
ORIGINAL ARTICLE

A scoping review to identify barriers and facilitators of research participation among chiropractic faculty

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ABSTRACT

Objective: To describe peer-reviewed literature on chiropractic faculty participation in research and identify important barriers and facilitators.

Methods: We conducted a scoping review using comprehensive searches of relevant databases from inception through November 2022. English language publications of any design were included, with search terms consisting of subject headings specific to each database and free text words related to chiropractic, faculty, and research. Primary and secondary reviewer teams performed article screening and data abstraction using Covidence software, with primary reviewers responsible for consensus. Data were entered into evidence tables and analyzed descriptively.

Results: A total of 330 articles were screened, with 14 deemed eligible including 8 cross-sectional/correlational studies and 6 narrative reviews/editorials. Article publication dates ranged from 1987 to 2017. No intervention studies were identified. Facilitators of chiropractic faculty research included research assignment as primary role, institutional culture promoting research, and dedicated release time. Barriers included teaching/clinic assignments, lack of incentives and mentorship, and teaching load. Qualitative results identified 5 domains impacting faculty research: demographics/professional roles; personal empowerment; research culture; institutional setting/policies; and research training.

Conclusion: Our scoping review found a paucity of recently published articles on chiropractic faculty participation in research. Educational institutions building research capacity among chiropractic faculty must establish cultural environments where scholarship is expected, rewarded, and valued. Tangible support, such as research policies, resources, and space, advanced training, funding, and release time, must be available. Faculty are encouraged to build upon key facilitators, evaluate interventions to address barriers to chiropractic faculty research, and publish their results.

Key Indexing Terms: Chiropractic; Education; Research; Faculty; Work Engagement; Authorship

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INTRODUCTION

Designated faculty effort is institution dependent but generally divided among 3 categories: teaching, scholarship, and service. A growing emphasis is being placed on research and publication,¹ creating discrepancies between how faculty spend their time and how they are evaluated during the review, promotion, and tenure process.² Faculty within chiropractic institutions are particularly impacted, as these programs require heavy teaching loads,³ which may discourage faculty from participating in scholarship.

Creating a culture of scholarship and research requires alignment of institutional values, priorities, policies, and

resources to facilitate scholarly activities.⁴ Administrative support, funding, and protected time are necessary to conduct studies, prepare manuscripts, presentations, and grant proposals, and access advanced research-focused training.⁴ Formal mentorship programs are consistently associated with improved scholarly productivity, faculty retention, and successful rank promotion.^{4–6} Barriers specific to each of these categories have been identified within chiropractic institutions.^{3,7–12}

The lack of training in research methods and inadequate scholarly output within chiropractic institutions is an ongoing topic of discussion in the literature. In a 1983 commentary, DeBour¹³ claimed that research “...has not reached the status of constituting a major part of the fabric of any [chiropractic] institution...” (p. 148). Adams et al⁸ recommended several approaches to improve the status of research capacity within the

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profession in their 1997 manuscript. A follow-up article¹⁴ published 9 years later evaluated progress on these recommendations and concluded that none was evident. Finally, Hoskins et al⁷ (2006) identified a “confronting paucity” of scholarly productivity among Australian chiropractic faculty members, which was 2–3 times lower than nonchiropractic faculty members.

Our objectives for this scoping review were to describe the scientific literature on chiropractic faculty participation in research, and to identify contributing barriers, facilitators, and other key variables. Scoping review methods were chosen as they are best suited to explore and map evidence on a broad topic, whereas systematic reviews evaluate specific research questions in areas with an established body of evidence.¹⁵ By synthesizing existing knowledge, our study aims to provide a better understanding of the behaviors, circumstances, and experiences that chiropractic faculty face in their endeavors to participate in research.

METHODS

We followed the 5-step methodological framework for scoping reviews outlined by Arksey and O'Malley.¹⁶ The Preferred Reporting Items for Systematic Reviews and Meta-Analyses-Scoping Review was used to guide reporting of the manuscript.¹⁷ The study protocol was registered with Open Science Framework on November 16, 2022 (<https://doi.org/10.17605/OSF.IO/RGVM3>).

