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Authors: Jon Adams, Romy Lauche, Katie De Luca, Michael Swain, Wenbo Peng, David Sibbritt



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**Title page****Prevalence and profile of Australian chiropractors treating athletes or sports people: a cross-sectional study**

Jon Adams, PhD<sup>1</sup>, Romy Lauche, PhD<sup>1</sup>, Katie De Luca, PhD<sup>2</sup>, Michael Swain, MChiroprac<sup>3</sup>, Wenbo Peng, PhD<sup>1</sup>, David Sibbritt, PhD<sup>1</sup>

<sup>1</sup> Australian Research Centre in Complementary and Integrative Medicine (ARCCIM), Faculty of Health, University of Technology Sydney, Sydney, NSW, Australia;

<sup>2</sup> Private Practice, South West Rocks, Sydney, NSW, Australia;

<sup>3</sup> Department of Chiropractic, Faculty of Science and Engineering, Macquarie University, Sydney, NSW, Australia

**Corresponding author:** Distinguished Professor Jon Adams

Postal address: Australian Research Centre in Complementary and Integrative Medicine (ARCCIM), Faculty of Health, Level 8, Building 10, University of Technology Sydney, 235-253 Jones St, Sydney, NSW, Australia 2007.

Fax number: +61 2 9514 4835

Telephone number: +61 2 9514 4821

E-mail address: Jon.Adams@uts.edu.au

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**Highlights**

- This paper presents the first clinically-relevant, national-presentative, and practice-based overview of the treatment of athletes or sports people by chiropractors in Australia.
- Nearly half of participating Australian chiropractors report frequently treating athletes or sports people.
- Chiropractors 'often' treating athletes or sports people are more likely to work in multi-clinician settings and refer to other healthcare providers than those not 'often' treating athletes or sports people.
- Chiropractors 'often' treating athletes or sports people are more likely to perform multi-modal management for athletes or sports people than those not 'often' treating athletes or sports people.

**Abstract**

Objectives: A range of health-care professionals including chiropractors provide treatment for sports-related health problems. This study reports analyses from the first national workforce survey to determine practitioner and practice-related factors associated with the frequent treatment of athletes or sports people by Australian chiropractors.

**Design and setting:** A 21-item questionnaire collecting information pertaining to practitioner and practice-related characteristics was distributed to all Australian registered chiropractors, as part of the Australian Chiropractic Research Network (ACORN) project and attracted a response rate of 43% (n=2,005). Statistical analyses compared the frequency of treating athletes or sports people against a wide range of relevant practitioner and practice characteristics.

**Results:** Of the respondents, 49.5% (n=936) reported frequently treating athletes or sports people, and these chiropractors were more likely to be male as well as report more patient care hours and patient visits per week than those chiropractors who did not frequently treat athletes or sports people. Chiropractors who frequently treat athletes or sports people were also more likely to perform multi-modal management, have multi-disciplinary practitioner relations, use diagnostic equipment and discuss nutrition and medication use as part of their patient care than those chiropractors who did not frequently treat athletes or sports people.

**Conclusions:** Nearly half of participating Australian chiropractors treat athletes or sports people frequently. The current and potential role of chiropractors in sports medicine appears significant. Further research is needed to examine the role, practices and outcomes of such chiropractic care helping to, provide treatment and policy development in this area of clinical management.

**Keywords:** chiropractic; sports medicine; exercise; survey.

## **Text**

### **Introduction**

Sports injuries pose a substantial health burden<sup>1,2</sup> and constitute a common cause of pain and disability that can negatively impact an individual's quality of life and well-being. It is estimated that 24% of all those experiencing a sport or exercise related injury are affected by a long-term condition; a figure similar to the global prevalence of back-related injuries.<sup>3</sup> Sports injuries also pose a significant monetary burden<sup>4,5</sup> with emergency-related costs and direct hospital-related expenses of sports injuries in Australia recently estimated to be \$2 billion per annum<sup>3</sup> - a conservative cost estimate that excludes treatment delivered in primary care settings, as well as other direct or indirect costs, such as loss of productivity.

