

Physical activity counselling and exercise prescription practices of chiropractors in Canada and internationally: an exploratory survey

Myles W. O'Brien, PhD, CSEP-CEP^{1,2}

Liam P. Pellerine, BScH³

Scott D. Howitt, BA, CK, MSc, DC, FRCCSS(C), FCCPOR⁴

Chris deGraauw, DC, FRCCSS(C)⁴

Jonathon R. Fowles, PhD, FCSEP, CSEP-CEP⁵

Background: *Physical activity and exercise (PAE) counselling and exercise prescriptions increase patient physical activity. However, the perceptions/practices of chiropractors are poorly understood.*

Methods: *We surveyed the practices among chiropractors working in Canada (n=50) and Internationally (n=37). Chiropractors completed self-reflection questionnaires regarding their current practices and perceptions towards providing PAE counselling to patients. Chiropractor responses were obtained via Canadian provincial survey and educational workshops.*

Pratiques des chiropraticiens en matière de conseil en activité physique et de prescription d'exercices au Canada et à l'étranger: une enquête exploratoire
Contexte: *Les conseils en matière d'activité physique et d'exercice (APE) et les prescriptions d'exercices augmentent l'activité physique des patients. Cependant, les perceptions et les pratiques des chiropraticiens sont mal comprises.*

Méthodologie: *Nous avons enquêté sur les pratiques des chiropraticiens travaillant au Canada (n=50) et à l'étranger (n=37). Les chiropraticiens ont rempli des questionnaires d'auto-réflexion sur leurs pratiques actuelles et leurs perceptions quant à l'offre de conseils aux patients en matière d'APE. Les réponses des chiropraticiens ont été obtenues au moyen d'une enquête provinciale canadienne et des ateliers éducatifs.*

¹ School of Physiotherapy (Faculty of Health) and Department of Medicine (Faculty of Medicine), Dalhousie University

² Geriatric Medicine Research, Dalhousie University and Nova Scotia Health

³ Division of Kinesiology, School of Health and Human Performance, Faculty of Health, Dalhousie University

⁴ Canadian Memorial Chiropractic College

⁵ School of Kinesiology, Acadia University

Corresponding author:

Jonathon Fowles, School of Kinesiology, Acadia University,

550 Main Street Wolfville,

Nova Scotia, Canada, B4P 2R6

Tel: (902) 585-1560

Fax: (902) 585-1702

E-mail: Jonathon.fowles@acadiau.ca

© JCCA 2023

The authors have no sources of support or funding to report in the preparation of this manuscript.

JRF was, and SH is the Exercise is Medicine Canada National Advisory Council Chair. JRF was the Scientific Lead for Exercise is Medicine Nova Scotia. JRF received honoraria and travel to deliver Exercise is Medicine Canada workshops through an unrestricted grant from the Lawson Foundation. All authors made substantial contributions to conception and design, acquisition of data or analysis and interpretation of data; drafted or critically revised the manuscript; approved the final version.

Results: Chiropractor respondents included PAE content and exercise prescriptions in most patient appointments ($67\pm 27\%$ and $59\pm 35\%$, respectively), but the largest barriers (2.5/4.0) and least confidence were in their patients to follow through ($52\pm 21\%$). Canadian respondents reported higher knowledge ($\sim 0.4/4.0$ higher), greater self-confidence (10-20% higher), and provided more PAE recommendations (8%) and prescriptions (16%) than International respondents. Chiropractor respondents were least comfortable advising patients with cancer.

Conclusion: Chiropractor respondents may serve as health promoters to address patient inactivity, and the challenges identified should be addressed through educational training.

(JCCA. 2023;67(2):105-116)

KEY WORDS: counseling; surveys and questionnaires; Canada; prescriptions; chiropractic

Introduction

The health benefits to engaging in regular physical activity and exercise (PAE) are well-established¹, but population rates of physical inactivity continue to be exceedingly high². Healthcare providers serve an important role in helping promote PAE to patients. Patients who receive physical activity counselling or written exercise prescriptions increase their activity levels and therefore lower their risk of developing, or improve their management of, chronic disease.³ Primary care providers (e.g., family physicians) are viewed as a useful source of PAE promotion.⁴ However, they experience many promotional barriers (e.g., lack of confidence when discussing PAE) which contribute to their low rates of PAE counselling and exercise prescription.⁴ Allied health professionals (e.g., chiropractors) may serve an important role in helping address patient inactivity, but the training, frequency, and experience levels of allied professionals integrating PAE into their patient appointments is not fully understood.

Chiropractic is a form of manual therapy that is commonly utilized to improve and/or maintain musculoskel-

Résultats: Les chiropraticiens interrogés ont inclus le contenu d'APE et les prescriptions d'exercices dans la plupart des rendez-vous avec les patients ($67\pm 27\%$ et $59\pm 35\%$, respectivement), mais les obstacles les plus importants (2,5/4,0) et la confiance la plus faible **étaient** à propos du fait que leurs patients allaient suivre les conseils ($52\pm 21\%$). Les répondants canadiens ont fait **état** d'une meilleure connaissance ($\sim 0,4/4,0$ de plus), d'une plus grande confiance en soi (10-20 % de plus) et ont fourni plus de recommandations (8 %) et de prescriptions (16 %) en matière d'APE que les répondants internationaux. Les chiropraticiens interrogés se sont montrés moins à l'aise pour conseiller les patients atteints de cancer.

Conclusion: Les chiropraticiens interrogés peuvent servir de promoteurs de la santé pour lutter contre l'inactivité des patients, et les difficultés relevées devraient **être** abordées dans le cadre d'une formation.

(JCCA. 2023;67(2):105-116)

MOTS CLÉS : conseils; enquêtes et questionnaires; Canada; prescriptions; chiropratique

etal function.⁵ Chiropractors treat the musculoskeletal system to address the needs of their patients. This may entail discussing patients' physical activity patterns and recommending that they engage in or avoid specific exercises to aid in their treatment.⁶ In students who attend Canadian Memorial Chiropractic College, 77% of respondents felt that exercise counselling is highly relevant to their intended specialty and 46% reported always counselling patients on exercise in their patient-provider interactions.⁷ The level of confidence of practicing chiropractors in including PAE as part of a patient's plan of management and what barriers may prevent them from integrating PAE as part of regular care has not been previously established. Given their training in movement related practices and/or exercise science, practicing chiropractors may serve a useful role in promoting PAE to patients.