1) Identify the research question

Following preliminary reviews of the literature, our scoping review was guided by the following research question: *What are the documented barriers and facilitators of chiropractic faculty research participation?*

2) Search strategy to identify relevant literature

Based upon our research question, 6 articles with likely eligibility served as the validation set (Appendix 1). A comprehensive search strategy, developed with the consulting health services librarian (JS), included National Library of Medicine Medical Subject Headings (MeSH) extracted from the validation set. The literature search was executed on November 8, 2022, utilizing PubMed/MEDLINE, CINAHL (EBSCOhost interface) and Index to Chiropractic Literature databases (Appendix 1). The search was limited to English language publications without date restrictions. Search terms consisted of subject headings specific to each database and free text words related to chiropractic, faculty, and research. The complete search strategies for each database are available in Appendix 1. The presence of the retrieved articles matching our validation set confirmed a successful search strategy. Search results were uploaded to the citation manager Zotero.¹⁸

3) Select relevant literature

Eligibility Criteria

Eligible articles included the search terms chiropractic, faculty, and research in the title or abstract. Reviewers used their judgement on search term synonyms (eg, teachers/professors for faculty). There were no restrictions on publication date or methodology. Ineligible articles did not include 1 or more search terms, were not written in English, or included the above search terms but not in the context of research participation.

Screening and Consensus

The article screening and inclusion consensus process was conducted using Covidence software.¹⁹ All citations were uploaded as an EndNote XML file generated by Zotero,¹⁸ which Covidence automatically de-duplicated. Open access full-text articles were imported automatically, with the remaining full-text articles imported individually by the lead author (BA) and librarian (JS). Covidence logged eligibility decisions and recorded data abstraction across included studies.

Article eligibility determination and data abstraction were conducted by 4 reviewer teams. The process was led by 2 primary reviewers (BA, KS), and involved teams of 2 to 3 secondary reviewers. Eligibility was determined through a 3-stage, sequential review. In the first stage, 3 secondary reviewers (JC, PS, MM) provided the title/abstract screening with eligibility decisions (Yes/No/Maybe) recorded, while primary reviewers (BA, KS) independently performed consensus reviews on half of the articles. Conflicting decisions went to a consensus vote performed by the primary reviewer who did not initially grade the article in question. In the next stage, 3 secondary reviewers (MV, AM, BW) completed preliminary full-text review, with consensus confirmed by the primary reviewers. The final stage included 3 secondary reviewers (AF, KP, KB) evaluating included studies for limitations and quality concerns.

4) Abstracting relevant information

Three members (MV, AM, BW) completed data abstraction using a comprehensive template developed by the lead author (BA) within Covidence to capture desired data. Abstraction fields included: Citation; Location (Country); Aim/purpose; Study methodology; Population; Facilitators of Research Participation; Barriers of Research Participation; Recommendations; and Summary. Additional members (BW, PS, MM, AF, KP, KB) categorized barriers and facilitators, future directions, and limitations using separate spreadsheets.

5) Data summarizing and reporting

We collated and summarized the scoping review results descriptively. *Descriptive numerical analysis* characterized the years of publication, project settings and populations, and study designs. *Narrative summaries* reported findings with a focus on key results. The *qualitative thematic analysis* highlighted barriers and facilitators to chiropractic faculty participation in research, as well as identifying future directions and limitations. Interrater reliability statistics provided by Covidence were reported to characterize the level of agreement among reviewers.

RESULTS

Quantitative Results

Our search yielded 377 publications, with 47 duplicates removed automatically (Fig. 1). Team 1 completed the initial title/abstract screening of 330 records, which excluded 307 records. Exclusions were categorized as epidemiological studies (n = 85) and chiropractic education/students/faculty studies without a focus on research participation (n = 60). Team 2 completed full-text screening of 23 articles, which excluded 9 publications. Fourteen articles were relevant to the research question and included in this review.

