

# Characteristics of Australian Osteopaths Managing Tendinopathies: Analysis of a Nationally Representative Survey of 989 Practitioners

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## DOI:

10.32098/mltj.01.2021.16

## LEVEL OF EVIDENCE: 4

## SUMMARY

**Background.** Tendinopathies are a common complaint presenting to health professionals, including osteopaths. Evidence supports the use of exercise rehabilitation, with a potential role for manual therapy. This study sought to profile the practice and clinical management characteristics of Australian osteopaths who often treat tendinopathies.

**Methods.** The study was designed as a cross-sectional survey of Australian osteopaths. Participants were Australian osteopaths who were members of the Osteopathy Research and Innovation Network (ORION) - the Australian professions' practice-based research network. Participants were invited to complete a 27-item practice and clinical management characteristic questionnaire. The questionnaire asked participants to identify demographic, practice and clinical management characteristics associated with their practice. Regression modelling was used to identify significant characteristics associated with often treating tendinopathies.

**Results.** Nine hundred and eighty-nine osteopaths responded and over 41% (n = 410) reported often treating tendinopathies. This group were more likely to be female (ORa 1.5), often treat patients with chronic pain (ORa 3.8) and sports injury (ORa 2.5) and often use exercise prescription (ORa 1.6) in patient care.

**Conclusions.** Australian osteopaths who often treat tendinopathies demonstrate different clinical practice and management characteristics compared to their colleagues who do not often treat this complaint. Research into patient outcomes and cost-effectiveness of osteopathy care for the management of tendinopathies is now required.

## KEY WORDS

*Musculoskeletal; manual therapy; rehabilitation; osteopathic medicine; practice-based research network.*

## INTRODUCTION

Tendons are a unique connective tissue attaching muscle to bone (1) and loading the tendon beyond its load capacity has been identified as a key risk factor to the development of tendinopathy (2). Tendinopathy is a highly prevalent condition that affects people from both athletic and non-athletic backgrounds (3-6). Prevalence studies across a variety of contexts suggests that tendinopathies are likely to be a

common presentation to a range of health professionals (7). Much of the prevalence literature focuses on lower extremity tendinopathies in different age groups (8), and populations (3), including those competing in sport at the elite (3) and non-elite level (9). However, Hopkins *et al.* (10) argue the prevalence of tendinopathies may be underestimated. First line management of tendinopathy is exercise-based (2). Contemporary narrative suggests that progressively expos-

ing the tendon to heavy slow resistance (HSR), the best way to: 1) improve load tolerance and mechanical stiffness of the tendon being loaded (2) and 2) induce adaptive changes to the musculotendinous unit. Loading programs have been shown to be efficacious in the management of adults with lower limb tendinopathy (11, 12).

There is an emerging body of evidence that draws associations between tendinopathy and psychosocial factors (13). Kinesiophobia or fear of movement was found to be present in 2 of every 3 patients in a consecutive cohort of adults with lower limb tendinopathy. Kinesiophobia, catastrophisation and depression were found to be positively associated with plantar heel pain (14) and with increased symptom severity in gluteal tendinopathy (15). When treating tendinopathy, evidence-based approaches to addressing psychosocial issues and chronic pain management may also be required as part of a multifaceted, patient-centred approach.

Osteopathy offers a whole person approach utilising a patient-centred, biopsychosocial (BPS) model. As such, osteopaths are well placed to play a role in the multidisciplinary management of musculoskeletal conditions including tendinopathy. Australian osteopaths are primary contact health professionals who utilise a range of manual therapy and exercise interventions in patient care, in addition to advice with respect to nutrition, stress and ergonomics (16). In Australia, osteopaths are not trained medical professionals but are able to examine and diagnose conditions affecting the musculoskeletal system, including tendinopathies. Recent workforce data suggests osteopaths manage tendinopathies relatively frequently (16) and are well placed to institute best practice tendinopathy management. The aim of this study was to profile the practice and clinical management characteristics of Australian osteopaths who often manage tendinopathies to better understand the role these health professions play in its management.

