

# A commentary on the use of mixed methods in chiropractic research.

## Part 1: overview of mixed methods research

Peter C. Emary, DC, PhD<sup>1-3</sup>  
Kent J. Stuber, DC, PhD<sup>4,5</sup>

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*We recently each completed doctoral programs where the major focus of our work was in mixed methods research. In the first part of this three-part commentary, we present an overview of mixed methods research. In the second part, we present a summary of our primary and secondary research findings from our doctoral work involving mixed methods. In a third paper, we will discuss integrating qualitative research with randomized controlled trials and how this mixed methods study design can be applied to research within the chiropractic profession.*

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*Étude sur l'utilisation de méthodes mixtes dans la recherche en chiropratique. Partie 1: aperçu des méthodes mixtes de recherche*  
*Nous avons récemment terminé chacun un programme de doctorat dont l'objectif principal était les méthodes mixtes de recherche. Dans la première partie de cette étude en trois parties, nous présentons un aperçu sur les méthodes mixtes de recherche. Dans la deuxième partie, nous présentons un résumé des résultats de nos recherches primaires et secondaires dans le cadre de nos travaux de doctorat impliquant des méthodes mixtes. Dans un troisième article, nous discuterons de l'intégration de la recherche qualitative aux essais cliniques randomisés et de la manière dont ce modèle d'étude mixte peut être appliqué à la recherche au sein de la profession chiropratique.*

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<sup>1</sup> Michael G. DeGroote Institute for Pain Research and Care, McMaster University, Hamilton, Ontario  
<sup>2</sup> Chiropractic Department, D'Youville University, Buffalo, New York  
<sup>3</sup> Private Practice, Lings Community Health Centre, Cambridge, Ontario  
<sup>4</sup> Parker University Research Center, Parker University, Dallas, Texas  
<sup>5</sup> Division of Research and Innovation, Canadian Memorial Chiropractic College, Toronto, Ontario

Corresponding author: Peter C. Emary, 1145 Concession Rd., Cambridge, ON N3H 4L5  
Tel: (519) 653-1470 ext. 352  
E-mail: emaryp@mcmaster.ca

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*Our aim with these papers is to increase awareness amongst the chiropractic community of the value (and challenges) of using this unique methodology. We also make recommendations for improving the quality of reporting and conduct of future chiropractic mixed methods studies. Further dissemination of this work will occur through online webinars and conference presentations.*

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KEY WORDS: Mixed Methods Research; Methodological Quality; Chiropractic

*L'objectif de ces articles est de sensibiliser la communauté chiropratique à la valeur (et aux difficultés) de l'utilisation de cette méthodologie unique. Nous formulons également des recommandations pour améliorer la qualité des rapports et la conduite des futures études sur les méthodes mixtes en chiropratique. La diffusion de ce travail se fera par des webinaires en ligne et des présentations lors de conférences.*

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MOTS CLÉS : Méthodes mixtes de recherche, qualité méthodologique, chiropratique

## Introduction

We recently each completed a Doctorate in Philosophy (PhD) degree in which we received extensive training in, and our respective thesis dissertations focused on, mixed methods research. The use of mixed methods designs (i.e., the combination of quantitative and qualitative methods) in research studies involving the chiropractic profession and other health-related fields has become increasingly common in recent years.<sup>1-3</sup> The explicit integration of methods within mixed methods research is distinct from “multi-method” research where investigators use quantitative and qualitative methods in a single study (e.g., a survey with follow-up interviews) but do not link or integrate the two components.<sup>4,6</sup> This distinction of mixed methods, that is, as an approach to research beyond simply using quantitative and qualitative methods as separate and distinct components in a single study, formally emerged within the mixed methods literature during the late 1980s and early 1990s.<sup>5</sup> Subsequently, the intentional and explicit integration of quantitative and qualitative methods is now recognized as a central tenet of mixed methods research.<sup>4,6</sup>

As part of our doctoral work, we reviewed the literature to assess the reporting and methodological quality of mixed methods studies involving chiropractic research and found that most ( $\approx 96\%$ ) studies had important omissions.<sup>1-3</sup> We applied these results to optimize methodo-

logic reporting in three mixed methods studies we conducted, one on patient-centredness in chiropractic care,<sup>7,8</sup> and two on the association between chiropractic care and opioid prescribing.<sup>9-11</sup>