Globally, the accessibility, education and training, and scope of practice of the chiropractic profession varies country-to-country.⁸ In the 90 countries surveyed, chiropractic education was offered in 48 institutions in 19 countries and legally recognized in 68 countries.⁸ As reviewed

elsewhere,⁸ Canada, United States, and Australia have a large proportion of chiropractors per capita. In comparison, Europe and Asia have a relatively low proportion of chiropractors.⁸ Whether chiropractors in different countries and different cultures have similar perceptions and barriers to integrating PAE into their practice is unknown. Understanding the PAE practices of chiropractors is important for assessing health promotion practices and identifying areas of need for further education or training to equip more health professionals with the skills to help more patients lead physically active lifestyles.

The purpose of our study was to characterize the perceptions towards and practices of physical activity counselling and exercise prescription of chiropractors in Canada (Ontario and Nova Scotia) with those of an international group of chiropractors attending an Exercise is Medicine Workshop in Europe. We explored whether the confidence, practices and barriers experienced, differed between chiropractors working in Canada and Internationally.

Methods

Participants and recruitment

Chiropractors for the current study were recruited from three sources: one group online (Nova Scotia) and two groups in person (Ontario and International). Chiropractor perceptions and PAE practices were collected three ways: 1) Healthcare providers across Nova Scotia, Canada completed an online provincial wide questionnaire (FluidSurveys, Ottawa, ON), as part of an Exercise is Medicine Nova Scotia initiative led by the Nova Scotia Health Authority office of Research and Innovation and Acadia University. Only de-identified data from chiropractors working in Nova Scotia, Canada (year: 2017) were extracted from the provincial online questionnaire. Participants provided electronic consent for secondary use of anonymous group data analysis prior to completing the online anonymous questionnaire. 2) Chiropractors completed a hard-copy questionnaire prior to an Exercise is Medicine Canada Workshop in 2018 in Ontario, Canada; and 3) Chiropractors completed a hard-copy questionnaire prior to beginning an Exercise is Medicine Canada workshop at the 2019 World Federation of Chiropractic conference held in Berlin, Germany. The distribution of this survey was initially not for research purposes with country of origin of each respondent not being collected at this conference. All

chiropractors respondents who attended these workshops or completed the provincial survey were included. The survey presenters (CD, SDH) anecdotally did not identify any Canadians participants who completed the survey, but this was not directly assessed. Similarly, it is not possible to discern the proportion of each World Federation conference attendee who works in Germany versus other countries and, therefore, we describe this group broadly as 'International'. All procedures were approved by the Acadia University (REB# 16-28) and Nova Scotia Health Authority (REB#: 1021602) Research Ethics Boards.

Perceptions and PAE practice questionnaire

Self-reflection questions were developed consistent with previous physical activity prescription questionnaires in healthcare.^{4,9,10} Our questionnaire development and rationale for each domain is described in detail elsewhere.⁴ We beta-tested the survey and the Exercise is Medicine Nova Scotia Steering Committee consisting of academic, healthcare providers, and decision makers edited and approved it. No personal information was required to complete the questionnaire. In brief, the self-reflection questionnaire included demographics (e.g., age, gender, ethnicity), PAE practice history, efficacy, barrier impact, and facilitator impact. Questions regarding demographic information, current PAE practice history, and barriers were developed from previous research in diabetes education.¹¹ The online and in-person questionnaires were nearly identical. The only difference in the questionnaires was that PAE practice history and efficacy variables were collected using visual analogue scales from 0-100% (1% increments) online but in 10% increments on the in-person questionnaire (i.e., 10%, 20%, etc.). Example questions are provided in Appendix 1.^{12,13}

Self-efficacy, barriers, and facilitator questions

Multiple domains of self-efficacy (e.g., "confidence in abilities to provide information, prescribe exercise", "confidence in abilities make appropriate referrals", etc.) were quantified separately from other-efficacy (e.g., confidence in their patients' abilities to follow through on recommendations). Barrier and facilitator impact were collected using an ordinal scale (1-4); with lower values indicating a barrier or a facilitator that has a weak impact on their ability to provide PAE counselling (i.e., "I = does not prevent me from counselling"). Conversely, a

higher barrier value indicates a very impactful barrier that prevents PAE practices (i.e., “4 = *completely prevents me from counselling*”) and a higher facilitator value indicates the variable makes it very easy to complete PAE practices.

Knowledge, readiness, and comfort advising patients with chronic conditions

Knowledge to provide physical activity counselling, knowledge to prescribe exercise, and readiness to counsel patients on physical activity were assessed using an ordinal scale (e.g., “not at all [0], slightly, moderately, very, extremely [4]”). Difficulty including activity counselling in patient sessions was also assessed using an ordinal scale (i.e., “not difficult [0], slightly difficult, somewhat difficult, difficult, very difficult [4]”).

Participants were provided a list of common disease conditions and were asked to identify those that they perceived as being “most comfortable”, and “least comfortable”, providing PAE advice. Disease conditions included cancer, cardiovascular disease, diabetes requiring insulin/secretagogue, diabetes not requiring insulin/secretagogue, hypertension, mental health, obesity, osteoarthritis, osteoporosis, other musculoskeletal conditions (e.g., low back pain), and respiratory diseases.

Data and statistical analysis

Respondents from the Nova Scotia online questionnaire and Ontario in-person workshop were combined into a single Canadian respondent group. Respondents who attended the Berlin in-person workshop were categorized into an International respondent group. All continuous variable distributions were tested for normality via the Shapiro-Wilk test. The only variable which met parametric assumptions was “*Confidence in Patients’ to Achieve Exercise Recommendations*”. Respondents’ PAE practices and confidence in including PAE in appointments were compared between Canada and the International group via independent samples *t*-tests (parametric data) or Mann-Whitney U tests (non-parametric data). Physical activity counselling knowledge, prescription knowledge, difficulty in providing PAE counselling in patient sessions are presented as proportional data (%). The disease conditions for which chiropractors reported being most and least comfortable providing PAE advice, are presented as proportional data for each disease option (represented as a % of respondents). Data are presented as means \pm stan-

dard deviation. Data were analyzed in SPSS (V28, IBM Statistics). The 95 percent confidence intervals (95% CI) were reported for all between-group comparisons and statistical significance was accepted as $p < 0.05$.