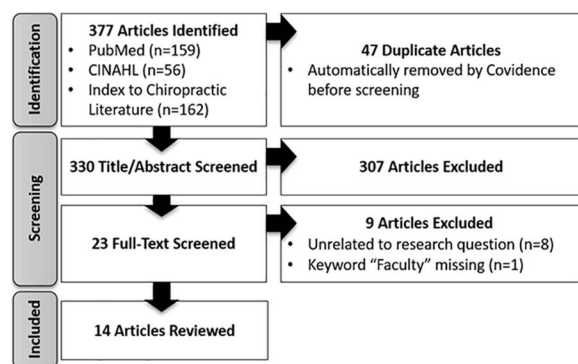


Figure 1 - PRISMA flow diagram.

Title/abstract screening consisted of 4 reviewer pairs with proportionate agreement values of 0.91, 0.85, 0.91, and 0.89, resulting in Cohen's kappa values of 0.43, 0.51, 0.49, and 0.29, respectively. The level of proportionate agreement among full-text reviewer pairs was 0.5, 0.78, 0.67, and 0.8. The number of comparisons in full-text review was not adequate to calculate Cohen's kappa values. Cohen suggests that kappa values <0.20 indicate no-to-slight inter-rater agreement, 0.21–0.40 as fair, 0.41–0.60 as moderate, 0.61–0.80 as substantial, and ≥ 0.81 as perfect agreement.²⁰ The kappa values calculated in our review correspond to fair to moderate interrater agreement.

Eight publications included cross-sectional or correlational studies, while 6 included editorials, descriptive reports, and narrative reviews. No intervention studies were reported. Article publication dates ranged from 1987 to 2017, with 4 papers published before 1999, 7 between 2000–2009, and 3 published since 2010. Publishers included *Journal of Manipulative and Physiological Therapeutics* (n = 6), *Journal of Chiropractic Education* (n = 3), *Journal of the Canadian Chiropractic Association* (n = 2), *Chiropractic & Osteopathy* (now *Chiropractic & Manual Therapies*) (n = 2), and *Journal of the Neuromusculoskeletal System* (n = 1).

Thirteen articles were completed in the United States (with data collected from Canada in 2 reports) and 1 in Australia. Chiropractic faculty were the principal population studied (n = 12), with faculty publications (n = 2) the other sampling frame. Six studies were conducted in multiple chiropractic educational institutions; 3 studies were completed at 1 chiropractic institution each; and 5 studies covered chiropractic faculty research in general.

Table 1 provides details about the 7 cross-sectional surveys and 1 correlational study included in this review. Three papers by Marchiori and colleagues were associated with a program of research on chiropractic faculty scholarship.^{21–23} Three papers described faculty knowledge of informed consent,²⁴ research in chiropractic college clinics,¹⁰ and a needs assessment for an academy of educators to support faculty development.⁹ Three papers explored faculty productivity of peer-reviewed journal publications.^{7,11,23}

Table 2 provides details on the 6 additional articles reviewed. Narrative reviews by Adams and Gatterman⁸ and updated by Mrozek et al¹⁴ addressed the current state of research on the chiropractic educational curriculum, noting the vast range of potential topics for scholarly investigation and the limited number of externally funded projects. Both articles strongly recommend

faculty embrace patient-centered approaches to research and encourage inter-institutional collaboration to guide chiropractic educational research. Editorials by Keating et al²⁵ and McCoy²⁶ encourage chiropractic institutions to promote a scientist-practitioner model by incorporating advanced training in research design, methodology and ethics,²⁵ along with mandatory student led research projects.²⁶ Ward²⁷ developed a faculty promotion rubric to evaluate evidence of unpublished scholarship among chiropractic faculty. Finally, Lawrence¹² describes the development of a teaching scholar program based on examples from other institutions.

Qualitative Thematic Results

Table 3 presents the qualitative thematic results among articles, with shared facilitators and barriers to chiropractic faculty research noted. Themes were categorized into 5 domains: demographics and professional roles, personal empowerment, research culture, institutional setting and policies, and research training.

Chiropractic faculty members who engage in research and scholarship share key characteristics including an academic rank of professor and educational backgrounds including research doctorates or combined DC-PhD degrees.^{7,23} Faculty clinicians with patient care duties had the lowest levels of research involvement. Age and gender were not predictive of productivity after controlling for rank and faculty position.