## Objective

The purpose of part 1 in this three-part commentary is to present an overview of mixed methods research for chiropractic clinicians and researchers. In part 2, we will summarize the findings from the aforementioned studies from our doctoral work involving mixed methods research. In doing so, our aim with these papers is to increase awareness amongst the chiropractic community of the value, and challenges, of using this unique methodology. We also make recommendations for improving the quality of reporting and conduct of future chiropractic mixed methods studies. In a third paper, we will discuss integrating qualitative research with randomized controlled trials and how this mixed methods study design can be applied to research within the chiropractic profession.

To inform this series of commentaries, we relied on mixed methods literature retrieved from previous searches in the MEDLINE, Embase, CINAHL, and the Index to Chiropractic Literature databases.<sup>1-3</sup> Additional mixed methods articles and textbooks not identified in our initial database searches that were pertinent to these commentaries were also used.<sup>4,6,10-17</sup> We hope readers and those inter-

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ested in reviewing or conducting mixed methods research will find the information and resources provided in this series of articles useful.

**Reflexivity statement**

At this stage of our careers, we each view our ontological and epistemological perspectives toward research inquiry as on a continuum between postpositivism and constructivism. We are both trained in health research methodology and are experienced clinicians. We also collectively have over 100 publications; however, much of this work, particularly from earlier on in our research careers, was conducted through primarily a postpositivist lens.

In this current series of papers, we present examples and findings from some of our own mixed methods research studies and have made a conscious effort to limit bias as well as an over-emphasis on quantitative findings in the organization and presentation of this information. We have also incorporated several examples from other authors of chiropractic mixed methods studies in our commentaries where relevant.

**Discussion**

**Mixed methods research**

Mixed methods research involves the mixing or integration of various elements of quantitative and qualitative methods, including viewpoints, data collection, analysis and inference techniques, for the purposes of breadth and depth of understanding and corroboration.<sup>4</sup> Mixed methods research is increasingly being recognized as a *third* research paradigm, distinct from purely quantitative or qualitative research.<sup>4,5</sup> Mixed methods research is particularly useful for answering questions that are difficult to answer using only quantitative or qualitative methods and can serve as a powerful tool for investigating educational programs, knowledge translation strategies, or complex therapeutic interventions, such as multi-modal chiropractic care.<sup>5,6</sup> A common philosophical approach used in mixed methods research is ‘pragmatism,’ where the focus is on combining methods of data collection for “what works” best in answering a particular research question.<sup>5</sup> With this approach, the research question drives the study design<sup>5</sup>, and both objective and subjective knowledge are

Table 1.  
*Philosophical approaches used in mixed methods research (adapted from Creswell and Plano Clark<sup>5</sup>).*

Philosophical Element	Postpositivist Worldview	Constructivist Worldview	Transformative Worldview	Pragmatist Worldview
• Ontology (i.e., the nature of reality)	Singular reality (e.g., researchers reject or fail to reject hypotheses)	Multiple realities (e.g., researchers provide quotes to illustrate different perspectives)	Multifaceted and based on different social and cultural positions (e.g., researchers recognize different power positionalities in our society)	Singular and multiple realities (e.g., researchers test hypotheses and provide multiple perspectives)
• Epistemology (i.e., the relationship between the researcher and that being researched)	Distance and impartiality (e.g., researchers objectively collect data on instruments)	Closeness and subjectivity (e.g., researchers visit with participants at their sites to collect data)	Collaboration (e.g., researchers actively involve participants as collaborators, build trust, and honour participant standpoints)	Practicality (e.g., researchers collect data by “what works” to address research question)
• Axiology (i.e., the role of values)	Unbiased (e.g., researchers use checks to eliminate bias)	Biased (e.g., researchers actively talk about and use their personal biases and interpretations)	Based on human rights and social justice for all (e.g., researchers begin with and advocate for this premise)	Multiple stances (e.g., researchers include both biased and unbiased perspectives)
• Methodology (i.e., the process of research)	Deductive (e.g., researchers test an a priori theory)	Inductive (e.g., researchers start with participants’ views and build “up” to patterns, theories, and interpretations)	Participatory (e.g., researchers involve participants in all stages of the research and engage in cyclical reviews of results)	Combining (e.g., researchers collect both quantitative and qualitative data and mix them)
• Rhetoric (i.e., the language of research)	Formal style (e.g., researchers use agreed-upon definitions of variables)	Informal style (e.g., researchers write in a literary, informal style)	Advocacy, activist-oriented (e.g., researchers use language that will help bring about change and advocate for human rights and social justice)	Formal or informal (e.g., researchers may employ both formal and informal styles of writing)

valued. The four philosophical approaches used in mixed methods research are outlined in Table 1.