A wide range of health care professionals, including sports physicians, physiotherapists, exercise physiologists, chiropractors, osteopaths, sports trainers and massage therapists provide sports injury management and treat athletes or sports people. In the discipline of chiropractic, a 2012 Australian workforce study reported that 12.5% of patient visits were specifically for sports injuries.<sup>6</sup> A population level study of 2529 Canadian chiropractors (response rate 39%) found that sports injuries were the main focus of practice activity for 28% of Canadian chiropractors and that those who focused on rehabilitation and sports injuries also reported more referrals from medical doctors.<sup>7</sup> At the 2009 World Games, chiropractors recorded 1,514 treatments with a utilisation rate of 15.31% for athletes<sup>8</sup> and this utilisation rate increased to 18.1% at the 2013 World Games.<sup>9</sup> However, there is scant research reporting the clinical characteristics of those chiropractors managing athletes or sports people, with the body of knowledge primarily consisting of sporting event surveillance designs.<sup>8-10</sup>

Sports chiropractic has attracted formal specialisation status in the US and Canada.<sup>11, 12</sup> In Australia, chiropractors with a special interest in sports chiropractic can undertake relevant postgraduate programs via the International Federation of Sports Chiropractic. Meanwhile, Sports Chiropractic Australia is a national interest group for sports chiropractors coordinating volunteer care at community, state and national level sporting events.<sup>13</sup> Despite these circumstances, there is no set of standards, no code of practice, and no tiered specialisation for Australian sports chiropractors<sup>14</sup> As such, there remains a lack of basic empirical data on the practice of sports chiropractic in Australia.

In direct response to this research gap, this paper reports the prevalence of treatment of athletes or sports people from a large, nationally-representative practice-based research network (PBRN) - the Australian Chiropractic Research Network (ACORN) - as well as examining the relationship between the socio-demographic and clinical characteristics of Australian chiropractors and the frequency with which they treat athletes or sports people. Recognising the prevalence and characteristics of Australian chiropractors treating athletes or sports people may help understand the burden of athletes/sports-related diseases, identify the range of chiropractic approaches used by athletes or sports people, and inform health care policy regarding the provision of such health services.

## **Methods**

This paper reports analyses from a questionnaire distributed as part of the recruitment for the ACORN project - a voluntary national PBRN independently designed and conducted by senior researchers at the Australian Research Centre in Complementary and Integrative Medicine, Faculty of Health, University of Technology Sydney. Nine research teams have submitted Expression of Interest to the ACORN Steering Committee from across Australia and overseas and five have completed their sub-studies of the ACORN PBRN. As part of the recruitment for the ACORN PBRN a 21-item practitioner questionnaire was distributed to all registered chiropractors across Australia<sup>15</sup> following ethical approval from the Human Research Ethics Committee of the University of Technology Sydney (#2014000027).

### *Recruitment and Sample*

Recruitment for the ACORN PBRN was conducted between March and July 2015, and an invitation pack was distributed to all registered chiropractors via both professional associations and a profession-wide mail out and email campaign. The invitation pack was also distributed via a number of regional chiropractic-related conferences and events as well as available online through the ACORN website<sup>16</sup> during the recruitment period. All participants were given the opportunity to complete the practitioner questionnaire online (SurveyGizmo™) or via hard copy. A series of reminders were distributed following initial invitation pack distribution via the same recruitment channels. Further details regarding the ACORN PBRN recruitment and promotion strategies can be found elsewhere.<sup>17</sup>

A total of 2,005 chiropractors completed the questionnaire (43% response rate) from 4,684 registered chiropractors in Australia at the time of recruitment. Compared to the total population of chiropractors as registered by Australian Health Practitioner Regulation Agency (AHPRA) in March 2015<sup>18</sup> the respondents have been found to be representative regarding a number of key indicators: age; gender; and practice location with the distribution of practice location amongst the ACORN workforce sample just slightly over-

represented by chiropractors from South Australia, the Australian Capital Territory, Tasmania and the Northern Territory.<sup>17</sup>