Results

A total of 87 licensed chiropractor respondents from Canada ($n=50$) and the International ($n=37$) chiropractic community completed a questionnaire of their PAE counselling and prescription behaviours. Table 1 displays the sample characteristics of the pooled results and between-group outcomes. Both groups of respondent samples were comprised of mostly experienced, middle-aged Caucasian chiropractors (Table 1). Most Canadian (58%) and International respondents (64%) saw >15 patients per day. Approximately half of Canadian respondents (48%) and International respondents (46%) saw patients for ≥ 20 minutes per session on average.

Table 1.

Comparing the self-reported characteristics and existing physical activity and exercise (PAE) training chiropractors by country.

| Variable | Pooled ($n = 87$) | Canada ($n = 50$) | International ($n = 37$) | Mean difference [95% CI] |
|--|------------------------|------------------------|-------------------------------|--------------------------------|
| Age (years) | 43 \pm 12 | 42 \pm 12 | 44 \pm 12 | -2 [-7, 3] |
| Gender (# men, # women, # did not disclose) | 38, 41, 8 | 23, 22, 5 | 15, 19, 3 | - |
| Ethnicity (% Caucasian) | 92 | 92 | 92 | - |
| Years of Practice | 16 \pm 11 | 15 \pm 11 | 17 \pm 11 | -2 [-7, 3] |
| Average Number of Patients Seen (patients/day) | 16-20 | 16-20 | 16-20 | - |
| Average Length of Appointment (minutes) | 21-30 | 11-20 | 21-30 | - |
| Received Training in PAE (n =Yes, % Yes) | 46 (55) | 36 (75) | 10 (29) | - |

Note: *Pairwise comparisons between Canadian and International chiropractor respondents were conducted using Mann-Whitney U-tests for continuous variables and Chi-square testing for categorical variables. For continuous variables, the mean difference and 95% confidence intervals are reported. CI, confidence interval; PAE, physical activity & exercise. Data presented as means \pm SD or proportions.*

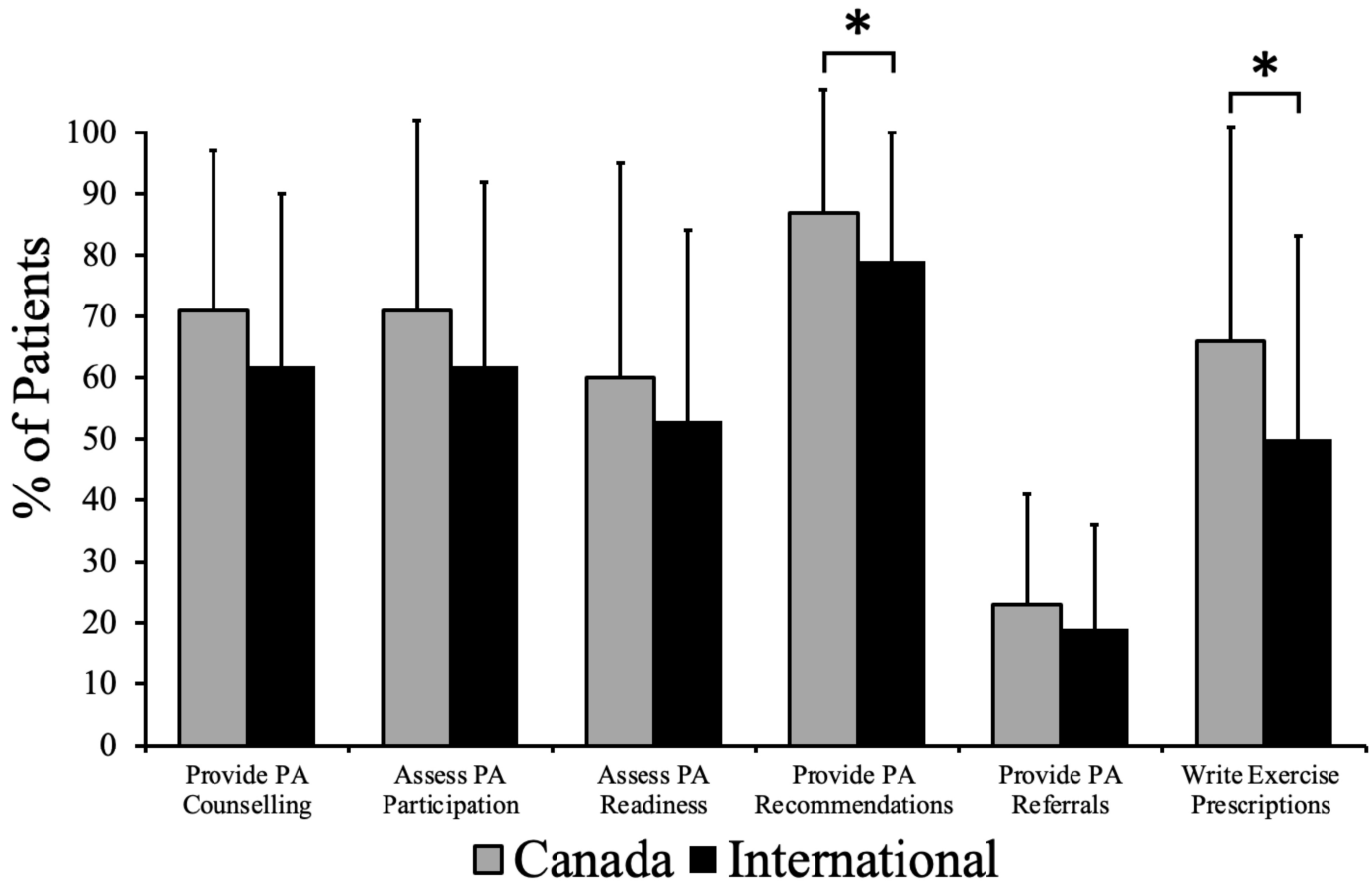


Figure 1.