## METHODS

Data for the secondary analysis were drawn from the practice-based research network (PBRN) established for the osteopathy profession in Australia – the Osteopathy Research and Innovation Network (ORION) Project (<http://www.orion-arccim.com/>) (16).

### Sample

Nine hundred and ninety-two osteopaths (N = 992) completed the ORION survey representing 49.1% of the profession at time of completion. The ORION research design and baseline data have been described elsewhere (16). The

ORION practitioner sample is nationally representative of the wider profession on a number of indicators including age, gender and primary practice location by comparison with data from the Australian Health Practitioner Regulation Agency (16).

### Questionnaire

Participants completed a questionnaire designed to collect demographic characteristics, practice characteristics, and clinical management of patient's via 27 items. Demographic characteristics included age, gender, the highest level of osteopathy professional qualification, and length of time working in private osteopathy practice. Practice characteristics include the average patient care hours and patient visits per week, practice location, health professionals working in same practice location, referral relationships (receiving and sending) with other health professionals, and diagnostic imaging use. The participants were asked about their clinical management, such as people's conditions, patient groups, and various aspects of osteopathy techniques. With respect to the current study, respondents were asked to indicate the frequency with which they manage patients with a tendinopathy (never/rarely/sometimes/often) as the outcome variable.

### Statistical analyses

Participants were categorised as based on their response to the frequency item. For the analysis, the outcome variable was dichotomised to 'not often' (never/rarely/sometimes) and 'often' treating patients with tendinopathies. Participants' demographics, practice characteristics, and clinical management were then compared between groups via chi-square tests and independent measures t-tests. Unadjusted odds ratios (OR) were calculated for the chi-square tests, and effect sizes calculated for t-tests where relevant. Variables with a  $p < 0.10$  were subsequently included in a multiple logistic regression model, using a backward stepwise elimination process, to examine the practice characteristics statistically significantly associated with frequency of managing tendinopathies. Alpha was set at 0.05 and adjusted odds ratios (ORa) were estimated from this multivariate logistic regression modelling. All statistical analyses were performed using SPSS version 25.

### Ethical approval

Osteopaths who chose to participate in the PBRN provided informed consent and ethics approval was granted through the University of Technology Sydney (approval number:

2014000759). The data collection was performed in accordance with the ethical standards for the journal described by Padulo *et al.* (17).

## RESULTS

Nine hundred and eighty nine respondents (99.7% of the ORION database) provided a response to the frequency item “How often do you treat patients with a tendinopathy?” (never/rarely/sometimes/often). The number of Australian osteopaths who reported treating tendinopathies often was 410 (41.4%) (table I). Descriptive statistics for the sample are presented in table I. Australian osteopaths who often treated patients with tendinopathies were 60% more likely to be female in addition to reporting a greater number of patient visits and patient

care hours per week, and being less likely to be involved in research (table I).

Australian osteopaths who often reported treating tendinopathies were more likely to send referrals to, and receive referrals from, a range of health professionals when compared to those who do not (table II). Referrals for diagnostic imaging were also three times more likely to be used by those osteopaths often treating tendinopathies compared to those who do not. Australian osteopaths who report often treating tendinopathies were more likely, compared to those who do not, to discuss a range of lifestyle and self-management strategies with patients, along with treating the breadth of body regions (table III). Most of the common manual therapy techniques utilised by Australian osteopaths were more likely to be used by those reporting often treating tendinopathies compared to those who do not.