### *Instruments*

Validity of the practitioner questionnaire items were assessed via pilot testing with a number of registered chiropractors who completed the survey and provided feedback on all aspects of the questionnaire regarding the topics included, wording, formatting, and broader issues around ease and duration of completion.<sup>17</sup> The questionnaire (see Appendix) collected information regarding: chiropractors' characteristics such as age, gender, education, professional qualifications and memberships in professional associations, years in private practice and professional roles in education, research and other professional areas; practice characteristics including average patient care hours and number of patient visits per week, the number of practice locations, the area of practice location, the State or Territory of practice, other health professionals working in their practice location, professional referral relationships (sending and/or receiving referrals), the use of diagnostic imaging, and the use of electronic records. In addition, participants were questioned regarding the frequency with which they discuss other health related topics with their patients as part of their care/management plans (e.g. diet, nutrition, alcohol, smoking, occupational health, nutritional supplements and medication). Participants were asked about the frequency with which they treat patients presenting with a range of conditions (i.e. neck pain, thoracic pain, low back pain, lower limb musculoskeletal disorders, upper limb musculoskeletal disorders, postural disorders, degenerative spine condition, headache disorders, migraine disorders, spinal health maintenance/prevention, and non-musculoskeletal disorders) and a range of patient subgroups (i.e. children, older people, Aboriginal and Torres Strait Islander people, pregnant women, people with work-related injuries, people with traffic-related injuries, people receiving post-surgical rehabilitation, and non-English speaking ethnic group(s)) with response options of never, rarely, sometimes, and often. Participants were also asked about the frequency with which they employ a range of techniques/methods (i.e. drop-piece techniques/Thompson or similar, biomechanical pelvic blocking/sacro-occipital technique, instrument adjusting, chiropractic biophysics, high velocity, low amplitude adjustment/manipulation/mobilisation, applied kinesiology, flexion-distraction, functional neurology and extremity manipulation) and musculoskeletal interventions (i.e. dry needling or acupuncture, soft tissue therapy/trigger point therapy/massage therapy/stretching, electro-modalities, heat/cryotherapy, orthotics, and specific exercise therapy/rehabilitation/injury taping) in their patient management with response options of never, rarely, sometimes, and often.

### *Statistical analyses*

Statistical analyses were conducted using the statistical software Stata 13.1 and the Statistical Package for Social Sciences software (IBM SPSS Statistics for Windows, release 22.0. Armonk, NY: IBM Corp.). The frequency of chiropractors treating athletes or sports people was the dependent variable for this analysis, and data on the frequency were merged into two categories: 'often' versus 'never/rarely/sometimes'. The same procedure was applied to independent variables with the same format, (e.g. items determining the frequency with which the practitioner discussed health related topics with their patients, treated patients presenting with pre-specified conditions or particular patient groups, and used different techniques or musculoskeletal interventions).

Characteristics were compared between chiropractors who reported 'often' treating athletes or sports people versus those chiropractors who reported treating athletes or sports people less than often via Student's t-

tests for normally distributed continuous variables and nonparametric Kruskal Wallis tests for continuous data with non-normal distribution patterns, and  $\chi^2$ -test for categorical data. Data are presented as means and standard deviations, median and range, or absolute and relative frequencies. Influential factors of frequently treating athletes or sports people were identified using multiple logistic regression analysis. Age and gender were identified two variables a priori that are predictors of chiropractors often treating athletes or sports people. In addition to age and gender, other factors associated with the frequent treatments of athletes or sports people, with a (bivariate) p-value of  $\leq 0.10$ , were included in the multiple regression model. Then a backwards stepwise model selection approach was utilised. Those with values of  $p < 0.05$  were retained in the final model, and adjusted odds ratios with 95% confidence intervals were calculated. Regarding the possible multicollinearity of the logistic regression model, the variance inflation factor (VIF) was used in a linear regression model to determine the degree of collinearity amongst covariates. A variance inflation factor score greater than 2.5 is considered relevant collinearity.<sup>19</sup>