The percentage of chiropractors providing physical activity and exercise (PAE) counselling, assessing PAE participation, assessing PAE readiness, providing PAE recommendations, providing PAE referrals, and writing exercise prescriptions to patients. Canadian versus International comparisons are based on Mann-Whitney U testing with a p-value significance level of $p < 0.05$.

Proportion of physical activity counselling and exercise prescription

As shown in Figure 1, both groups of respondents demonstrated similar proportions of physical activity counselling (Canada: $71 \pm 26\%$ vs. International: $62 \pm 28\%$, $p = 0.135$, 95% CI: [-3, 21]), PAE participation assessments ($71 \pm 31\%$ vs. $62 \pm 30\%$, $p = 0.147$, [-5, 22]), PAE readiness assessments ($60 \pm 35\%$ vs. $53 \pm 31\%$, $p = 0.405$, [-9, 21]), and referrals to exercise professionals ($23 \pm 18\%$ vs. $19 \pm 17\%$, $p = 0.151$, [-3, 11]). However, Canadian respondents reported higher proportions of providing

PAE recommendations ($87 \pm 20\%$ vs. $79 \pm 21\%$, $p = 0.024$, [0, 17]) and written exercise prescriptions ($66 \pm 35\%$ vs. $50 \pm 33\%$, $p = 0.018$, [1, 31]) than International respondents (see Figure 1).

Chiropractor knowledge and readiness

Figure 2 demonstrates the distribution of chiropractic knowledge and readiness between Canadian and International respondents. Most Canadian respondents were very-to-extremely knowledgeable in physical activity counselling (61% of respondents; average: 2.80/4),

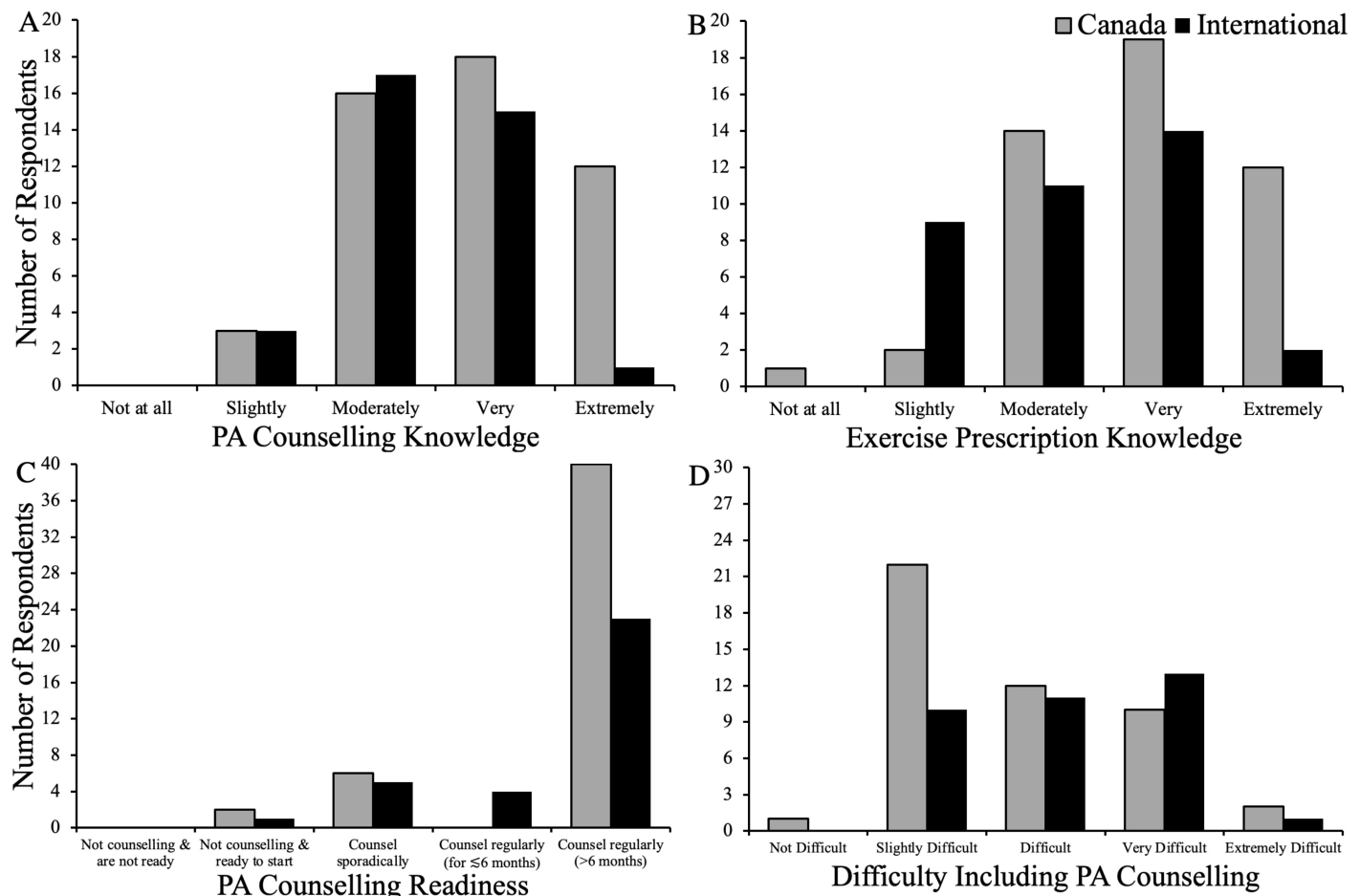


Figure 2.

The distribution of chiropractor physical activity (PA) knowledge (A) for prescribing exercise (B), readiness to include PAE counselling during sessions (C), and difficulty of including PA counselling during sessions (D). Canadian versus International comparisons are based on chi-square analysis with a p -value significance level of $p < 0.05$.

which was higher than International respondents (44%; 2.39/4; Figure 2A). Similarly, most Canadian respondents were very-to-extremely knowledgeable in providing exercise prescriptions (65% of respondents; average: 2.83/4), which was higher than International respondents (44%; 2.25/4; Figure 2B). Both respondent groups were very-to-extremely ready to include PAE during sessions with patients (Canadian: 3.63/4, International: 3.48/4; Figure 2C) and found it slightly-to-somewhat difficult to include PAE counselling into sessions (Canadians: 1.79/4, International: 2.14/4; Figure 2D).