Positive values and attitudes toward research are essential.²⁵ A sense of empowerment, job satisfaction, commitment, innovation, self-determination, and productivity were impactful among individuals and their willingness to do research.²¹ Faculty and institutions should shift beliefs that scholarship is a voluntary activity or only for research professionals.^{11,22,25} Altering the atmosphere surrounding research, such as increasing scholarly productivity of supervisors, could motivate teaching faculty to conduct and publish research.³¹ Promoting positive research cultures in the chiropractic student body and teaching critical analysis skills early on could help build research capacity and instill the value of research participation.¹⁰ Professional organizations should espouse the benefits of research to the chiropractic profession and public.⁷

Institutional support was another facilitator, including such activities as encouraging faculty to pursue higher academic degrees, setting minimum publication levels, and offering advanced standing as incentives.^{7,26} Research databases, peer review rubrics, and workshops could communicate standards, monitor research involvement, and evaluate productivity.^{7,27} Communal research interests among faculty (and students) should be defined and, when possible, cross-institutional investigations pursued.¹⁴ Embracing patient-centered approaches on student learning and program performance could be meaningful.¹⁴ Lastly, teaching clinics are a potentially impactful environment for clinical research.¹⁰

Authors frequently cited inadequate funding as a major barrier to faculty scholarship, organized training,^{8,10,14,25} and protected time for research.^{8,23} Without external funding, chiropractic institutions are challenged to participate in, or internally support, faculty scholarship through financial incentives and/or seed funding.^{8,14} Faculty development is essential. Barriers focused on a lack of research experience, mentorship, role modeling, time, and established training programs. When policies are not in place, faculty mentorship is hindered.^{8,10,12,14,25} Release time is role and

Table 1 - Overview of Included Cross-Sectional and Correlational Studies

Citation	Study Aim	Population & Study Design	Results	Limitations + Recommendations (Author Provided)
Marchiori 1998a ²³	Investigate faculty research productivity and facilitators of peer-reviewed publication.	23-item nonvalidated survey completed by full time faculty (n = 673) across 17 colleges. Data: demographics, research priorities, and available resources. Outcome: 3-year peer reviewed publications.	Respondents were 68% male, age range 41–50 years. Highest publication count from DC + PhD and research appointment. Lowest publications from instructors and clinical faculty. No publications from 72% of chiropractic faculty.	Limitations: Narrow productivity definition, lack of publication quality data, unmeasured confounders, self-reporting bias and unequal institutional response rates. Recommendation: Evaluate impact of training and incentive programs on faculty research efforts.
Marchiori 1998b ²²	Investigate chiropractic faculty attitudes toward research activities	Same survey data described in Marchiori ²³	Low faculty expectations for research, high for teaching/ service. Faculty spend <10% effort on research. 62% want better research understanding. Barriers were time, funding, mentorship, and training.	Limitations: Narrow demographics, self-reporting bias, unmeasured confounders, and unequal institutional response rates. Recommendations: Research release time; support clinician-investigator role; publication incentives.
Marchiori 2003 ²¹	Evaluate associations between perceived faculty empowerment, demographics, and workplace characteristics	Faculty at 16 chiropractic colleges completed 5-point Likert scale survey of Spreitzer's measure of empowerment, workplace variables, demographics. Outcome: mean empowerment scores.	Nearly half provided patient care. Empowerment scores: meaning (4.7); competence (4.6); self-determination (4.0); impact (3.2). Faculty assignment most important predictor of empowerment score with clinic faculty lowest and administrators and research faculty highest. Published articles: 155 PM; 415 ICL. Yearly publication rate was 0.31 PM/0.62 ICL, or <2–3× than university average. 3 faculty alone produced 75% PM citations. Trends indicate decreasing publication rates. Academic doctoral degree resulted in 5.2× greater publication rate.	Limitations: Self-reporting bias, narrow demographics, and unequal institutional response rates. Recommendations: Develop empowerment programs for faculty focused on confidence, comfort, competence, credibility, and control.
Hoskins 2006 ⁷	Document research publications by academic faculty of 3 Australian chiropractic institutions	41 academic faculty identified from school websites cross-referenced with publications in PubMed or Index to Chiropractic Literature.		Limitations: Manuscripts in review, presentations or posters not included; collaborative publications not counted; quantity vs quality focus. Recommendations: Chiropractic profession must establish research culture through mentoring, training, updating curricula, advanced academic degrees, and developing chiropractic research databases.
Lawrence 2006 ²⁴	Determine understanding of IRB policies at 1 chiropractic institution	56 faculty (55% response) indicated correct IRB determination among written scenarios.	Only 29% to 65% indicated correct scenario response. Concluded general lack of knowledge regarding IRB policies and procedures.	Limitations: Small convenience sample, no demographics, pilot. Recommendations: Conduct IRB workshop; repeat study with broader scope of IRBs/scenarios.