**Table I.** Practitioner characteristics of Australian osteopaths who often treat patients with tendinopathies.

	‘Often’ (n = 410)	‘Not often’ (n = 579)	p-value	OR [95% CI]
<b>Gender</b>				
Male	210 (51.2%)	366 (63.2%)		
Female	200 (48.8%)	213 (36.8%)	< 0.01	1.6 [1.2, 2.1]
<b>Age (years)</b>				
Mean (± SD)	38.3 (± 10.4)	37.8 (± 11.2)	0.48	-
<b>Years in clinical practice</b>				
Mean (± SD)	11.8 (± 8.5)	11.1 (± 9.3)	0.24	-
<b>Patient care hours per week</b>				
Mean (± SD)	30.3 (± 11.8)	26.3 (± 12.0)	< 0.01 <sup>a</sup>	-
<b>Patient visits per week</b>				
Mean (± SD)	39.9 (± 18.5)	33.9 (± 18.3)	< 0.01 <sup>b</sup>	-
<b>Qualification (n, %)</b>				
Diploma	28 (6.8%)	33 (5.7%)	0.40	-
Advanced Diploma	1 (0.2%)	8 (1.4%)		
Bachelor degree	91 (22.2%)	127 (21.9%)		
Master’s degree	283 (69.0%)	396 (68.4%)		
PhD	1 (0.2%)	4 (0.7%)		
Other	6 (1.5%)	11 (1.9%)		
<b>Additional qualification*</b>	7 (1.7%)	8 (1.4%)	0.68	-
<b>Involved in as an osteopath</b>				
University teaching	49 (12.0%)	67 (11.6%)	0.85	-
Clinical supervision	66 (16.1%)	84 (14.5%)	0.49	-
Professional organisations	40 (9.8%)	67 (11.6%)	0.36	-
Research	14 (3.4%)	40 (6.9%)	0.02	0.5 [0.2, 0.8]
Volunteer	66 (16.1%)	92 (15.9%)	0.93	-

\*Qualification beyond primary osteopathy qualification, <sup>a</sup>  $d=0.33$ , <sup>b</sup>  $d=0.32$  ( $d$ =Cohen’s  $d$  effect size).

**Table II.** Practice characteristics of Australian osteopaths who often treat patients with tendinopathies.

	'Often' (n = 410)	'Not often' (n = 579)	p-value	OR [95% CI]
<b>Practice location</b>				
Urban practice	336 (82.0%)	482 (83.2%)	0.60	-
More than one practice location	150 (36.6%)	196 (33.9%)	0.37	-
<b>Co-located with other health professionals ('yes')</b>				
Osteopath	275 (67.1%)	365 (63.0%)	0.19	-
General Practitioner	36 (8.8%)	35 (6.0%)	0.10	-
Specialist Medical Practitioner	13 (3.2%)	18 (3.1%)	0.95	-
Podiatrist	71 (17.3%)	75 (13.0%)	0.06	-
Physiotherapist	59 (14.4%)	85 (14.7%)	0.90	-
Exercise Physiologist	57 (13.9%)	65 (11.2%)	0.21	-
Occupational Therapist	5 (1.2%)	14 (2.4%)	0.18	-
Psychologist	78 (19.0%)	112 (19.3%)	0.90	-
Massage Therapist	210 (51.2%)	289 (49.9%)	0.68	-
Acupuncturist	76 (18.5%)	111 (19.2%)	0.80	-
Naturopath	82 (20.0%)	110 (19.0%)	0.70	-
Dietician	29 (7.1%)	43 (7.4%)	0.83	-
Nutritionist	38 (9.3%)	40 (6.9%)	0.17	-
<b>Send referrals to other health professionals ('yes')</b>				
Osteopath	225 (54.9%)	279 (48.2%)	0.04	1.3 [1.0, 1.7]
General Practitioner	368 (89.8%)	507 (87.6%)	0.29	-
Specialist Medical Practitioner	204 (49.8%)	237 (40.9%)	< 0.01	1.4 [1.1, 1.8]
Podiatrist	286 (69.8%)	362 (62.5%)	0.02	1.4 [1.0, 1.8]
Physiotherapist	145 (35.4%)	186 (31.1%)	0.29	-
Exercise Physiologist	186 (45.4%)	210 (36.3%)	< 0.01	1.5 [1.1, 1.8]
Occupational Therapist	43 (10.5%)	63 (10.9%)	0.84	-
Psychologist	164 (40.0%)	184 (31.8%)	< 0.01	1.4 [1.1, 1.8]
Massage Therapist	288 (70.2%)	383 (66.1%)	0.17	-
Acupuncturist	182 (44.4%)	269 (46.5%)	0.52	-
Naturopath	203 (49.5%)	273 (47.2%)	0.46	-
Dietician	82 (20.0%)	84 (14.5%)	0.02	1.5 [1.0, 2.1]
Nutritionist	66 (16.1%)	63 (10.9%)	0.02	1.6 [1.1, 2.3]
<b>Receive referrals to other health professionals ('yes')</b>				
Osteopath	259 (63.2%)	353 (61.0%)	0.48	2.0 [1.4, 2.9]
General Practitioner	378 (92.2%)	505 (87.2%)	0.01	1.7 [1.1, 2.7]
Specialist Medical Practitioner	128 (31.2%)	108 (18.7%)	< 0.01	2.0 [1.5, 2.6]
Podiatrist	220 (53.7%)	249 (43.0%)	< 0.01	1.5 [1.2, 2.0]
Physiotherapist	120 (29.3%)	146 (25.2%)	0.16	-
Exercise Physiologist	122 (29.8%)	135 (23.3%)	0.02	1.4 [1.0, 1.8]
Occupational Therapist	29 (7.1%)	32 (5.5%)	0.32	-
Psychologist	70 (17.1%)	83 (14.3%)	0.24	-
Massage Therapist	326 (79.5%)	426 (73.6%)	0.03	1.4 [1.0, 1.9]