Confidence levels for providing PAE information to patients

Table 2 reports respondents' confidence levels for providing different aspects of PAE advice to patients. Canadian respondents were more confident in providing PAE information, assessing PAE readiness, answering PAE-related questions, maintaining PAE levels among patients, assessing PAE safety to begin PAE, advising patients with conditions, and providing PAE referrals (all $p < 0.04$). Canadian and International chiropractors reported varying levels when asked about their confidence in patients to achieve PAE recommendations.

Table 2.
Self-reported level of confidence in providing physical activity and exercise (PAE) advice to patients.

| Confidence in _____ (out of 100%) | Pooled (n = 87) | Canada (n = 50) | International (n = 37) | Mean difference [95% CI] |
|--|--------------------|--------------------|---------------------------|-----------------------------|
| Providing PAE Information | 82 ± 17 | 87 ± 17 | 76 ± 15 | 11 [4, 18]* |
| Assessing PAE Readiness | 63 ± 26 | 69 ± 27 | 54 ± 22 | 14 [4, 25]* |
| Answering PAE Questions | 77 ± 21 | 84 ± 17 | 68 ± 22 | 16 [8, 24]* |
| Maintaining PAE in Patients | 59 ± 25 | 64 ± 24 | 52 ± 25 | 12 [1, 22]* |
| Assessing Safety to Begin PAE | 68 ± 24 | 73 ± 23 | 61 ± 23 | 12 [1, 21]* |
| Advising Patients with Conditions | 57 ± 25 | 62 ± 24 | 50 ± 24 | 12 [1, 22]* |
| Providing Appropriate PAE Referrals | 64 ± 28 | 73 ± 25 | 51 ± 28 | 22 [11, 34]* |
| Patients' to Achieve PAE Recommendations | 52 ± 21 | 54 ± 22 | 50 ± 20 | 4 [-6, 13] |

Note: Pairwise comparisons between Canadian and International chiropractor respondents were conducted using Mann-Whitney U-tests. The mean difference and 95% confidence intervals are reported. CI, confidence interval; PAE, physical activity & exercise. *, indicates statistical significance of $p < 0.05$ between Canadian and International respondents. Data presented as mean ± SD (%). For each variable, respondents rated their own confidence out of 100%.

Table 3.
Self-reported level of comfort in providing physical activity and exercise (PAE) advice to patients with disease.

| Chronic Disease | Highest Comfort Level | | Lowest Comfort Level | |
|---|-----------------------|------------------------|----------------------|------------------------|
| | Canada n (%) | International n (%) | Canada n (%) | International n (%) |
| Cancer | 7 (14) | 6 (16) | 30 (60) | 21 (57) |
| Cardiovascular Disease | 17 (34) | 15 (41) | 21 (42) | 10 (27) |
| Diabetes (Insulin/Secretagogue Required) | 21 (42) | 10 (27) | 15 (30) | 11 (30) |
| Diabetes (No Insulin/Secretagogue Required) | 26 (52) | 14 (38) | 5 (10) | 2 (5) |
| Hypertension | 21 (42) | 15 (41) | 7 (14) | 3 (8) |
| Mental Health | 23 (46) | 11 (30) | 10 (20) | 6 (16) |
| Obesity | 39 (78) | 24 (65) | 0 (0) | 0 (0) |
| Osteoarthritis | 45 (90) | 22 (59) | 3 (6) | 0 (0) |
| Osteoporosis | 30 (60) | 21 (57) | 9 (18) | 3 (8) |
| Musculoskeletal (e.g., Low Back Pain) | 48 (96) | 30 (81) | 1 (2) | 1 (3) |
| Respiratory | 9 (18) | 5 (14) | 26 (52) | 12 (32) |

Note: Respondents were asked to select all diseases that they felt most/least comfortable providing PAE advice. CI, confidence interval; PAE, physical activity & exercise.

Comfort levels for advising patients with disease

Table 3 includes respondents' comfort levels for discussing PAE with patients diagnosed with various chronic diseases. Both Canadian and International respondents were most comfortable providing PAE advice to patients with musculoskeletal conditions, osteoarthritis, and obesity. Both groups were least comfortable providing PAE advice to patients with cancer and respiratory conditions. While Canadians were less comfortable advising patients with cardiovascular conditions, International respondents were less comfortable advising patients with diabetes (insulin/secretagogue required).

Perceived importance of facilitators for prescribing exercise

Table 4 reports the perceived importance of facilitators for prescribing PAE to patients. Canadian and International respondents rated each potential facilitator for writing exercise prescriptions with varying levels of importance.

Perceived importance of barriers to prescribing exercise

Table 5 reports the perceived barriers to prescribing PAE to patients. Canadian and International respondents rated each potential barrier with varying levels of importance.

Table 4.

Perceived importance of facilitators that encourage physical activity counselling and exercise prescription.