**Rationales for using mixed methods**

There are several rationales for undertaking mixed methods research. These include, but are not limited to, a need to:

- obtain more complete and corroborated results (e.g., to find points of convergence and divergence<sup>12</sup>);
- explain initial quantitative results;
- first explore questions, variables to be measured, or theories to guide a study before administering instruments;
- enhance an experimental (i.e., randomized controlled) trial with a qualitative study, such as in a feasibility study or process evaluation;
- describe and compare different types of cases;
- involve participants in the study to ensure the research will bring about change that impacts people or communities (i.e., participatory-social justice); or
- develop, implement and evaluate a program.<sup>5</sup>

The purposes or rationales for mixed methods research have been consolidated by Greene *et al.*<sup>12</sup> into five general categories, namely: (1) triangulation, (2) complementarity, (3) development, (4) initiation, and (5) expansion (Table 2). In a 2021 mixed methods study, Emary *et al.*<sup>9</sup> used the rationale of *complementarity*, where the interview (i.e., qualitative) component of the study was used to obtain a more complete understanding of the barriers and facilitators to incorporating chiropractic services into

primary care as well as whether these services were used by patients or general practitioners to reduce reliance on opioid prescribing for chronic non-cancer pain. Similarly, Stuber *et al.*<sup>7</sup> utilized a complementarity approach where qualitative and quantitative data were interwoven to provide an in-depth understanding of patients’ and chiropractors’ perspectives, perceptions, and experiences of patient-centred care in chiropractic. They also used *triangulation* in which their qualitative data were converged with their quantitative data for the purposes of corroborating the quantitative findings.

A mixed methods study is not always preferable. There are instances where only a quantitative or qualitative research approach is not only sufficient, it is preferable and more suitable. For instance, quantitative research may be the best approach when the aim is to understand the relationship between variables or determine if one group, compared to another group, performs better on a particular outcome of interest. A qualitative approach, on the other hand, may be optimal when the aim is to explore a particular phenomenon, map the complexity of the situation, or honour the voices and convey multiple perspectives of participants.<sup>5</sup>

In general, problems best suited for mixed methods research are those in which one data source (i.e., quantitative or qualitative) may be insufficient. For example, in a 2014 narrative review of the literature<sup>13</sup>, we identified previously published studies on clinicians’ attitudes toward medication prescription rights in chiropractic practice. In all identified studies, traditional quantitative survey methods (e.g., Likert-scale items) were utilized for data collection.

Table 2.  
*Rationales for undertaking mixed methods research (adapted from Greene et al.<sup>12</sup>).*

Rationale	Description
Triangulation	• Seeks convergence and corroboration of results from different methods (i.e., quantitative and qualitative) studying the same phenomenon.
Complementarity	• Seeks elaboration, enhancement, illustration, or clarification of the results from one method with results from the other method.
Development	• Seeks to use the results from one method to help inform the other method.
Initiation	• Seeks the discovery of paradoxes and contradictions that lead to a reframing of the research question.
Expansion	• Seeks to extend the breadth and range of inquiry by using different methods for different inquiry components.