## Results

Of the 2,005 registered chiropractors included in the study, 1,891 (94.3%) answered the question 'Indicate the frequency with which you treat athletes or sports people'. Of those who answered this question, 955 (50.5%) indicated that they 'never', 'rarely' or 'sometimes' treated athletes or sports people, while 936 (49.5%) indicated that they 'often' treated athletes or sports people. Results of the group comparisons can be found in Tables 1-3. No differences between those chiropractors who 'often' treat athletes or sports people and those who did not often treat athletes or sports people were found for age, qualification and years in practice. However, these practitioner groups were significantly different regarding gender with almost two thirds of the male practitioners 'often' treating athletes or sports people compared to only approximately 30% of female chiropractors ( $p < 0.001$ ) reporting as 'often' treating athletes or sports people. Chiropractors 'often' treating athletes or sports people also reported significantly more patient care hours per week and patient visits per week and were more frequently involved in volunteer work than those who did not often treat athletes or sports people (Table 1).

With regards to practice characteristics (Table 2), those chiropractors 'often' treating athletes or sports people were more likely to report having one practice location only and to work with a physiotherapist and/or another chiropractor at the same practice location. Furthermore, chiropractors treating athletes or sports people 'often' were more likely to report having significantly more referral relationships with GPs, physiotherapists, podiatrists, and/or medical specialists, and were more likely to have x-rays in their practice as well as use imaging facilities when compared to those who did not 'often' treat athletes or sports people. Chiropractors treating athletes or sports people 'often' were more likely to discuss diet/nutrition, smoking/drugs/alcohol, physical activity/fitness, occupational health and safety, pain counselling, nutritional supplements and medication as part of their patient management, and to treat patients with a variety of medical conditions when compared to those chiropractors who did not treat athletes or sports people often (Table 3). Chiropractors treating athletes or sports people 'often' were also more likely to use high velocity low amplitude adjustment/manipulation/mobilisation and/or extremity manipulation as well as a wide range of musculoskeletal interventions (e.g. specific exercise therapy/rehabilitation/injury taping and/or soft tissue therapy/trigger point therapy) compared to chiropractors not treating athletes or sports people 'often'.

The regression analysis (Table 4) revealed that the following factors were influential of treating athletes or sports people 'often': being involved in volunteer work (OR 1.57; 95%CI 1.09-2.27) and having a referral relationship with a physiotherapist (OR 1.51; 95%CI 1.11-2.04). Discussion of diet and/or nutrition as part of the patient management plan was negatively associated with treating athletes or sports people 'often' (OR 0.68; 95%CI 0.50-0.93) while discussing physical activity as part of the patient management plan was positively associated (OR 2.08; 95%CI 1.32-3.29). Further influential factors of treating athletes or sports people 'often' were treating low back pain (referred/radicular) 'often' (OR 1.60; 95%CI 1.08-2.36), treating migraine disorders 'often' (OR 1.50; 95%CI 1.11-2.02), consulting with children aged 4-18 years 'often' (OR 2.18; 95%CI 1.59-2.99), consulting with people with work-related (OR 2.00; 95%CI 1.45-2.76) and traffic-related injuries 'often' (OR 2.10; 95%CI 1.25-3.53), and consulting with people receiving post-surgical rehabilitation 'often' (OR 3.20; 95%CI 1.42-7.22). Furthermore, the use of biomechanical pelvic blocking/Sacro-Occipital Techniques ® (OR 0.56; 95%CI 0.41-0.75) were negatively associated with treating athletes or sports people 'often', while the use of extremity manipulations (OR 2.01; 95%CI 1.49-2.70), dry needling or acupuncture (OR 1.59; 95%CI 1.01-2.48) and specific exercise therapy/rehabilitation and injury taping (OR 1.60; 95%CI 1.18-2.16) were positively associated with treating athletes or sports people 'often'. The VIF score for all variables included in this logistic regression was lower than 1.5, indicating no significant multicollinearity.