Table 1 - Continued.






Citation	Study Aim	Population & Study Design	Results	Limitations + Recommendations (Author Provided)
Hawk 2008 ¹⁰	Investigate issues related to conducting research in chiropractic teaching clinics	34 faculty/staff from 16 chiropractic colleges (54% from 3 programs). Survey included 3 Yes/No items and 6 open-ended. Thematic analysis on open-ended questions.	On-site clinical research advantages: improved student experience, research culture/capacity, contribute to community, and faculty development. Challenges: administrative research priority low, IRB processes, inadequate resources, lack of time/interest/training from faculty and students.	Limitations: Small sample size, unequal institutional response rates and limited generalizability. Recommendations: Administrative buy-in for dedicated research clinic; research procedures manual needed; students as research assistants; faculty/student incentives for research participation; developing research training programs.
Tunning 2017 ⁹	Assess need for and willingness to participate in academy of educators at 1 chiropractic institution (3 campuses)	Convenience sample (n = 200) of faculty (53% response, 63% male, 39% associate professor, 43% clinical sciences). Pre-tested 77-item survey of training, perceived need, demographics, participation in continuing education, scholarship, and curricular development.	Tenure inversely associated with perceived need for academy as faculty with <5 years of experience/assistant professor rank more willing to engage than faculty with 21+ years/professor rank. Same relationship regarding willingness to incorporate new technology. 89% agreed an academy was necessary.	Limitations: Survey may lack external validity, convenience sample from 1 institution. Recommendations: Institute an academy of educators. Consider adding a qualitative component to understand faculty experiences.
Bakkum 2017 ¹¹	Investigate self-reported barriers to publication of research presented at ACC-RAC conferences	All abstract presenters at ACC-RAC 2006–2008 contacted via email (n = 67; 60% response rate). 4-item survey about barriers to publication.	Most respondents were chiropractors with clinical faculty roles. 66% never submitted papers for publication, 4% submitted and rejected, 30% published/ in process. Most frequent barriers were low publishing priority and inadequate time.	Limitations: Short 4-item survey provides limited information, lack of anonymity potentially prevented responses. Author Recommendations: Conduct a more comprehensive survey with a larger sample.

ACC-RAC, Association of Chiropractic Colleges-Research Agenda Conference; DC, Doctor of Chiropractic; ICL, Index of Chiropractic Literature; IRB, Institutional Review Board; PhD, Doctor of Philosophy; PM, PubMed.

Table 2 - Overview of Included Narrative Reviews, Descriptive Reports, and Editorials