| PAE Counselling Facilitators | Pooled (n = 87) | Canada (n = 50) | International (n = 37) | Mean difference [95% CI] |
|---|--------------------|--------------------|---------------------------|-----------------------------|
| Flexibility for Scheduling Patients | 2.9 ± 0.9 | 3.0 ± 0.7 | 2.7 ± 1.1 | 0.3 [-0.1, 0.8] |
| Support from Co-workers//Manager/Organization | 2.7 ± 0.9 | 2.8 ± 0.8 | 2.5 ± 1.2 | 0.3 [-0.4, 0.9] |
| Readily Available PAE Resources and Tools | 3.1 ± 0.7 | 3.0 ± 0.7 | 3.2 ± 0.5 | -0.2 [-0.6, 0.2] |
| Continuing Education Opportunities | 2.5 ± 0.9 | 2.5 ± 0.8 | 2.6 ± 1.0 | -0.1 [-0.7, 0.4] |
| Patient is Interested in PAE | 3.3 ± 0.9 | 3.3 ± 0.9 | 3.3 ± 0.9 | 0.0 [-0.5, 0.5] |
| Self-Confidence in PAE Counselling | 3.1 ± 0.9 | 3.2 ± 0.8 | 2.9 ± 1.1 | 0.3 [-0.2, 0.7] |
| Availability of Exercise Professionals for Referrals | 2.9 ± 0.9 | 2.8 ± 1.0 | 3.0 ± 0.8 | -0.2 [-0.7, 0.4] |
| Administrative Tools (i.e., PAE records, billing codes) | 2.4 ± 1.1 | 2.3 ± 1.1 | 2.6 ± 1.2 | -0.3 [-1.2, 0.6] |
| Patient is Ready to Engage in PAE | 3.4 ± 0.7 | 3.5 ± 0.6 | 3.3 ± 0.8 | 0.2 [-0.2, 0.6] |
| Availability of Community PAE Programs | 3.1 ± 0.7 | 3.1 ± 0.7 | 3.1 ± 0.6 | 0.0 [-0.4, 0.4] |
| Availability of Community PAE Facilities | 3.2 ± 0.7 | 3.2 ± 0.7 | 3.1 ± 0.6 | 0.1 [-0.4, 0.4] |

Note: Respondents were asked to rank facilitators on a scale from 1 (not impactful) to 4 (very impactful). Data presented as mean ± SD. The mean difference and 95% confidence intervals are reported. CI, confidence interval; PAE, physical activity & exercise.

Discussion

The primary objective of this exploratory cross-sectional study was to characterize the physical activity counselling and exercise prescription perceptions and PAE practices of chiropractors. Chiropractors included physical activity in most patient appointments, had moderate-to-high confidence in their ability to provide activity counselling, and cited patients' interest in PAE as their primary facilitator/barrier. Most PAE practices and barriers were not different between Canadian and International chiroprac-

tors, but Canadian chiropractors reported greater training, enhanced PAE knowledge, and higher confidence for physical activity counselling and provided more PAE recommendations and written prescriptions. Altogether, the results of this study document the knowledge, confidence and PAE practices that chiropractors have in promoting physical activity to patients and highlights areas of further improvement to inform continuing education or university education topics for Canadian and International chiropractors.

Table 5.
Perceived importance of barriers that prevent physical activity counselling and exercise prescription.

| PAE Counselling Barriers | Pooled (n = 87) | Canada (n = 50) | International (n = 37) | Mean difference [95% CI] |
|---|--------------------|--------------------|---------------------------|-----------------------------|
| Patient is Not Interested in PAE | 2.5 ± 0.7 | 2.5 ± 0.7 | 2.6 ± 0.8 | -0.1 [-0.5, 0.2] |
| Patient Prefers Medication Management | 2.2 ± 0.7 | 2.1 ± 0.7 | 2.4 ± 0.8 | -0.3 [-0.6, 0.1] |
| Lack of PAE Resources for Chronic Diseases | 2.2 ± 0.8 | 2.1 ± 0.8 | 2.3 ± 0.7 | -0.2 [-0.6, 0.3] |
| Lack of Time | 2.1 ± 0.8 | 2.0 ± 0.6 | 2.4 ± 0.8 | -0.4 [-0.8, 0.0] |
| Other Lifestyle Changes are More Important | 1.8 ± 0.6 | 1.7 ± 0.6 | 2.1 ± 0.7 | -0.4 [-0.7, 0.1] |
| Limited Personal Knowledge | 1.6 ± 0.6 | 1.6 ± 0.6 | 1.7 ± 0.7 | -0.1 [-0.5, 0.2] |
| Lack of PAE Education in School | 1.6 ± 0.7 | 1.4 ± 0.6 | 1.9 ± 0.9 | -0.5 [-0.8, -0.1] |
| Lack of Billing Structure for PAE | 1.4 ± 0.7 | 1.4 ± 0.7 | 1.9 ± 0.9 | -0.5 [-0.9, -0.1] |
| Lack of Evidence for the Effectiveness of PAE | 1.3 ± 0.5 | 1.3 ± 0.5 | 1.2 ± 0.5 | 0.1 [-0.2, 0.4] |

Note: Respondents were asked to rank barriers on a scale from 1 (not impactful) to 4 (very impactful). Data presented as mean ± SD. The mean difference and 95% confidence intervals are reported. CI, confidence interval; PAE, physical activity & exercise.

Providing patients with written exercise prescriptions is a proven means of increasing patients' physical activity levels.³ The rates of prescriptions reported by chiropractors in the present study is higher than previous studies in physicians^{9,12} and dietitians¹⁴, but lower than to previous reports in a group of physiotherapists¹⁸. The rate of prescriptions appears to coincide with the availability of common facilitators like community programs and exercise facilities. Existing community programs should reach out to chiropractors (and *vice versa*) to ensure they are aware of existing programs and advocating for a greater development of these programs.¹⁵ While the details of the exercise prescription that chiropractors typically provide patients with was not ascertained (e.g., aerobic, resistance, and/or balancing), it is hypothesized to be dependent upon the individual patient. Our study demonstrates that the self-reported high PAE knowledge, PAE confidence, exercise prescriptions and frequent contact with patients enables chiropractors to be valuable resources for promoting healthy lifestyle behaviours. Accordingly, the international problem of physical inactivity² cannot be addressed by a single type of healthcare provider, and patients will be more likely to engage in more physical activity if brought up and discussed by a range of

health care providers, including their physician, dietitian, physiotherapist, chiropractor, etc.

The most impactful barrier to adding PAE content into patient appointments was patients not being interested in physical activity. This is similar to research we have conducted with other healthcare professionals.^{4,14,18} Respondents also reported the lowest confidence in their patients' to achieve their PAE recommendations. Prior research has identified that chiropractors believe patients do not comply with home-based exercise recommendations due to a lack of patient time or forgetting to do the exercise.¹⁷ These observations corroborate previous research highlighting the need for more behaviour change training to equip chiropractors with the necessary skills (e.g., goal setting, planning techniques, motivational interviewing) to address patients who are lower in their stage of change, improving their ability to promote healthy behaviours to all patients.^{19,20} For instance, motivational interviewing and behaviour management are topics covered in the Exercise is Medicine Canada workshops for healthcare providers.⁴ Providing chiropractors with more training opportunities should help to increase their PAE counselling confidence and reduce the impact of barriers such as lack of time or belief in patients.