## Discussion

This paper reports findings from the first study drawing upon a large, nationally- representative sample of chiropractors to investigate chiropractic care for athletes or sports people with reference to practitioners' profile, practice characteristics, and clinical management. Our study provides important platform data regarding the scope of sports chiropractic in Australia. Approximately half of participating Australian chiropractors in our workforce study treat athletes or sports people 'often', suggesting athlete specific or sports-related disorders may constitute a substantial component of focus for chiropractic clinical practice in Australia. The high prevalence of chiropractic use amongst athletes or sports people reflect the high satisfaction with treatment outcomes reported by those patients with sports related problems after receiving chiropractic care (in particular spinal manipulation) in previous studies.<sup>8,20</sup>

This paper shows that chiropractors who often treat athletes or sports people used a vast variety of treatments, employed imaging modalities, and held more collaborative professions/referral relationships compared to other chiropractors who not often treat athletes or sports people. Multidisciplinary care planning has been advocated as a way of improving outcomes for patients with complex care needs<sup>21</sup> and a multidisciplinary team-based approach is well established in sports medicine.<sup>22</sup> In Australia, chiropractors have demonstrated their willingness and capacity to work in sports medicine teams for the benefit of elite athletes or sports people.<sup>23</sup> This multi-clinician focus is important for any future integration of sports chiropractic into multidisciplinary primary care settings and more research is particularly needed to explore clinician behaviours and relations of daily routine care and their cost effectiveness as associated with chiropractic services within wider sports medicine teams.

Our analyses also suggest that extremity manipulation, dry needling or acupuncture and specific exercise therapy/rehabilitation/injury taping are all positively associated with the frequent treatment of athletes or sports people. These techniques have been identified to have therapeutic effect for sports related disorders.<sup>10,</sup>

<sup>24</sup> While previous research findings suggest it is possible that chiropractors in our sample may have used

multi-modal techniques in a single clinical session when treating athletes or sports people,<sup>7, 25</sup> our study did not directly address this issue in detail and it is important for future research to examine whether such multi-modal technique use is concurrent or sequential or a mixture of both.

There is scant data examining chiropractors' treatments of athletes versus non-athletes and reporting the management provided by chiropractors' who treat sports people. However, there is evidence of variability in the use of treatment modalities by physiotherapists when treating athletes.<sup>26</sup> Physiotherapy treatment of non-athletes tends to more frequently contain the use of joint manipulation and mobilisation, compared to athletes. Our findings, while not directly comparable suggest the opposite trend amongst chiropractors, an association between the use of manipulation (spinal or extremity) and the frequent treatment of athletes or sports people. This raises the possibility that chiropractors and physiotherapists take a different approach to the treatment of athletes or sports people.

It is worth noting that when all factors were accounted for in our final model, less physical forceful modalities such as pelvic blocking technique use and diet/nutrition discussion were negatively associated with chiropractic frequent treatment of athletes or sports people, the latter only apparent after adjustment. Although a multicollinearity check has been conducted and demonstrated a low variance inflation factor value regarding the issue of diet/nutrition discussion, it may have led to the change of direction of the association. Hence, our data may suggest a more hands-on approach in chiropractors that frequently treat athletes or sports people, which needs to be clarified in future work.