Citation	Study Aim	Population & Study Design	Recommendations	Limitations (Reviewer Provided)
Keating 1987 ²⁵	Present educational innovations and research training recommendations for those planning to pursue careers in chiropractic science.	Chiropractors, chiropractic students and chiropractic educators; Opinion/editorial	Develop scientist-practitioner model to enhance use and contributions to research. Training in statistics, research design, literature searching, grant writing, and ethics. Address antiscientific attitudes. Senior faculty serve as mentors. Provide incentives.	Logistical challenges to making curricular changes (eg, accreditation and licensing bodies). Limited availability of research-fluent faculty mentors.
Adams 1997 ⁸	Review status of chiropractic educational research, identify barriers, and recommend future research topics.	Chiropractic stakeholders; Narrative review and consensus statement using modified nominal group process	Sponsor consensus conference to define patient-centered approach to educational research. Develop outcomes/methods for studying educational process. Develop/pilot test programs. Actions proposed by Adams not undertaken: patient-centered paradigm/educational research components not identified; no national faculty development program. Profession should provide opportunities for consensus building; fund educational research; support faculty pursuit of higher educational qualifications.	Establishing a "patient-centered paradigm" is not a measurable outcome. Too many objectives and unrealistic action steps.
Mrozek 2006 ¹⁴	Update Adams (1997) article on status of chiropractic educational research.	Chiropractic educators, researchers, and administrators; Narrative review	Proposed rubric documents tangible evidence of scholarship of integration (research added into course materials) or teaching (pedagogical practices carefully planned and evaluated). Prioritize research budgets, add case study research methods to curriculum and incorporate mandatory student research projects.	Updated recommendations are similar to those of the 1997 article without solutions to funding or advanced training offered.
Ward 2008 ²⁷	Report on a qualitative rubric for evaluation of unpublished scholarship among chiropractic faculty.	Chiropractic faculty; Narrative review.	Develop curriculum for teaching scholar program to include learning theory, curriculum development, teaching methods, educational research, and academic leadership.	Instrument described as an informal "sniff test" for the presence of scholarship. Qualifying teaching responsibilities as research activities.
McCoy 2008 ²⁶	Describe literature related to research attitudes and productivity among students and faculty in chiropractic and other healthcare fields.	Students and faculty within chiropractic institutions; Opinion/editorial	Develop curriculum for teaching scholar program to include learning theory, curriculum development, teaching methods, educational research, and academic leadership.	Commentary with limited citations. No evidence of cross-professional reliability between courses designed for health professions and chiropractic students. Proposed courses not validated within chiropractic settings.
Lawrence 2010 ¹²	Describe existing teaching scholar programs and propose a new program for faculty educational training.	Chiropractic faculty; Narrative review	Examples from research-intensive universities may not be comparable to chiropractic institutions. Several questions posed as challenges without suggesting potential solutions.	

Table 3 - Qualitative Thematic Analysis Results

Variable	Facilitators to Chiropractic Faculty Research	Barriers to Chiropractic Faculty Research
 Demographics & Professional Role	DC + PhD credentials ²³ Professor rank ²³ Researcher role ^{21-23, 26} Administrator role ^{21, 26} Full-time employee ²¹	Clinical faculty role ²¹ Clinical or teaching faculty ²² Part-time faculty ²¹ Not having research doctoral degree ⁷
 Empowerment	Self-determination/control of work schedule ²¹ Job satisfaction ²¹ Lifelong learning values from chiropractic training ⁷ Faculty encouraged to pursue research degrees ⁷	Low ability to direct own work ²¹ Unable to participate in faculty development ^{8, 21} Unwillingness to engage in research training ⁹
 Research Culture	Administrator/faculty attitudes on importance of research ²⁵ Scientist-practitioner/apprenticeship training models ²⁵ Patient-centered approach to research ¹⁴ Patient-focused research by clinicians ²⁶ Student/program performance approach ⁸ Defined/communal areas of research interest ¹⁴ Institutional culture and societal influences ^{7, 8, 26} Annual chiropractic educational conference ⁸ Research dissemination presentations/proceedings ³² Communicate scholarship standards ²⁷ Set minimum goals for publication ⁷ Professional organizations emphasis importance of research ⁷	Anti-scientific perspectives and philosophy ²⁵ Teaching preferred professional activity ²² Research/scholarship/publication considered voluntary ^{11, 22, 25} Research viewed as job of research professionals ²² Supervisors are not productive scholars ²² Student interest in research lacking ^{10, 26} Research vision ⁸ or consensus on key research questions lacking within chiropractic profession ¹⁴ Chiropractic programs isolated from academic universities ⁸ Collective bargaining agreements ¹²
 Institutional Setting & Policies	Dedicated research clinic ¹⁰ Release time for faculty development ^{8, 12} Release time/modified schedules for research ²² Financial incentives/recognition for publication/research ²² Rubric for peer evaluation of scholarly activity ²⁷ Research database to monitor individual/institutional progress on scholarship goals ⁷	Inadequate clinic resources ¹⁰ Teaching course loads excessive ¹⁰⁻¹² No designated time for research ^{8, 12, 22} or writing ¹¹ External funding lacking ^{8, 14, 25} No institutional incentives to conduct research ^{8, 25} Institutional policies for research lacking ²⁴ Technology resources/knowledge gaps among faculty ⁹
 Research Training	Tangible support to build research culture/capacity ¹⁰ Teaching scholars' program proposed ¹² Training to improve understanding on institutional review policies and process ²⁴ Faculty-driven training/mentorship in research ⁹	Research mentorship/role modeling lacking ^{8, 10, 12, 14, 22, 25, 26} Publication experience lacking in faculty ^{7, 11} Knowledge/confidence about research process/procedures/skills lacking ^{7, 12, 22, 25} Research training for faculty lacking ^{8, 10, 14, 25}

