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## ORIGINAL ARTICLE

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### Newly qualified chiropractors' perceptions of preparedness for practice: *A cross-sectional study of graduates from European training programs*

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**Objective:** The purpose of this pilot study was to explore chiropractic graduates' perceived preparedness for practice in the 7 key competencies of the Canadian Medical Education Directives for Specialists.

**Methods:** An anonymous 5-point Likert scale electronic questionnaire was distributed to graduates from the 2014–2016 cohorts of 9 European chiropractic colleges accredited by the European Council of Chiropractic Education. For each group under 1 competency role, the mean overall score was calculated. Statistical differences were analyzed using a *t* test and analysis of variance. Cronbach's alpha was calculated for internal consistency.

**Results:** Results of 7 chiropractic colleges were analyzed ( $n = 121$ ). Differences were found among colleges, competencies, and items. Overall, the graduates who responded scored the lowest in collaborator (3.76) and scholar (3.78) competencies. They scored the highest in professional (4.39) and chiropractic expert (4.13) competencies. In all colleges, a lower level of perceived preparedness was found in collaborator, scholar, and manager competencies. Statistical differences were found that compared the type of employment and cohorts.

**Conclusion:** Our results show there may be a gap between education and professional practice regarding perceived preparedness, and graduates perceived themselves to be unprepared in some competencies. The preliminary results of this study could be used to improve curricula of chiropractic education.

**Key Indexing Terms:** Chiropractic; Competency-Based Education; Curriculum; Professional Competence

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### INTRODUCTION

Research has shown that education and professional practice do not meet. A study done in 2003 reported that 40% of medical graduates in the United Kingdom did not feel prepared for practice, and significant differences were found between graduates of different schools.<sup>1</sup> A study from 2013 did not report substantial differences between UK medical schools. However, it did find differences between the levels of perceived preparedness in different competencies.<sup>2</sup> Other studies have reported similar differences in the perceived preparedness among competencies and areas of practice.<sup>3,4</sup> Several studies have reported that students do not feel prepared to start practice.<sup>5–9</sup> A study from 2012 reported that new doctors feel relatively unprepared for several aspects of practice.<sup>10</sup> Graduates of the Canadian general internal medicine training programs over the past 10 years have identified perceived gaps between training and important areas for practice.<sup>11</sup>

There is a paradigm shift in health care education from traditional teaching toward competency-based education (CBE).<sup>12</sup> CBE has been widely adopted within health care

professions and replaced structure- and process-based education.<sup>13</sup> Frank et al<sup>14</sup> defined CBE as “an approach to preparing physicians for practice that is fundamentally oriented to graduate outcome abilities and organized around competencies derived from an analysis of societal and patient needs.” This shift toward CBE has been called “the Flexnerian revolution of the 21st century.”<sup>13</sup>

There is an ongoing debate around the definitions of competence and competency.<sup>13,15</sup> Competencies have been described as a set of outcomes that practicing doctors need to achieve to function at a professional level.<sup>16</sup> Competence encompasses knowledge, skills, abilities, and traits. It is gained in the health care professions through preservice education, in-service training, and work experience.<sup>17</sup> The European Council on Chiropractic Education (ECCE) defines competency as “a measurable set of skills, knowledge, problem-solving abilities and attitudes in controlled representations of professional practice when performing at maximum levels of ability.”<sup>18</sup> It has been suggested that 1 broad definition of competency is not sufficient for all professions and that they need to be profession specific.<sup>15</sup>

Canadian Medical Education Directives for Specialists (CanMEDS) is an educational framework. CanMEDS identifies 7 key roles for a physician that are fundamental for effective patient care. The CanMEDS competency roles are medical expert, communicator, collaborator, leader (manager), health advocate, scholar, and professional.<sup>19</sup>

In 2018, there were 9 ECCE-accredited colleges in Europe: Anglo-European College of Chiropractic (AECC), Barcelona College of Chiropractic (BCC), Institut Franco-Européen de Chiropraxie-Campus Paris (IFEC Paris) and Campus Toulouse (IFEC Toulouse), McTimoney College of Chiropractic (MCC), Real Centro Universitario Escorial Maria-Cristina (RCU), Syddansk Universitet Odense (SDU), University of South Wales (USW), and University of Zurich (UZ). There were 2 ECCE-accredited colleges outside Europe: Durban University of Technology and University of Johannesburg in South Africa.<sup>20</sup>