Our study has a number of limitations that should be taken into consideration when interpreting the findings reported in this paper. Firstly, our data are based on self-report, potentially introducing recall bias. Secondly, the survey questions asked to indicate the frequency with which a chiropractor treats 'athletes or sports people' is somewhat ambiguous and we do not know exactly how participants may have interpreted this question. Some respondents may have potentially understood this question as referring to professional (or semi-professional) athletes or sports people, others may have interpreted the question as referring to non-professional athletes or sports people and others still may have considered the question as referring to both professional and non-professional athletes or sports people. Thirdly, the profile of chiropractors identified in our study does not imply that athletes or sports people tend to seek chiropractors with such a profile to manage their conditions. Finally, it is not possible from the wording of our survey to distinguish between participants treating athletes or sports people and treating athletic or sports injuries and the associations identified in our analyses need to be interpreted with appropriate caution. Nevertheless, despite these limitations our study does provide the first analyses focused upon the prevalence and profile of chiropractors who often treat athletes or sports people drawing upon a large nationally-representative sample of chiropractors. Our study also provides an essential platform upon which further research can build in order to help understand the role of chiropractors in the treatment of athletes or sports people. Our work is significant in helping establish a broad evidence-base upon which the chiropractic profession and other health care practitioners outside the profession can help move towards effective, safe and coordinated treatment for athletes or sports people.

## **Conclusions**

Nearly half of Australian chiropractors treat athletes or sports people 'often' employing multi-disciplinary and multi-modal management approaches. Treating sports-related disorders appears to be a substantial

focus for many Australian chiropractors and further research is needed to provide detailed examination of the practices and outcomes of such chiropractic care. The potential role of chiropractors in wider sports medicine appears significant and should be of interest to all involved in promoting practice and policy development in this area of health care. Meanwhile, sports medicine may be a field where chiropractic has a large potential impact on musculoskeletal health.

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**Declarations of interest:** none

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### **Authorship**

JA and DS led the study design, project management, data collection and planning of the manuscript writing. RL performed the statistical analyses. RL, KL, MS and WP contributed to the writing of the first draft of the manuscript. All authors provided critical revision of later drafts and approved the final version of the manuscript.

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**Table 1** Sample characteristics

Variable	Never/rarely/ sometimes n=955	Often n=936	p
Age in years, mean±sd	42.4±12.3	42.0±11.8	0.509
Gender			<0.001*
Male n (%)	523 (55.1%)	653 (70.1%)	
Female n (%)	427 (44.9%)	279 (29.9%)	
Qualification <sup>+</sup>			0.558
Diploma n (%)	22 (2.3%)	19 (2.0%)	
Advanced diploma n (%)	9 (1.0%)	5 (0.5%)	
Bachelor n (%)	328 (34.7%)	329 (35.4%)	
Doctor of Chiropractic n (%)	283 (29.9%)	275 (29.6%)	
Masters degree n (%)	294 (31.1%)	298 (32.0%)	
PhD n (%)	10 (1.1%)	4 (0.4%)	
Years in practice, median (range)	15 (0-58)	14 (0-56)	0.660
Patient care hours per week, median (range)	25 (0-60)	30 (0-60)	<0.001*
Patient visits per week, median (range)	70 (0-400)	90 (0-400)	<0.001*
Involved in as chiropractor			
University teaching n (%)	64 (6.7%)	65 (6.9%)	0.856
Research n (%)	49 (5.1%)	57 (6.1%)	0.370

Volunteer work n (%)	127 (13.3%)	216 (23.1%)	<0.001*
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\* Statistically significant association of treating athletes or sports people “often” with the characteristics of chiropractors.

+ Chiropractors with all listed qualifications are allowed to practice in Australia

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**Table 2** Practice characteristics