	'Often' (n = 410)	'Not often' (n = 579)	p-value	OR [95% CI]
Acupuncturist	153 (37.3 %)	215 (37.1%)	0.95	1.5 [1.1, 2.1]
Naturopath	183 (44.6%)	216 (37.3%)	0.02	1.3 [1.0, 1.7]
Dietician	22 (5.4%)	17 (2.9%)	0.05	-
Nutritionist	28 (6.8%)	27 (4.7%)	0.14	-
<b>Diagnostic imaging</b>				
Referral for imaging ('often')	49 (12.0%)	24 (4.1%)	< 0.01	3.1 [1.9, 5.2]
Investigation of unknown pathologies	315 (76.8%)	427 (73.7%)	0.27	-
Investigation of suspected diagnosis	351 (85.6%)	481 (83.1%)	0.28	-
Investigation of potential fractures	318 (77.6%)	429 (74.1%)	0.21	-
Rule out risk factors prior to treatment	130 (31.7%)	142 (24.5%)	0.01	1.4 [1.1, 1.9]
General screening of the spine	15 (3.7%)	17 (2.9%)	0.53	-
<b>Patient assessment ('yes')</b>				
Orthopaedic testing	403 (98.3%)	562 (97.1%)	0.22	-
Clinical assessment algorithm	209 (51.0%)	258 (44.6%)	0.04	1.3 [1.0, 1.7]
Neurological testing	378 (92.2%)	537 (92.7%)	0.74	-
Screening questionnaire	271 (66.1%)	359 (62.0%)	0.19	-
Cranial nerve testing	295 (72.0%)	375 (64.8%)	0.02	1.4 [1.1, 1.8]

**Table III.** Clinical management characteristics of Australian osteopaths who often treat patients with tendinopathies.

	'Often' (n = 410)	'Not often' (n = 579)	p-value	OR [95% CI]
<b>Discuss with patients ('often')</b>				
Diet	179 (43.7%)	195 (33.7%)	< 0.01	1.5 [1.2, 2.0]
Smoking and drug use	96 (23.5%)	82 (14.2%)	< 0.01	1.9 [1.3, 2.6]
Physical activity	380 (92.7%)	504 (87.0%)	< 0.01	1.9 [1.3, 2.9]
Occupation Health & Safety	232 (56.7%)	273 (47.2%)	< 0.01	1.4 [1.1, 1.9]
Pain counselling	90 (22.0%)	175 (30.2%)	< 0.01	0.7 [0.5, 0.9]
Stress	231 (56.5%)	257 (44.5%)	< 0.01	1.6 [1.2, 2.1]
Nutrition	122 (29.8%)	120 (22.5%)	< 0.01	1.5 [1.1, 1.9]
Medication	195 (47.7%)	196 (33.9%)	< 0.01	1.8 [1.4, 2.1]
<b>Patient presentations ('often')</b>				
Neck pain	409 (99.8%)	560 (96.7%)	< 0.01	13.9 [1.8, 104.8]
Thoracic pain	397 (96.8%)	511 (88.3%)	< 0.01	4.1 [2.2, 7.5]
Low back pain	410 (100%)	565 (97.8%)	< 0.01	1.7 [1.6, 1.8]
Hip musculoskeletal pain	368 (89.8%)	374 (64.7%)	< 0.01	4.8 [3.3, 6.9]
Knee musculoskeletal pain	288 (70.4%)	202 (34.9%)	< 0.01	4.4 [3.4, 5.2]
Ankle musculoskeletal pain	217 (53.0%)	115 (19.9%)	< 0.01	4.5 [3.4, 6.0]
Foot musculoskeletal pain	191 (46.%)	102 (17.6%)	< 0.01	4.1 [3.0, 5.4]
Shoulder musculoskeletal pain	389 (94.9%)	411 (71.1%)	< 0.01	7.5 [4.7, 12.1]
Elbow musculoskeletal pain	182 (44.6%)	68 (11.8%)	< 0.01	6.1 [4.4, 8.3]
Wrist musculoskeletal pain	136 (33.3%)	51 (8.8%)	< 0.01	5.2 [3.6, 7.3]