Based on the findings from these studies, we concluded that there was no clear definition or consensus on medication prescription rights within the chiropractic profession, and that further research was warranted. In a 2020 study of chiropractors in Switzerland, Emary *et al.*<sup>19</sup> utilized a mixed-methods (Q-methodology) approach and identified four distinct viewpoints among chiropractors toward medication prescribing (i.e., *prescribers*, *non-prescribers*, *collaborators*, and *integrators*) that were not identified in previous quantitative surveys. Respondents' rankings of agreement toward 38 statements from a Q-methodology survey (quantitative) were triangulated with their answers to a series of open-ended questions (qualitative) to identify the four typologies of individuals within the larger group (n = 286) of Swiss chiropractors. These findings provided new insights on chiropractic prescribing rights, and consensus was reached on this topic among participants in this study.<sup>19</sup> All except the *non-prescriber* group thought medication prescription privileges were advantageous for the chiropractic profession in Switzerland, and there was strong consensus among all four groups that medication prescribing should not replace manual therapy in chiropractic practice.<sup>19</sup>

### *Mixed methods study designs*

There are three core study designs used in mixed methods research, including: (1) convergent, (2) explanatory sequential, and (3) exploratory sequential (Figure 1). In a *convergent* design, researchers compare and combine (or triangulate) quantitative and qualitative results to obtain a richer understanding of the research problem, or to validate one set of findings with the other.<sup>5</sup> With this design, the results from one method do not depend on the results of the other method; therefore, quantitative and qualitative data are collected and analyzed concurrently, but separately. The results from the two datasets are then merged and the researcher interprets to what extent and in what ways the two sets of results converge or diverge from one another.<sup>5</sup> For example, in an online survey of students, faculty, and staff at five international chiropractic educational institutions, Pohlman *et al.*<sup>20</sup> used closed- and open-ended questions (i.e., quantitative and qualitative data collection, respectively) to evaluate patient safety attitudes among stakeholders in chiropractic teaching clinics. The authors integrated quantitative and qualitative methods through 'merging',<sup>6</sup> by comparing the

quantitative and qualitative findings through joint display figures and narrative discussion. By combining methods, the qualitative findings provided in-depth insight into the quantitative survey results and helped identify areas for improvement in patient safety education within chiropractic teaching programs. In a 2023 study, Emary *et al.*<sup>14</sup> used a convergent, mixed methods study design to examine 1,681 Canadian military Veterans' use and preferences toward 12 specific health care disciplines and treatment approaches for the management of chronic low back pain. Qualitative (open-text) data were integrated with quantitative (closed-ended) survey data using a joint display table and contiguous narrative in the results to gain a deeper understanding of Veterans' treatment preferences.

With an *explanatory* sequential design, quantitative data collection and analysis are followed by qualitative data collection and analysis, and the qualitative data are used to help explain or expand on the initial quantitative results. For example, in a mixed methods study on patient perceptions toward patient-centred care in chiropractic practice, Stuber *et al.*<sup>7</sup> used an explanatory sequential design, where follow-up qualitative interviews and focus groups were conducted to help explain initial quantitative survey results. Emary *et al.*<sup>9</sup> also used an explanatory sequential, mixed methods design in two separate analyses<sup>10,11</sup> on the association between chiropractic integration and opioid use among patients with non-cancer spinal pain in an Ontario community health centre. In-depth, one-on-one interviews of patients and general practitioners (qualitative) were used to further explore differences in the number and dose of opioid prescriptions between recipients and non-recipients of chiropractic services measured via electronic medical record review (quantitative). In all three of these studies<sup>7,10,11</sup>, integration was achieved using joint display, contiguous narrative, or weaving approaches.<sup>6</sup>

In contrast to an *explanatory* sequential design, an *exploratory* sequential design begins with an exploratory qualitative phase (i.e., qualitative data collection and analysis) followed by a developmental quantitative phase. The quantitative phase is based on the initial qualitative results, which are used to generate new quantitative variables, design a quantitative instrument, or develop activities for an intervention or digital product, such as an app or website.<sup>5</sup> The developmental quantitative phase is followed by a third phase where the new feature (i.e.,