Variable	Never/rarely/ sometimes n=955	Often n=932	p
<b>Location n (%)</b>			
Urban	714 (23.6%)	717 (21.9%)	0.376
One location only	219 (23.0%)	256 (27.4%)	0.030*
<b>Other health professionals active in the practice location n (%)</b>			
GP	61 (6.4%)	59 (6.3%)	1.000
Podiatrist	85 (8.9%)	95 (10.1%)	0.389
Medical specialist	26 (2.7%)	25 (2.7%)	1.000
Physiotherapist	76 (8.0%)	100 (10.7%)	0.048*
Another chiropractor	520 (54.5%)	589 (62.9%)	<0.001*
Exercise physiologist	52 (5.4%)	73 (7.8%)	0.042*
Psychologist/Counsellor	128 (13.4%)	108 (11.5%)	0.237
Occupational therapist	24 (2.5%)	23 (2.5%)	1.000
<b>Referral relationships n (%)</b>			
GP	477 (49.9%)	599 (64.0%)	<0.001*
Psychologist/Counsellor	19 (12.5%)	152 (16.2%)	0.022*
Physiotherapist	245 (25.7%)	355 (37.9%)	<0.001*

Occupational therapist	66 (6.9%)	92 (9.8%)	0.025*
Podiatrist	319 (33.4%)	436 (46.6%)	<0.001*
Medical specialist	107 (11.2%)	194 (20.7%)	<0.001*
Exercise physiologist	118 (12.4%)	177 (18.9%)	<0.001*
Using imaging (used often) n (%)	402 (42.3%)	487 (52.3%)	<0.001*
Having the following imaging facilities on site n (%)			
X-rays	118 (12.4%)	162 (17.3%)	0.003*
MRI	24 (2.5%)	38 (4.1%)	0.070
SEMG	33 (3.5%)	48 (5.1%)	0.088
Diagnostic ultrasound	17 (1.8%)	37 (4.0%)	0.005*
Thermography	36 (3.8%)	51 (5.4%)	0.099

\* Statistically significant association of treating athletes or sports people “often” with the chiropractic practice characteristics.

**Table 3** Clinical management characteristics

Variable	Never/rarely/ sometimes n=955	Often n=932	p
Discussed as part of the care/management plan (done often) n (%)			
Diet/Nutrition	445 (46.8%)	512 (54.9%)	0.001*
Smoking/Drugs/Alcohol	198 (20.9%)	271 (29.2%)	<0.001*
Physical activity/Fitness	747 (78.6%)	859 (92.4%)	<0.001*
Occupational health and safety	331 (35.0%)	440 (47.6%)	<0.001*
Pain counselling	196 (20.9%)	268 (29.0%)	<0.001*
Nutritional supplements (including vitamins, minerals, herbs)	324 (34.0%)	377 (40.5%)	<0.001*
Medications (including for pain/inflammation)	179 (18.9%)	251 (27.3%)	<0.001*
Treating patients with the following conditions (done often) n (%)			
Neck pain (axial)	867 (91.0%)	903 (96.6%)	<0.001*
Neck pain (referred/radicular)	511 (53.6%)	675 (72.1%)	<0.001*
Thoracic pain (axial)	749 (79.0%)	846 (90.8%)	<0.001*
Thoracic pain (referred/radicular)	359 (38.2%)	508 (54.7%)	<0.001*
Low back pain (axial)	875 (92.3%)	908 (97.2%)	<0.001*

Low back pain (referred/radicular)	706 (74.4%)	819 (87.7%)	<0.001*
Lower limb musculoskeletal disorders (hip, knee, ankle, foot)	452 (47.6%)	690 (73.7%)	<0.001*
Upper limb musculoskeletal disorders (shoulder, elbow, wrist, hand)	484 (50.9%)	697 (74.9%)	<0.001*
Postural disorders (including lordosis, thoracic kyphosis, scoliosis)	495 (53.1%)	636 (70.0%)	<0.001*
Degenerative spine conditions (including spondylolisthesis)	549 (58.9%)	646 (71.1%)	<0.001*
Headache disorders (including cervicogenic, tension)	782 (83.5%)	829 (91.0%)	<0.001*
Migraine disorders	406 (43.4%)	572 (62.8%)	<0.001*
Spinal health maintenance/prevention	650 (69.7%)	697 (76.7%)	0.001*
Non-musculoskeletal disorders	180 (27.4%)	228 (32.5%)	0.044*
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Treating the following patient subgroups			
(treated often) n (%)			
Children (4 to 18 years)	409 (42.9%)	593 (63.4%)	<0.001*
Older people (65 years or over)	642 (67.4%)	744 (79.6%)	<0.001*
Aboriginal and Torres Strait Islander people	6 (0.6%)	27 (2.9%)	<0.001*
People with work-related injuries	216 (23.1%)	452 (49.8%)	<0.001*
People with traffic-related injuries	59 (6.3%)	194 (21.4%)	<0.001*