The ECCE is an international autonomous organization established by the chiropractic profession in Europe to accredit and reaccredit institutions providing undergraduate chiropractic education. It is an external quality assurance agency that establishes professional standards for chiropractic undergraduate education and ensures that chiropractic colleges meet these standards.<sup>20</sup> The standards include competencies that are defined by the ECCE.<sup>18</sup> The ECCE is a member of the Councils on Chiropractic Education International (CCEI).<sup>20</sup>

In 2009, Wangler<sup>21</sup> studied the usefulness of CanMEDS competencies for chiropractic graduate education in Europe. Wangler found that the CanMEDS competencies were perceived as important by chiropractic students and chiropractors and that chiropractors judged the importance of these competencies significantly higher than their remembered confidence in these competencies 2 years after graduation. Wangler concluded that CanMEDS competencies might be considered as a base for future graduate training in the chiropractic profession. The literature regarding the preparedness of chiropractic graduates is scarce and needs greater attention. Education is the foundation of the profession. One of the fundamental aims of chiropractic education is to ensure that the graduates are safe and competent.<sup>20</sup> Therefore, the topic of this study is highly relevant, as it will give a greater perspective on how prepared graduates perceive themselves to be in the 7 key competencies. It can also shine a light on how well chiropractic education is preparing students for practice.

The purpose of this pilot study is to explore chiropractic graduates' perceived preparedness for practice in the 7 CanMEDS key competencies and to compare any differences in the level of perceived preparedness between the competencies.

## METHODS

This study used a cross-sectional design. The population included graduates from 9 European chiropractic colleges: AECC, BCC, IFEC Paris, IFEC Toulouse, MCC, RCU, SDU, USW, and UZ. Alumni who graduated in

2014, 2015, and 2016 were included in the study. Graduates who did not meet these criteria were excluded from the study.

The data gathered for the study were collected from December 13, 2016, to 21 February 2017 via an electronic survey using Google Forms (Google Inc, Mountain View, CA). Google Forms is a password-protected, free tool that is part of Google Drive and used to create surveys. The questionnaire was designed to be attractive, quick, and easy to answer. In order to answer the questionnaire, participants were not required to sign in. The questionnaire form clearly stated that the survey was anonymous and that participation was voluntary. Therefore, completion and return of the questionnaire implied consent from the participant. The research was reviewed and approved by the BCC ethics committee.

### Survey Development

The questionnaire was based on a survey developed by Rademakers in 2007<sup>22</sup> and later used in chiropractic by Wangler in 2009 in which the role of chiropractic expert replaced medical expert.<sup>21</sup> The questionnaire was modified to inquire about preparedness instead of importance or confidence in the necessary competencies. The exact wording in the questionnaire was changed to “at graduation; I felt prepared in” as opposed to “two years after my graduation as a chiropractor, I was confident in,” which was the terminology used in Wangler’s study. To reduce the burden on the participant and improve the clarity of the questions, we decided to reduce the number of questions from 56 to 28. This was expected to reduce the numbers of participants not completing the full questionnaire. The questionnaire included 4 items to correspond to each of the 7 key CanMEDS competencies on a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree), with an option to answer “not applicable.” Respondents were asked to fill in their age, sex, the college they graduated from, and whether they were self-employed as a chiropractor, working for an employer as a chiropractor, or not working as a chiropractor.

### Data Collection

The link to the questionnaire was distributed by e-mail to the administrations of the 9 aforementioned chiropractic colleges. We sent 2 follow-up reminders to the colleges. The BCC chapter of the World Congress of Chiropractic Students distributed the link to other congress members, and they were asked to further distribute it to graduates. Graduates from the colleges were contacted directly and asked to distribute the questionnaire to other alumni through contacts and via social media. The participants were further encouraged to send the survey to other alumni.