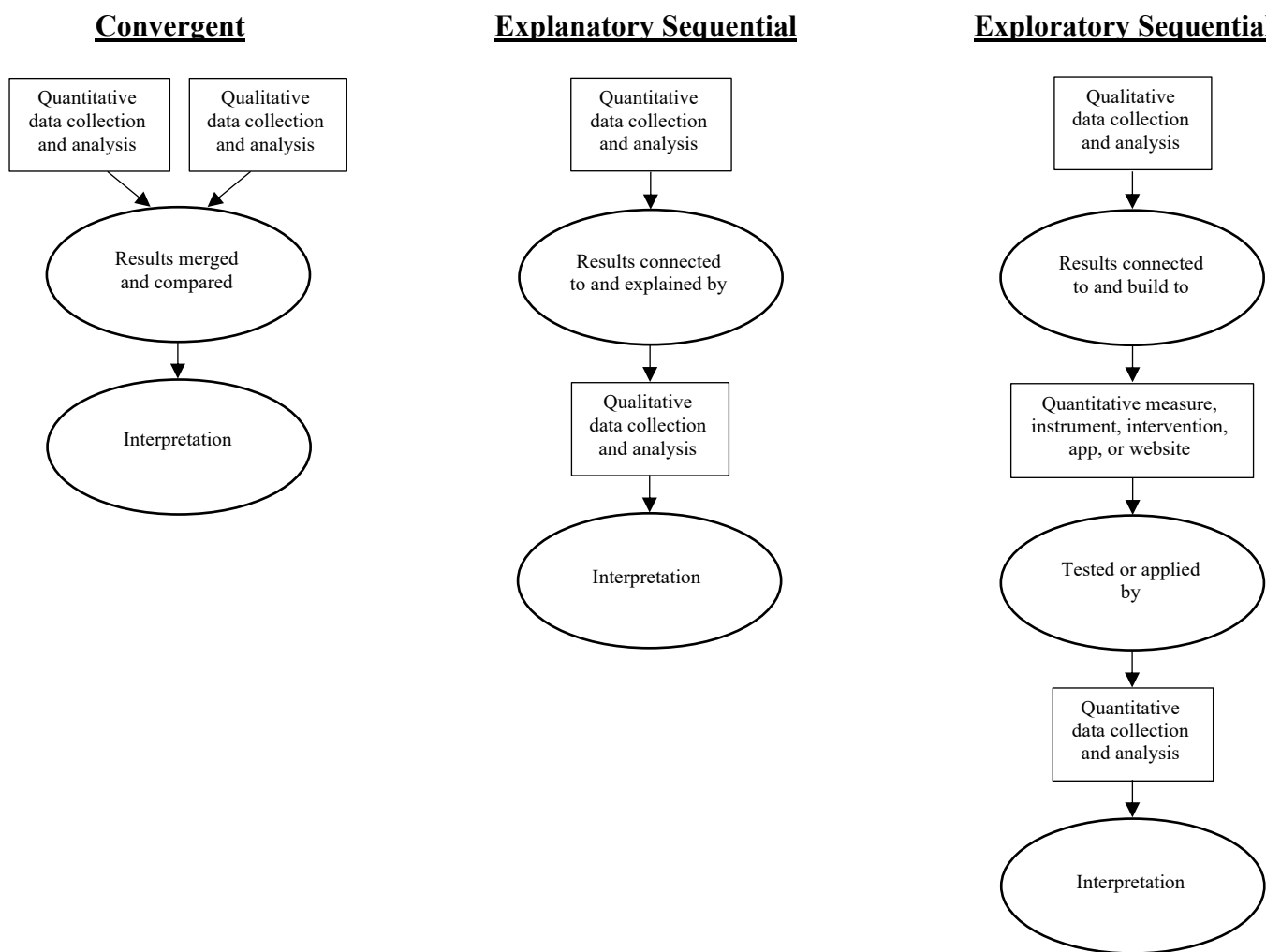


Figure 1.

Core mixed methods study designs (adapted from Creswell and Plano Clark<sup>5</sup>). The ovals in the diagrams represent points of integration (or mixing) of the quantitative and qualitative phases.

variable[s], instrument, or product) is tested quantitatively to see how the quantitative findings build on the initial qualitative results or provide a clearer understanding of the research problem. In either case, the development of the quantitative feature is grounded in the initial qualitative perspectives of participants.<sup>5</sup> In a 2020 study investigating chiropractors' understanding of building trust with patients, Connell and Bainbridge<sup>20</sup> used an exploratory sequential design, where initial interviews (qualitative) were conducted with six chiropractors in British Columbia (BC), Canada and used to develop a survey instrument (quantitative). This type of integration

is an example of 'building'<sup>6</sup>, where qualitative findings are used to create a quantitative questionnaire. In addition, the initial qualitative findings from the interviews in this study ensured that questions on the survey instrument reflected the perspectives of BC chiropractors. The questionnaire was then distributed to all members of the provincial chiropractic association (n = 1,154) and used to measure chiropractors' perceptions of trust and confirm initial qualitative themes.<sup>20</sup> The authors further integrated their results through 'merging'<sup>6</sup>, by comparing the qualitative and quantitative findings through narrative discussion.