department dependent, and often outside of the faculty members control based on their assigned role.²³ Authors encouraged chiropractic institutions to teach faculty about the research process,^{12,14,24,25} which may include developing structured curricula in statistics, research design, grant writing, and research ethics.²⁵ Teaching scholars¹² and academies of educators⁹ were promoted for their focus on teaching and educational research.

Future research should evaluate *and report* interventions for faculty empowerment, training, publication support and incentives, and mandated, *protected* research time from competing job responsibilities.^{8,11,12,23,27} Faculty empowerment through shared decision making between administration and faculty members based on open communication may drive growth and potentiate productivity among faculty and administrators.²¹ Recommendations to evaluate cross-institutional collaboration among chiropractic educational institutions and between closely aligned academic fields may serve as possible sources of improving publication by drawing resources from other professions.¹⁴

DISCUSSION

Using scoping review methods, we identified 14 articles (8 cross-sectional and correlational studies and 6 narrative reviews or editorials) which allowed us to identify major barriers and key facilitators of chiropractic faculty research participation. No studies examined the effectiveness of interventions to increase chiropractic faculty scholarship. While chiropractic educational institutions are increasingly dispersed on a global scale, most reports ($n = 13$) were based in the United States, with 2 studies gathering data in Canada, and 1 focused on faculty publications in Australia. Publication dates ranged from 1987 to 2017, with only 2 studies published in the past decade, revealing a continual downward trend over time.

What challenges do chiropractic faculty face when deciding to conduct research? When the philosophy of a chiropractic educational institution towards research remains inconsistent, or even hostile, scholarly productivity is suppressed.²⁵ Institutions may require their faculty to produce scholarship. However, without knowledge, experience, mentorship, or training, faculty will struggle, especially those without advanced academic degrees in research methods.⁷ Without funding, faculty lack resources and incentives to participate in scholarship. The lack of protected time dedicated to research is another important barrier.^{8,12} Ward³ documented that teaching workloads among faculty at 1 chiropractic institution were 2.7 times higher than comparable universities, and 3.5 times higher than recommended for graduate level teaching. He concludes "... the high teaching load for chiropractic faculty is related to their low level of scholarly productivity, and it is probable that this does represent a significant impediment to acceptable levels of scholarly activity" (p. 9). As chiropractic training programs are increasingly integrated within university settings, the expectations of and for chiropractic faculty participation in research and scholarship may continue to change to align with those of their institutional peers.

Many facilitators to faculty research participation identified in our scoping review involve research capacity building (RCB) strategies, defined as "a process of individual and institutional development which leads to higher levels of skills and greater ability to perform useful research" (p. 2).²⁸ A systematic review²⁹ of RCB strategies evaluated the impact of various programs on research productivity, including

fellowships, masters' degree programs, teaching scholar programs, writing groups, research awards or grants, and offices of health professions education.

Positive outcomes of RCB interventions were seen in 3 domains; learner satisfaction, increased knowledge, and skills to conduct research, and (most importantly) improved rates of publication and grant writing. RCB among chiropractic educational institutions and their faculties is a cyclical topic of interest within the profession. For example, a recent Chiropractic Educators Research Forum (CERF) conference included over 20 presentations and panel discussions on capacity building for faculty scholarship, suggesting broadening interest worldwide.³⁰ Historically, however, this interest has not translated to improved research productivity, as chiropractic faculty report a lack of time and interest in pursuing publication as the primary reasons for low journal publication rates (30%) following conference presentations.¹¹