### Data Analysis

We excluded all colleges with <10 responses from the analysis. Graduates responding either “strongly agree” or “agree” were considered prepared. Comparisons with previous studies were presented as the percentage of prepared graduates for each competency relative to the

**Table 1 - Characteristics of the Respondents**

All participants (n = 121):	Total (%)
Men (n = 55)	45.5
Women (n = 66)	54.6
Age:	
18–24 (n = 24)	19.8
25–34 (n = 80)	66.1
35–44 (n = 11)	9.1
45–54 (n = 6)	5.0
Employment status:	
Self-employed as a chiropractor (n = 60)	49.6
Working as a paid employee chiropractor (n = 53)	43.8
Not working as a chiropractor (n = 8)	6.6
Year of graduation:	
2014 (n = 24)	19.8
2015 (n = 46)	38.0
2016 (n = 51)	42.2
College:	
Anglo-European College of Chiropractic (n = 19)	15.7
Barcelona College of Chiropractic (n = 27)	22.3
Institut Franco-Européen de Chiropraxie Paris (n = 16)	13.2
Institut Franco-Européen de Chiropraxie Toulouse (n = 12)	9.9
Real Centro Universitario Escorial-Maria Cristina (n = 14)	11.6
University of Southern Denmark (n = 12)	9.9
University of South Wales (n = 21)	17.4

preparedness of the expert competency. Responses from the different colleges were analyzed individually for each college as described above.

The 5-point Likert scale was transformed into numerical scores so that 5 corresponded to “strongly agree” and 1 to “strongly disagree.” The means and standard deviations were calculated for all individual items. In addition, for every group of 4 items under 1 competency role, the overall mean score and standard deviation were also calculated.

The statistical analysis was carried out using GNU PSPP 0.10.2 (Free Software Foundation, Boston, MA) and Statgraphics Centurion XVI v16.1.11 (Statgraphics Technologies, Inc, The Plains, VA).

To establish the reliability of the overall scores, we measured the coherence of each group of items by its internal consistency (Cronbach’s  $\alpha$ ). Corrected item-total correlations ( $r_{it}$ ) were calculated to assess the contribution of each individual item to the valuation of the competency field as a whole.

Before group comparisons, all distributions were inspected by calculating the skewness and kurtosis. None of the distributions departed significantly from normality, and parametric tests were deemed to be justified. Statistical differences between sexes were analyzed using a *t* test. The significance level was specified at  $p < .05$ . For the graduation cohort, age-group, and type of employment analysis, uniformity of variance was determined using Levene’s test for each competency. The difference between

the groups was analyzed by 1-way analysis of variance, and the homogeneity of groups was determined by a multiple range test.

## RESULTS

In total, 124 graduates responded to the questionnaire from 8 chiropractic colleges. The response rates were the following: BCC 47% ( $n = 27$ ), RCU 23% ( $n = 14$ ), SDU 14% ( $n = 12$ ), USW 9% ( $n = 21$ ), IFEC 8% (Paris  $n = 16$ ; Toulouse  $n = 12$ ), and AECC 6% ( $n = 19$ ). MCC had only 3, and UZ did not have any responses, so, due to a low number of responses, MCC and UZ were excluded from the analysis. In the final analysis, we considered 121 responses from 7 colleges. Table 1 presents the characteristics of the participants.

### Preparedness Perceived by the Graduates

In all the colleges, the 7 roles were not equally valued in perceived preparedness by the graduates. There were differences in overall means between the key competencies. The highest mean rating scores were found in professional ( $4.39 \pm 0.80$ ) and chiropractic expert ( $4.13 \pm 0.82$ ) competencies, and the lowest mean scores were in collaborator ( $3.76 \pm 0.89$ ) and scholar ( $3.78 \pm 1.00$ ) competencies. Respondents scored the highest in items “practicing consistently with the ethical standards of the profession” ( $4.48 \pm 0.75$ ) and “being conscious of the limits of my personal knowledge and acting within these limits” ( $4.41 \pm 0.77$ ). The respondents scored the lowest in items “contributing to development of professional and scientific knowledge” ( $3.44 \pm 1.14$ ) and “consulting effectively with other doctors and health care professionals” ( $3.48 \pm 0.97$ ) (Table 2).

