, and its role in pre-professional osteopathic education.

CRediT authorship contribution statement

Cindy McIntyre: Writing – review & editing, Writing – original draft, Supervision, Project administration, Formal analysis, Conceptualization. **Brett Vaughan:** Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Investigation, Formal analysis, Conceptualization. **Jerry Draper-Rodi:** Writing – review & editing, Writing – original draft. **Jack Feehan:** Writing – review & editing, Writing – original draft. **Michael Fleischmann:** Writing – review & editing, Writing – original draft. **Niklas Sinderholm Sposato:** Writing – review & editing, Writing – original draft. **Nicholas Tripodi:** Writing – review & editing, Writing – original draft. **Kesava Kovanur Sampath:** Writing – review & editing, Writing – original draft, Conceptualization.

Ethics declaration

Written informed consent to take part in the study and to publish the article has been obtained from all participants or their legal representatives. The privacy rights of participants have been observed.

This study was performed in compliance with relevant laws, regulatory frameworks and guidelines where the research took place. This study was approved by the University of Technology Sydney. (Approval No. ETH19-3435)

Patient consent

Not required.

Data availability

The datasets analysed during the current study are not publicly available as the authors do not have the authority to disseminate the data. The dataset is available through reasonable request at arccim@uts.edu.au.

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Declaration of competing interest

The authors declare no conflict of interest.

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