Organized mentorship programs are another form of RCB with documented positive outcomes, including: a higher likelihood of being awarded research grants, remaining in academia, and career satisfaction; greater confidence in research skills; and developing career plans.⁵ In a survey of 92 junior occupational therapy faculty, those who were actively mentored were more likely to spend at least 5 hours per week on research, serve as principal or co-principal investigators on research projects, and receive grant funding than those without mentors.⁶ One model for developing chiropractic researcher capacity is provided by the Chiropractic Academy for Research Leadership (CARL).^{31,32} CARL aims to foster research culture and capacity among a global network of researchers with burgeoning programs of research in chiropractic. The first CARL cohort successfully trained 13 chiropractors using financial and in-kind support from multiple international faculties, research centers, and universities. This model might serve as a template for organizations, such as the Association for Chiropractic Colleges, to develop leadership and research capacity among faculty without extensive research training who teach at chiropractic educational institutions. The RAND Center for Collaborative Research in Complementary and Integrative Health also provides opportunities to strengthen research by facilitating collaboration among faculty at chiropractic colleges.³³

Facilitators of faculty productivity among similar doctoral-level academic programs are informative. An academic doctoral credential or associate/professor title, along with institutional Carnegie classification, were significant predictors of research productivity among physical therapy faculty.^{33,34,35} A linear decrease in productivity was noted when comparing academic pharmacy faculty at R1 vs R2 vs doctoral/professional institutions.³⁵ Institutions classified as "teaching-oriented" had mean faculty publication rates nearly 50% lower than "balanced" or "research-oriented" institutions. Faculty at public institutions had a 60% higher mean publication rate compared to those at private institutions.³⁶ These findings are relevant to chiropractic faculty, as all US chiropractic institutions are classified as private and doctoral/professional.

Strengths and Limitations

Our scoping review had many strengths. We used an established and reproducible step-wise methodology and registered our protocol prior to data extraction. Our team included individuals with experience in scoping reviews, as well as a health

science librarian who oversaw the search strategy process and library request procedures. We developed a validation set of articles to assure expected articles on the topic were retrieved with our search strategy. All team members undertook formal training before beginning the review to ensure standardization of methods. Two sets of reviewers (primary and secondary) contributed to the consensus process at every review stage. We also used the innovative Covidence software, which allowed our team to document inclusion decisions, collect data systematically, and generate kappa values about reviewer agreement, a statistic not often reported for scoping reviews within chiropractic.

Our initial search identified over 300 articles potentially related to the topic of chiropractic faculty participation in research and scholarship. Although our search strategy was comprehensive and verified by a health sciences librarian, our study was limited to English language publications and required the inclusion of 3 key words (“research”, “faculty”, “chiropractic” [to capture “chiropractic”, “chiropractor”, etc]) in the article title or abstract. This strategy may have led to a small number of studies being excluded. To maintain rigorous methodology, we included only peer-reviewed articles indexed within 3 databases. We did not include gray literature, such as conference proceedings or graduate theses which may have informed our research question.

One limitation of this scoping review rests on the paucity of *current* literature on chiropractic faculty involvement in research. Of 14 included articles, 13 are outdated with publication dates before 2010.^{7,10,12,14,21,23–27,31} Several studies were conducted across multiple institutions, which provides useful, if not dated, information about the state of faculty research participation across the profession.^{7,10,11,21–23} However, many projects had small samples from single institutions, limiting the generalizability of those findings. Several articles can be classified as editorials, which are not methodologically rigorous and include author opinions. Overall, the included studies have underdeveloped reports of study design. Finally, no publication reported on interventions to increase research productivity or participation among chiropractic faculty.

CONCLUSION

This scoping review explored the published literature on chiropractic faculty participation in research, including 14 articles published between 1987–2017. Our review offers insights into the key facilitators (research as primary role, institutional culture promoting research, dedicated release time) and barriers (teaching or clinic primary role, lack of incentives and mentorship, excessive teaching load) to faculty scholarship in chiropractic educational institutions. These facilitators and barriers were classified into 5 domains; demographics and professional role; empowerment; research culture; institutional setting and policies; and research training. The need to place a higher value on research participation within chiropractic academic institutions was clearly identified, requiring individual and institutional commitments to faculty training with accompanying funding.

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