	'Often' (n = 410)	'Not often' (n = 579)	p-value	OR [95% CI]
Hand musculoskeletal pain	94 (23.0%)	27 (4.7%)	< 0.01	6.1 [3.8, 9.5]
Postural disorders	337 (82.4%)	337 (58.2%)	< 0.01	3.3 [2.5, 4.5]
Degenerative spine conditions	315 (77.0%)	283 (48.9%)	< 0.01	3.5 [2.6, 4.7]
Headache disorders	387 (94.4%)	504 (87.0%)	< 0.01	2.5 [1.5, 4.1]
Migraine disorders	231 (56.6%)	169 (29.1%)	< 0.01	3.1 [2.4, 4.1]
Spine health maintenance	233 (57.0%)	225 (38.9%)	< 0.01	2.1 [1.6, 2.7]
Chronic or persistent pain	341 (83.2%)	288 (49.8%)	< 0.01	5.0 [3.6, 6.8]
Temporomandibular joint disorders	121 (29.6%)	62 (10.7%)	< 0.01	3.5 [2.5, 4.9]
Non-musculoskeletal disorders	61 (15.1%)	64 (11.1%)	0.07	-
<b>Patient subgroups (treat 'often')</b>				
Up to 3 years of age	62 (15.2%)	94 (16.3%)	0.64	-
4 to 18 years of age	142 (34.6%)	128 (22.1%)	< 0.01	1.9 [1.4, 2.5]
Over 65 years of age	298 (72.7%)	272 (47.1%)	< 0.01	3.0 [2.3, 3.9]
Aboriginal & Torres Strait Islander peoples	3 (0.7%)	4 (0.7%)	0.94	-
Pregnancy	187 (45.6%)	157 (27.2%)	< 0.01	2.2 [1.7, 2.9]
Non-English speaking	17 (4.1%)	16 (2.8%)	0.24	-
Sport injuries	295 (72.0%)	203 (35.2%)	< 0.01	4.7 [3.6, 6.2]
Worker injury (compensable)	61 (14.9%)	41 (7.1%)	< 0.01	2.3 [1.5, 3.5]
Work injury (non-compensable)	197 (48.0%)	142 (24.6%)	< 0.01	2.8 [2.1, 3.7]
Traffic injury (compensable)	35 (8.6%)	18 (3.1%)	< 0.01	2.9 [1.6, 5.2]
Traffic injury (non-compensable)	81 (19.9%)	32 (5.6%)	< 0.01	4.2 [2.7, 6.5]
Post-surgery	54 (13.2%)	24 (4.2%)	< 0.01	3.5 [2.2, 5.7]
<b>Manual therapy (use 'often')</b>				
Counterstrain	201 (49.1%)	217 (37.5%)	< 0.01	1.6 [1.2, 2.1]
Muscle energy technique	338 (82.6%)	447 (77.2%)	0.04	1.4 [1.0, 1.9]
High-velocity, low-amplitude manipulation	288 (70.4%)	342 (59.1%)	< 0.01	1.7 [1.3, 2.2]
Joint manipulation	209 (51.2%)	184 (31.8%)	< 0.01	2.2 [1.7, 2.9]
Soft tissue technique	368 (90.0%)	477 (82.5%)	< 0.01	1.9 [1.3, 2.8]
Myofascial release	282 (68.9%)	327 (56.6%)	< 0.01	1.7 [1.3, 2.2]
Visceral techniques	43 (10.5%)	55 (9.5%)	0.60	-
Lymphatic pump	43 (10.5%)	41 (7.1%)	0.06	-
Autonomic balancing	73 (17.9%)	84 (14.5%)	0.15	-
Biodynamics	60 (14.7%)	95 (16.4%)	0.46	-
Functional technique	125 (30.6%)	144 (24.9%)	0.04	1.3 [1.0, 1.7]
Balanced ligamentous tension	139 (34.0%)	209 (36.1%)	0.50	-
Chapman's reflexes	17 (4.2%)	7 (1.2%)	< 0.01	3.6 [1.4, 8.6]
Trigger point therapy	126 (30.8%)	132 (22.8%)	< 0.01	1.5 [1.1, 2.0]
Osteopathy in the Cranial Field	88 (21.6%)	145 (25.0%)	0.20	-
Facilitated positional release	83 (20.3%)	83 (14.4%)	0.01	1.5 [1.1, 2.2]
Dry needling	121 (29.6%)	113 (19.6%)	< 0.01	1.7 [1.3, 2.3]