### Consistency of Questionnaire

We calculated Cronbach’s alpha for the internal validity of the questionnaire. The highest internal validity was found in manager competency ( $\alpha = .81$ ) and the lowest in health advocate competency ( $\alpha = .61$ ) (Table 2). In addition, Cronbach’s alpha also was calculated if each individual item was excluded but no relevant difference was found. The corrected item-total correlations were always above .3, and therefore no specific item was discarded. The results of this study were compared to those of Wangler<sup>21</sup> and Rademakers.<sup>22</sup> A congruency in the higher- and lower-scoring competencies was observed (Fig. 1).

### Comparison of Different Groups

We calculated the results of all colleges as the percentage of “agree” or “strongly agree” responses in relation to the results of expert competency. The results are shown in Figure 2. Although there are some differences among the colleges studied, a pattern can be observed. Communicator and professional competencies were valued similarly to expert competency. Furthermore, collaborator, scholar, and manager competencies scored consistently lower, whereas health advocate competency lies approximately in the middle.

**Table 2 - Means and Standard Deviations (SD) for All the Colleges<sup>a</sup>**

At graduation, I felt prepared in	Average ± SD	$\alpha$	$r_{it}$
Chiropractic expert:	4.13 ± 0.82	.74	
My knowledge and skills according to the profession's current standards	4.04 ± 0.82		.724
Adequately applying the diagnostic, therapeutic, and preventive possibilities of chiropractic in an evidence-based way wherever possible	4.08 ± 0.79		.566
Delivering effective and ethical care	4.34 ± 0.77		.430
Quickly finding necessary information and applying it adequately	4.04 ± 0.85		.453
Communicator:	4.08 ± 0.90	.74	
Establishing adequate therapeutic relationships with patients	4.13 ± 0.95		.605
Listening carefully and obtaining relevant patient information effectively	4.36 ± 0.73		.539
Adequately discussing chiropractic and medical information with patients and their families	3.95 ± 0.93		.594
Reporting adequately on patient cases in oral and written ways	3.88 ± 0.91		.426
Collaborator:	3.76 ± 0.89	.79	
Consulting effectively with other doctors and health care professionals	3.48 ± 0.97		.661
Referring adequately to other chiropractors and health care professionals	3.93 ± 0.89		.658
Delivering adequate collegial advice	3.87 ± 0.82		.511
Supporting effective interdisciplinary collaboration and chain care	3.76 ± 0.80		.500
Scholar:	3.78 ± 1.00	.68	
Assessing chiropractic (medical) information critically	4.07 ± 0.78		.368
Contributing to development of professional and scientific knowledge	3.44 ± 1.14		.499
Developing and maintaining a personal ongoing education plan	3.89 ± 0.91		.428
Contributing to the education of students, residents, colleagues, patients, and others involved in health care	3.70 ± 1.05		.513
Health advocate:	4.01 ± 0.88	.61	
Knowing and identifying determinants of illnesses	3.94 ± 0.82		.485
Contributing to health of patients and the community	4.08 ± 0.91		.353
Acting according to relevant legislation	4.20 ± 0.80		.317
Acting adequately in case of incidents in health care	3.79 ± 0.92		.445
Manager:	3.83 ± 0.93	.81	
Finding adequate balance between professional patient care and personal development	3.83 ± 0.90		.558
Working effectively and efficiently in health care organization	3.79 ± 0.96		.699
Allocating available health care resources wisely	3.83 ± 0.88		.632
Using information technology to optimize patient care and lifelong learning	3.85 ± 0.98		.585
Professional:	4.39 ± 0.80	.79	
Delivering high-quality care with integrity, honesty, and compassion	4.32 ± 0.98		.645
Exhibiting appropriate personal and interpersonal professional behavior	4.35 ± 0.67		.525
Being conscious of the limits of my personal knowledge and acting within these limits	4.41 ± 0.77		.531
Practicing consistently with the ethical standards of the profession	4.48 ± 0.75		.673

<sup>a</sup> 1 = strongly disagree; 5 = strongly agree,  $\alpha$  = Cronbach's coefficient alpha;  $r_{it}$  = correlation of item with scores on the 3 other items.