People receiving post-surgical rehabilitation	14 (1.5%)	106 (11.7%)	<0.001*
Non-English speaking ethnic groups	39 (4.3%)	77 (8.7%)	<0.001*
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Using the following techniques/management			
(used often) n (%)			
Drop-piece techniques/Thompson or similar	495 (52.7%)	505 (54.7%)	0.403
Biomechanical pelvic blocking/ Sacro-occipital technique	436 (46.4%)	382 (41.5%)	0.035*
Instrument adjusting	504 (53.4%)	471 (51.0%)	0.308
Chiropractic biophysics	34 (3.8%)	44 (5.0%)	0.247
High velocity, low amplitude adjustment/manipulation/mobilisation	735 (77.9%)	802 (86.6%)	<0.001*
Applied kinesiology	152 (16.3%)	145 (16.0%)	0.899
Flexion-distraction	56 (6.1%)	90 (10.0%)	0.002*
Functional neurology	97 (10.6%)	145 (16.1%)	0.001*
Extremity manipulation	462 (48.9%)	642 (69.4%)	<0.001*
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Using the following musculoskeletal			
interventions (used often) n (%)			
Dry needling/Acupuncture	86 (9.1%)	170 (18.4%)	<0.001*
Soft tissue therapy, trigger point therapy, massage therapy, stretching	587 (61.9%)	656 (70.3%)	<0.001*
Electro-modalities (TENS, laser,	76 (8.1%)	107 (11.6%)	0.013*

interferential/ultrasound therapy)

Heat/Cryotherapy	110 (11.7%)	201 (21.7%)	<0.001*
Orthotics	68 (7.2%)	121 (13.1%)	<0.001*
Specific therapy/rehabilitation/injury taping	exercise 357 (38.0%)	563 (61.1%)	<0.001*

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\* Statistically significant association of treating athletes or sports people “often” with the chiropractic clinical management characteristics.

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**Table 4** Influential factors of chiropractors who often treat athletes or sports people

Variable	Odds ratio	95% CI	p
Patient visits per week (increments of 10)	1.05	1.03; 1.08	<0.001
Involved in volunteer work	1.57	1.09; 2.27	0.015
Referral relationship with physiotherapist	1.51	1.11; 2.04	0.008
Discusses diet/nutrition as part of the care/management plan (done often)	0.68	0.50; 0.93	0.016
Discusses physical activity/fitness as part of the care/management plan (done often)	2.08	1.32; 3.29	0.002
Treats patients with low back pain (referred/radicular) (done often)	1.60	1.08; 2.36	0.018
Treats patients with migraine (done often)	1.50	1.11; 2.02	0.008
Treats children (4 to 18 years) (done often)	2.18	1.59; 2.99	<0.001
Treats people with work-related injuries (done often)	2.00	1.45; 2.76	<0.001
Treats people with traffic-related injuries (done often)	2.10	1.25; 3.53	0.005
Treats people receiving post-surgical rehabilitation (done often)	3.20	1.42; 7.22	0.005
Uses biomechanical pelvic blocking/sacro-occipital technique (done often)	0.56	0.41; 0.75	<0.001
Uses extremity manipulation (done often)	2.01	1.49; 2.70	<0.001
Uses dry needling/acupuncture (done often)	1.59	1.01; 2.48	0.043

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Uses specific exercise therapy/rehabilitation/injury taping (done often)	1.60	1.18; 2.16	0.002
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