	'Often' (n = 410)	'Not often' (n = 579)	p-value	OR [95% CI]
Exercise prescription	338 (82.8%)	393 (67.9%)	< 0.01	2.3 [1.7, 3.2]
Shockwave therapy	14 (3.4%)	4 (0.7%)	< 0.01	5.1 [1.6, 15.6]
Ultrasound	18 (4.4%)	9 (1.6%)	< 0.01	2.9 [1.3, 6.5]
TENS	14 (3.4%)	5 (0.9%)	< 0.01	4.1 [1.4, 11.4]
Instrument manipulation	1 (0.2%)	1 (0.2%)	0.81	-
Instrument soft-tissue	9 (2.2%)	3 (0.5%)	0.02	4.3 [1.1, 16.1]
Sport taping	74 (18.1%)	48 (8.3%)	< 0.01	2.5 [1.6, 3.6]
<b>Expanded practice scope ('definitely')</b>				
Prescribing rights	123 (30.1%)	133 (23.0%)	0.01	1.4 [1.1, 1.9]
Referral rights to orthopaedic surgeon	306 (74.8%)	394 (68.0%)	0.02	1.4 [1.0, 1.8]
Referral rights to paediatrician	231 (56.5%)	308 (53.2%)	0.31	-
Referral rights to sports medicine specialist	333 (81.6%)	454 (78.4%)	0.21	-
Referral rights to rheumatologist	287 (70.2%)	339 (58.5%)	< 0.01	1.6 [1.3, 2.2]
Referral rights to other medical specialist	1 (0.3%)	0	0.23	-
Expanded diagnostic imaging rights	359 (87.8%)	461 (79.6%)	< 0.01	1.8 [1.3, 2.6]
<b>Research in practice ('strongly agree')</b>				
Useful to help patients understand the benefits of osteopathy	182 (44.4%)	261 (45.1%)	0.83	-
Useful to help GPs and other conventional health professionals understand the role of osteopathy	280 (70.9%)	389 (70.2%)	0.82	-
Useful to provide scientific evidence for what I do as an osteopath	213 (54.9%)	301 (54.9%)	0.99	-
Irrelevant to the professional development of osteopathy in Australia.	232 (59.9%)	331 (60.5%)	0.86	-
Impact of research on practice ('high impact')	410 (100%)	579 (100%)	0.18	-

Adjusted odd ratios for significant characteristics associated with often treating tendinopathies are described in **table IV**. Australian osteopaths who often treat patients with tendinopathies were more likely to treat patients with chronic patients and sports injuries, but less likely to be involved in research.