The results of the current study also suggest that there is a need for better guidance on promoting exercise with some non-musculoskeletal conditions, such as cancer and respiratory disease, as respondents report low comfort on providing activity advice to these considerations. The patient-focused challenges and specific disease states of low comfort identified in our study provide direction for targeted interventions aimed at improving chiropractor's role as health promoters⁶ and addressing international concerns of patient inactivity. Improving awareness and dissemination of disease-specific exercise recommendations (e.g., cancer guidelines)²¹ would help address the low comfort level of these professionals.

Self-efficacy domains such as knowledge of PAE counselling, assessing PAE participation/readiness, providing PAE referrals (i.e., referrals to exercise professionals), and the facilitators of providing PAE counselling were not different between groups. Whereas other domains such as educational training in PAE, PAE counselling and exercise prescription knowledge, confidence in PAE counselling, and the rates of providing PAE recommendations and prescribing PAE tended to be lower in International respondents compared to the Canadian respondents. This provides useful information regarding the development of resources that can help build a chiropractor's confidence to conduct counselling, which in turn, will likely increase promotion and recommendations for prescribing PAE.²² Short-term training interventions have documented effectiveness in improving healthcare providers' activity counselling confidence.^{23–25} In addition, an evaluation of what health promotion content is covered in chiropractic training and available options for continuing education would help identify specific areas to integrate further training.

Strengths and limitations

This was not a hypothesis-driven study, and the purpose was to describe the PAE practices, confidence, barriers, facilitators, disease comfort level, physical activity counselling, and exercise prescription perceptions of a small, conveniently sampled group of chiropractors. We acknowledge that our findings are based on samples of chiropractors in Nova Scotia, Ontario, and attendees at an International conference held in Berlin,

Germany, and that our results reflect the answers of our questionnaire respondents only and not of all chiropractors. Including two sources of Canadian chiropractors is a strength of the study. The International group did not presume to include any Canadians but a detailed background of where they worked was not available, and therefore it is unclear how homogenous this group was. Given that some respondents signed up for an Exercise is Medicine Canada workshop, it may be possible that those included in the present study are already “bought-in” on the importance of activity promotion, and potentially report higher PAE practices than their colleagues, although the reverse could also be true, that those with low knowledge and confidence may attend a workshop to improve these attributes.^{10,23} Similarly, respondents may have responded in a way that is more socially desirable,²⁶ reporting more frequent PAE practices than they truly do, but objectively determining specific PAE practices was beyond the scope of this study.

Conclusion

The majority of chiropractors included in our study discussed PAE counselling and prescribed exercise in most patient appointments. However, we identified disease conditions (e.g., cancer and respiratory disease) and certain self-efficacy domains (e.g., confidence in activity counselling and frequency of providing recommendations and prescribing PAE) in which chiropractors were not comfortable with promoting PAE. A large-scale survey of chiropractor's rates of physical activity counselling and exercise prescriptions is warranted to further explore these potential areas for further evaluation. This study identified that chiropractors may need improvement in some areas to help patients lead more physically active lifestyles but also indicates that chiropractor respondents had the knowledge, confidence and PAE practices that may make them an under recognized source of PAE promotion.

Acknowledgements

LPP was supported by a Fredrick Banting and Charles Best CIHR Master's Award. MWO was supported by a CIHR Post-Doctoral Fellowship Award (#181747) and a Dalhousie University Department of Medicine University Internal Medicine Research Foundation Research Fellowship Award.