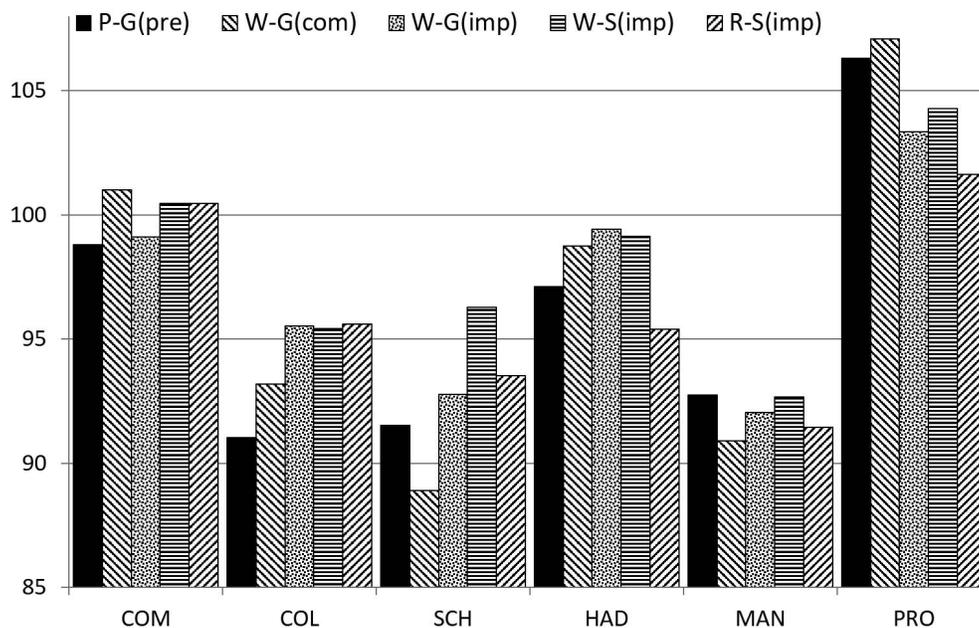
We explored in detail the competencies that scored the lowest by age-groups. The 18–24 and 25–34 age-groups had similar opinions about their perceived preparedness. The 35–54 age-group scored noticeably low in manager competency (Fig. 3).

We further analyzed the data by sex, cohort, and employment. There was no statistically significant difference in the perceived preparedness between females and males in the competencies. There was a statistically significant difference in the perceived preparedness comparing graduates from the 2014 cohort to graduates from the 2015 or 2016 cohort in professional competency ( $p < .05$ ). There was a statistically significant difference in the perceived preparedness comparing graduates from the 2014 cohort to graduates from the 2016 cohort in collaborator ( $p < .05$ ) and scholar ( $p < .05$ ) competencies. There was a statistically significant difference in the perceived preparedness comparing graduates from the

2015 cohort to graduates from the 2016 cohort in collaborator competency ( $p < .05$ ). There was a statistically significant difference in the perceived preparedness comparing graduates who are self-employed as chiropractors and graduates who are not working as chiropractors in the scholar competency ( $p < .05$ ) (Table 3).

## DISCUSSION

The training of health care professionals is a rapidly evolving field, and many health care educational institutions have adopted competency-based education.<sup>13</sup> CanMEDS has provided a framework of competencies that could potentially be used beyond the medical profession and for improving patient care by enhancing health care providers' training. Its main purpose is to define the necessary competencies for all areas of clinical practice and provide a comprehensive foundation for health care



**Figure 1** - Comparison of Canadian Medical Education Directives for Specialists (CanMEDS) with results in previous publications. The results for all the 7 competencies of the present study are compared to those obtained by Wangler and by Rademakers.<sup>21,22</sup> All values are expressed as the percentage compared to the Expert competency. The series are as follows: P-G(pre): Pulkkinen-Graduates (preparedness); W-G(con): Wangler-Graduates (confidence); W-G(imp): Wangler-Graduates (importance); W-S(imp): Wangler-Students (importance); R-S(imp): Rademakers-Students (importance). Data for Wangler reprinted with permission from Wangler M. Usefulness of CanMEDS competencies for chiropractic graduate education in Europe. *J Chiropr Educ.* 2009;23(2):123–133. Data for Rademakers reprinted with permission from Rademakers JJ, De Rooy N, Ten Cate OT. Senior medical students’ appraisal of CanMEDS competencies. *Med Educ.* 2007;41(10):990–994.