## DISCUSSION

There is limited literature on how osteopaths manage tendinopathies (18), and none describing the practice and clinical management characteristics associated with patients presenting with this complaint. Our work offers the first

substantive description of how Australian osteopaths manage tendinopathies based on data from a large, nationally representative sample of practitioners (16).

The strongest association identified in the regression model for Australian osteopaths who *often* treat patients presenting with tendinopathies was with frequency of management of those patients with chronic or persistent pain (ORa 3.8). Whether this refers to chronic tendinopathies or more broadly, chronic musculoskeletal pain, is unclear. However, we posit that these osteopaths may be more likely to manage chronic tendinopathies when compared to their osteopathy counterparts who do *not often* treat this complaint. Previous work has shown chronic musculoskeletal pain is linked with

**Table IV.** Adjusted odds ratios for significant characteristics of Australian osteopaths who often treat patients with tendinopathies.

	Adjusted Odds Ratio	95% Confidence Interval	p-value
<b>Practitioner characteristics</b>			
Gender (female)	1.5	1.0-2.1	0.01
Involved in research (yes)	0.5	0.2-0.9	0.04
<b>Conditions treated</b>			
Treat foot musculoskeletal complaints (often)	1.7	1.1-2.7	< 0.01
Treat shoulder musculoskeletal complaints (often)	2.8	1.6-4.9	< 0.01
Treat elbow musculoskeletal complaints (often)	2.1	1.4-3.3	< 0.01
Treat degenerative spine conditions (often)	1.8	1.2-2.5	< 0.01
Treat temporomandibular joint disorders (often)	1.7	1.1-2.7	0.02
<b>Patient subgroups</b>			
Treat patients with chronic pain (often)	3.8	2.6-5.5	< 0.01
Treat patients with sports injuries (often)	2.5	1.8-2.4	< 0.01
Treat patients aged 65 years and older (often)	1.7	1.2-2.4	< 0.01
Treat compensable workers compensation patients (often)	1.7	1.2-3.5	< 0.01
<b>Patient management</b>			
Use soft tissue techniques (often)	2.1	1.2-3.5	0.02
Use exercise prescription (often)	1.6	1.0-2.4	0.03

cognitive, psychological and social factors that are recommended to be managed via a biopsychosocial (BPS) model of care (19). Australian osteopaths who often treat tendinopathies were approximately 50% more likely to refer to psychologists, specialists and exercise physiologists, suggesting that osteopaths may manage tendinopathy patients using a BPS model. Further, Australian osteopaths who *often* treat tendinopathies are more likely to report receiving referrals from other healthcare professionals such as medical specialists, podiatrists and dieticians. This data suggests that Australian osteopaths may participate in multidisciplinary care of tendinopathies however such an assertion requires additional investigation.

Evidence-based approaches to tendinopathy recommend the use of exercise in its management, regardless of anatomical location (20-23). Australian osteopaths who *often* treat tendinopathies were 60% more likely to use exercise prescription in patient care compared to those osteopaths who reported *not often* treating this condition. Whether prescribed exercises accord with current evidence requires further exploration however the result is encouraging from the standpoint of osteopaths utilising this in patient care. Taping was also more likely to be used by those Australian osteopaths who *often* manage tendinopathies. Again, the specifics of this taping cannot be gleaned from our work,

nor the type of taping used (*e.g.* rigid sports taping, kinesiology taping). However, given the equivocal nature of the literature with respect to taping for tendinopathies (23), the use and clinical reasoning for this intervention would be useful to explore.

Australian osteopaths who *often* treat tendinopathies are more likely to report often managing conditions affecting the extremities compared to those who do *not often* treat this complaint. In particular, those osteopaths who treat foot, shoulder and elbow musculoskeletal complaints were 50% more likely to report *often* treating tendinopathies compared to colleagues who do not often treat this complaint. Tendinopathies affecting the Achilles (2-4) and shoulder (5) are common presentations in the broader population and our results may be a reflection of these being a common presentation to Australian osteopaths. Further, our results also suggest that older patients are more likely to be treated often by osteopaths who *often* treat tendinopathies. The prevalence of tendinopathies in older patients, particularly those in the hip and shoulder, and sports injury populations has previously been reported (24). These outcomes highlight the role that Australian osteopaths may play in the management of tendinopathies in sport injury and older adult populations, providing an interesting area for additional research.