### *Advantages and challenges of mixed methods research*

There are several advantages with a mixed methods approach.<sup>5</sup> Mixing quantitative and qualitative methods allows the strengths of each methodology to account for weaknesses of the other. For instance, when there is good external validity (e.g., data collected in a representative epidemiological survey or pragmatic clinical trial), quantitative research findings are generalizable to larger populations. However, findings from qualitative research allow for greater in-depth knowledge and understanding of perspectives, experiences, or beliefs of individuals or groups.<sup>15</sup> Therefore, by incorporating both deductive and inductive reasoning<sup>5,16</sup>, mixed methods research builds on the strengths of quantitative and qualitative methods and provides more complete answers to research questions. Mixed methods research can also offer new insights into investigations that go beyond the results of the separate quantitative and qualitative components (i.e., meta-inferences)<sup>5,17</sup>, as illustrated in the following equation:  $1 + 1 = 3$ , where the first '1' is the quantitative component, the second '1' is the qualitative component, and the '3' is the combination of results and meta-inferences generated from mixing quantitative and qualitative methods.<sup>17</sup> Meta-inferences are a set of conclusions reached in a mixed methods study when researchers jointly draw on the quantitative and qualitative results. For example, in the 2022 mixed methods analyses by Emary *et al.*<sup>10,11</sup>, receipt of chiropractic services at an Ontario community health centre was inversely associated with opioid use among adults with non-cancer spinal pain. When combined with themes from the studies' qualitative findings (i.e., patient self-efficacy, accessibility of non-pharmacological services, and impact of treatment), the meta-inferences drawn from these two studies were that, (1) patients who were referred for chiropractic services may have been more resistant to taking opioids, and (2) access to chiropractic treatment at the centre provided patients and their general practitioners with another non-opioid pain management option. By combining inferences from the quantitative and qualitative components in each of the two studies, the authors gained additional insight into why chiropractic recipients were less likely to be prescribed opioids or had, among those already prescribed, reduced opioid use.

Mixed methods research also provides opportunities for collaboration, which can help bridge the historical div-

ide (also known as the *paradigm debate period*<sup>5</sup>) between quantitative and qualitative researchers.<sup>5</sup> Mixed methods research also encourages the use of multiple worldviews, or paradigms, including those such as pragmatism that encompass both quantitative and qualitative research (see Table 1).<sup>5</sup> A final advantage of mixed methods research is that it helps investigators develop broader skillsets or expertise in multiple forms of research methods (i.e., quantitative, qualitative, and mixed methods).

Despite its advantages, mixed methods research also entails unique challenges. For instance, mixed methods studies can often become complex, drawn-out investigations which may take several years to complete.<sup>5,6</sup> Qualitative data collection and analysis are time-intensive, and additional time is needed for mixed methods studies that incorporate a sequential explanatory (i.e., two-phase) or exploratory (i.e., three-phase) study design. There are also cost considerations in mixed methods research, such as the need to purchase additional materials or services (e.g., quantitative and qualitative analysis software programs, audio recorders, printing, transcription services), as well as the need to work in larger teams requiring qualitative researchers and/or mixed methodologists (i.e., methodologists with graduate-level training or expertise in mixed methods research). Mixed methods studies can also create team management issues, particularly for members with diverse levels of mixed methodological or content expertise. Further, mixed methods investigators may need to educate team members or others (e.g., grant committees, journal editors, or peer reviewers) about mixed methods research, particularly if they are unfamiliar with this methodology. As such, mixed methods research must be carefully planned, and suitable training should be sought by novice researchers interested in conducting mixed methods research.

### **Conclusion**

In this first paper, we have presented an overview of mixed methods research as well as the philosophical underpinnings and rationales for using this methodology. In addition, we have introduced readers to the three core mixed methods study designs, as well as the advantages and challenges of employing a mixed methods approach. In part 2 of our commentary, we will present the primary and secondary findings from our doctoral work involving mixed methods research and provide recommendations

for improving the quality of reporting and conduct of future chiropractic mixed methods studies.

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