References

- Hoffmann TC, Maher CG, Briffa T, Sherrington C, Bennell K, Alison J, Singh MF, Glasziou. Prescribing exercise interventions for patients with chronic conditions. *Can Med Assoc J*. 2016;188(7): 510-518. doi:10.1503/cmaj.150684
- Kohl HW, Craig CL, Lambert EV, Inoue S, Alkandari JR, Leetongin G, Kahlmeier S. The pandemic of physical inactivity: global action for public health. *Lancet*. 2012;380(9838): 294-305. doi:10.1016/S0140-6736(12)60898-8
- Thornton JS, Frémont P, Khan K, Poirier P, Fowles J, Wells GD, Frankovich R. Physical activity prescription: a critical opportunity to address a modifiable risk factor for the prevention and management of chronic disease: a position statement by the Canadian Academy of Sport and Exercise Medicine. *Br J Sports Med*. 2016;50(18): 1109-1114. doi:10.1136/bjsports-2016-096291
- O'Brien M, Shields CA, Oh PI, Fowles JR. Health care provider confidence and exercise prescription practices of Exercise is Medicine Canada workshop attendees. *Appl Physiol Nutr Metab*. 2017;42(4): 384-390. doi:10.1139/apnm-2016-0413
- Homola S. Chiropractic: history and overview of theories and methods. *Clin Orthop Relat Res*. 2006;444: 236-242. doi:10.1097/01.blo.0000200258.95865.87
- Hawk C, Amorin-Woods L, Evans MW, Whedon JM, Daniels CJ, Williams Jr RD, Parkin-Smith G, Taylor DN, Anderson D, Farabaugh R, Walters SA, Schielke A, Minkalis AL, Crivelli LS, Alpers C, Hinkeldey N, Hoang J, Caraway D, Whalen W, Cook J, Redwood D. The role of chiropractic care in providing health promotion and clinical preventive services for adult patients with musculoskeletal pain: a clinical practice guideline. *J Altern Complement Med*. 2021;27(10): 850-867. doi:10.1089/acm.2021.0184
- Howitt S, Ethridge E, Nelson E, Gotuaco M, Demello L. Exercise prescription: perceptions and physical activity habits in chiropractic students at CMCC. *J Can Chiropr Assoc*. 2016;60(4): 286-293.
- Stochkendahl MJ, Rezaei M, Torres P, Sutton D, Tuckin P, Borwn R, Cote P. The chiropractic workforce: a global review. *Chiropr Man Therap*. 2019;27(1):36. doi:10.1186/s12998-019-0255-x
- Petrella R, Lattanzio C, Overend T. Physical activity counseling and prescription among Canadian primary care physicians. *Arch Intern Med*. 2007;167(16): 1774-1781. doi:10.1001/archinte.167.16.1774
- Fowles JR, O'Brien MW, Solmundson K, Oh PI, Shields CA. Exercise is Medicine Canada physical activity counselling and exercise prescription training improves counselling, prescription, and referral practices among physicians across Canada. *Appl Physiol Nutr Metab*. 2018;43(5): 535-539. doi:10.1139/apnm-2017-0763
- Shields CA, Fowles JR, Dunbar P, Barron B, McQuaid S, Dillman CJ. Increasing diabetes educators' confidence in physical activity and exercise counselling: the effectiveness of the "Physical Activity and Exercise Toolkit" training intervention. *Can J Diabetes*. 2013;37(6): 381-387. doi:10.1016/j.cjcd.2013.08.265
- O'Brien MW, Shields C, Crowell S, Theou O, McGrath P, Fowles J. The effects of previous educational training on physical activity counselling and exercise prescription practices among physicians across Nova Scotia: a cross-sectional study. *Can Med Educ J*. 2018;9(4): e35-45. doi:10.36834/cmej.43098
- O'Brien MW, Shields CA, Campbell KL, Crowell SJ, Fowles JR. Perceptions and practices of providing physical activity counselling and exercise prescriptions among physiotherapists in Nova Scotia. *Physiother Canada*. 2020;72(3): 230-238. doi:10.3138/ptc-2018-0098
- O'Brien MW, Shields CA, Dunbar MJ, Crowell SJ, Fowles JR. Physical activity counselling and exercise prescription practices among dietitians across Nova Scotia. *Cahill N, ed. Can J Diet Pract Res*. 2022;83(1): 35-40. doi:10.3148/cjdp-2021-025
- Pellerine LP, O'Brien MW, Shields CA, Crowell SJ, Strang R, Fowles JR. Health care providers' perspectives on promoting physical activity and exercise in health care. *Int J Environ Res Public Health*. 2022;19(15): 9466. doi:10.3390/ijerph19159466
- Andersen RE. Exercise, an active lifestyle, and obesity. *Phys Sportsmed*. 1999;27(10): 41-50. doi:10.1080/00913847.1999.11439359
- Ainsworth KD, Hagino CC. A survey of Ontario chiropractors: their views on maximizing patient compliance to prescribed home exercise. *J Can Chiropr Assoc*. 2006;50(2): 140-155.
- O'Brien MW, Shields CA, Campbell KL, Crowell SJ, Fowles JR. Perceptions and practices of providing physical activity counselling and exercise prescriptions among physiotherapists in Nova Scotia. *Physiother Canada*. 2020;72(3):230-238. doi:10.3138/ptc-2018-0098
- Coombes JS, Williams A, Radford J. Training health professionals to provide physical activity counselling. *Prog Cardiovasc Dis*. 2021;64: 72-76. doi:10.1016/j.pcad.2020.12.005
- Stilwell P, Harman K. "I didn't pay her to teach me how to fix my back": a focused ethnographic study exploring chiropractors' and chiropractic patients' experiences and beliefs regarding exercise adherence. *J Can Chiropr Assoc*. 2017;61(3): 219-230.
- Campbell KL, Winters-Stone KM, Wiskemann J, May AM, Schwartz AL, Courneya KS, Zucker DS, Matthews CE, Ligibel JA, Gerber LH, Morris GS, Patel AV, Hue TF, Perna FM, Schmitz KH. Exercise guidelines for cancer survivors: consensus statement from international multidisciplinary roundtable. *Med*

- Sci Sports Exerc. 2019;51(11):2375-2390. doi:10.1249/MSS.0000000000002116
22. McFadden T, Fortier M, Sweet SN, Tomasone JR, McGinn R, Levac BM. Canadian medical students' perceived motivation, confidence and frequency recommending physical activity. *Prev Med Reports*. 2019;15: 100898. doi:10.1016/j.pmedr.2019.100898
 23. O'Brien MW, Shields C, Solmundson K, Fowles J. Exercise is medicine Canada workshop training improves physical activity practices of physicians across Canada, independent of initial confidence level. *Can Med Educ J*. 2020;11(5): e5-e15. doi:10.36834/cmej.68376
 24. Brennan AM, D'Urzo KA, Fenuta AM, Houlden RL, Tomasone JR. Integrating exercise counseling into the medical school curriculum: a workshop-based approach using behavior change techniques. *Am J Lifestyle Med*. 2021;15(1): 84-107. doi:10.1177/1559827617722754
 25. Jadcak AD, Tam KL, Visvanathan R. Educating medical students in counselling older adults about exercise: the impact of a physical activity module. *J Frailty Aging*. 2018;7(2): 113-119. doi:10.14283/jfa.2017.44
 26. Brenner PS, DeLamater JD. Social desirability bias in self-reports of physical activity: is an exercise identity the culprit? *Soc Indic Res*. 2014;117(2): 489-504. doi:10.1007/s11205-013-0359-y.

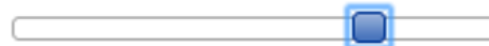
Appendix 1. Example questions

A)

For what percentage of patients are you currently recommending physical activity?

0% (None)

100% (Always)



73

reset

B)

Barriers

Consider your own practice, and using the table below, identify the barriers that apply to physical activity and exercise counselling for you. Also, for each barrier you identify, rate the impact it has on your ability to provide counselling when they occur (use the scale provided).

Impact

N/A = Does not apply to me

1 = Does not prevent me from providing physical activity and exercise counselling

2 = Sometimes prevents me from providing physical activity and exercise counselling

3 = Often prevents me from providing physical activity and exercise counselling

4 = Completely prevents me from providing physical activity and exercise counselling

| | N/A-Not Applicable | 1-Does Not Prevent | 2-Sometimes Prevents | 3-Often Prevents | 4-Completely Prevents |
|------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 26) Lack of time | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

reset