The predominant treatment approach utilised in Australian osteopathy practice is manual therapy (16). Unadjusted odds ratios suggest Australian osteopaths who *often* treat tendinopathies are more likely to use a range of manual therapy interventions, including some not traditionally described in tendinopathy management (*i.e.*, counterstrain, facilitated positional release). On this basis, we propose that osteopaths may utilise a range of management approaches for tendinopathies, potentially to modulate pain levels (25). Modulating pain may offer an avenue to explore exercise rehabilitation and other active management strategies. This strategy has been described in a case report describing the osteopathy management of Achilles tendinopathy with successful outcomes (18). How the use of these other manual therapy techniques or combinations of techniques contributes to patient outcomes, and the clinical reasoning of osteopaths with respect to technique choice in tendinopathy care would require further research.

### Limitations

The cross-sectional and self-report nature of the design of the ORION questionnaire is a limitation when interpreting the results of the study. Cross-sectional self-report designs are potentially susceptible to social desirability bias and recall bias. How practitioners defined *sometimes* and *often* for example, when completing the questionnaire is open to interpretation and may skew the results. Data collection took place in mid-late 2016 and it is possible that the practice profile and characteristics have since changed. This may limit the generalisability of the work to contemporary osteopathy practice as the education providers have changed their curricula to include development of skills and knowledge with respect to active approaches (*i.e.*, load management in exercise prescription) and pain education interventions. The design of the survey also does not allow us to identify the prevalence of specific tendinopathies nor the treatment approaches for these. It may be that practitioners approach different regions in different ways and this clinical reasoning would be valuable to explore.

### Future work

As described, there are opportunities to explore the multidisciplinary nature of tendinopathy management where an osteopath is involved in the care team. How individual osteopaths clinically reason their management of a patient with a tendinopathy also would be of value. The role of adjunctive therapies such as dry needling and shockwave therapy as part of the approach osteopaths use for tend-

inopathy also requires additional research. Osteopaths who *often* treat tendinopathies also appear to be engaging in both active (*i.e.*, exercise prescription) and passive (*i.e.*, manual therapy, SWT) interventions more frequently than colleagues who do *not often* treat this complaint. Again, whether these use of active and passive interventions is related to tendinopathy care could be the basis for future research. Additionally, future research should evaluate patient outcomes and cost-effectiveness of osteopathy care when managing tendinopathies. Broadly, the outcomes of the study suggest that the clinical management of tendinopathies by Australian osteopaths is focused on manual therapy combined with exercise, within a BPS approach to patient care. As highlighted, how this approach translates to care outcomes requires further evaluation in case-control and cohort designs.

## CONCLUSIONS

Little is known about how tendinopathies are managed by osteopaths however this study begins to illuminate the approaches to patient management and practices of osteopaths who report *often* treating this musculoskeletal complaint. Tendinopathies are reported to be commonly managed by osteopaths in our study, with foot, elbow and shoulder musculoskeletal complaints, in addition to working with older and sport injury populations, being associated with those practitioners who *often* treat tendinopathies. These findings appear to be relatively consistent with our understanding of the epidemiology of tendinopathies with respect to gender, influence of sporting activity on the development of tendinopathies, and the regions of the body most commonly affected by this musculoskeletal issue. This study contributes data to the wider discourse about the management of tendinopathies in manual therapy practice and the role osteopaths may be able to play in the care of acute and chronic tendinopathies.

## ACKNOWLEDGEMENTS

The ORION project is funded by Osteopathy Australia. The funding source had no influence in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript. The research reported in this paper is the sole responsibility of the authors and reflects the independent ideas and scholarship of the authors alone. The authors would also like to thank Professor Jon Adams, Dr Amie Steel and Dr Wenbo Peng from the Australian Research Centre in Complementary and Integrative Medicine, University of Technology Sydney for their input into the initial stages of the analysis and data interpretation.

## CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

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