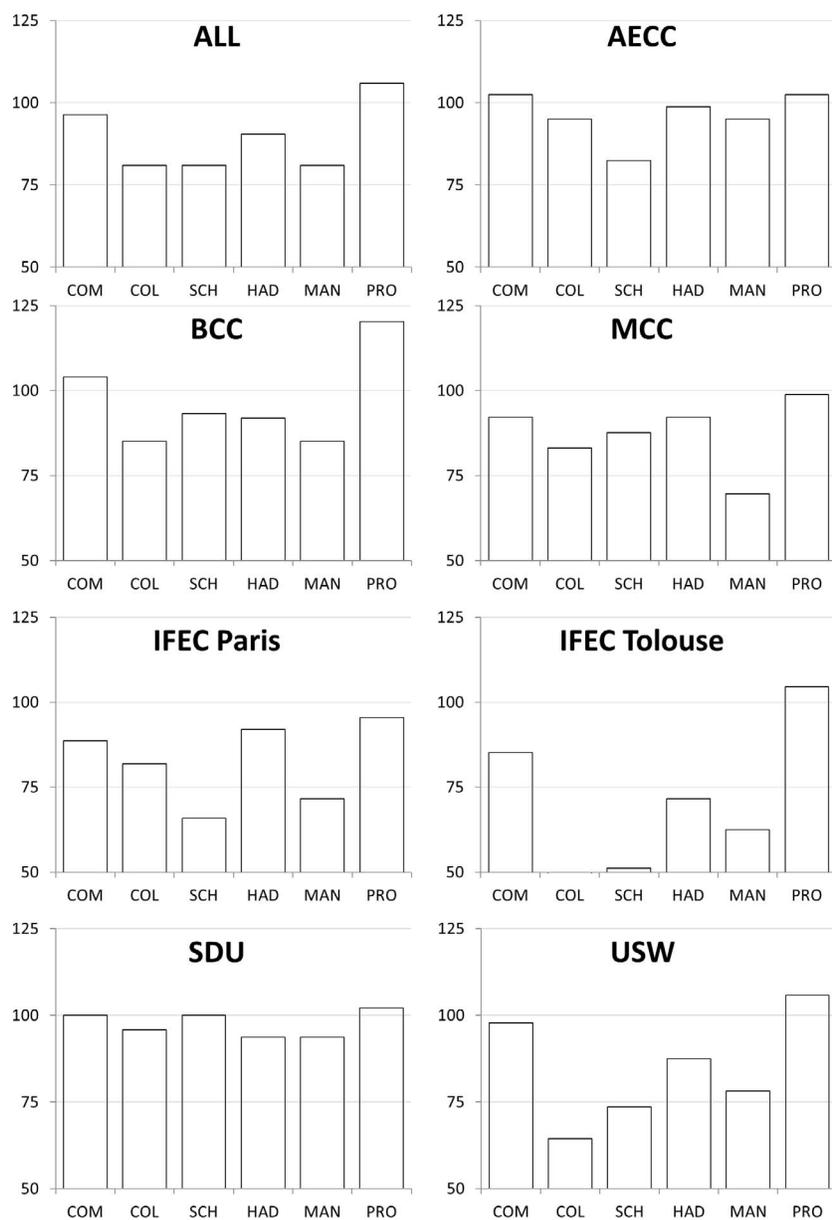
education. This framework is designed to be useful throughout a clinician’s career, not only for undergraduate students, frontline educators, or residency training program supervisors.

Although CanMEDS expands the role of the traditional doctor, a previous study has shown that students in the final year of their undergraduate program do not give the same importance to all the competencies.<sup>24</sup> Those students considered the medical expert, communicator, and professional competencies more important than the others. There was a similar trend when senior chiropractic students and licensed chiropractors were asked about the importance and their confidence with regard to the CanMEDS competencies.<sup>21</sup> In general, there is little information about health care professionals’ perception of their preparedness, and many times it is limited to medical doctors’ views. In this study, we explored the perceived preparedness in the competencies among recent graduates of accredited chiropractic colleges in Europe. The response rate of this questionnaire was low, posing a major limitation to the level of confidence we can impose on the conclusions. Therefore, the following discussion and conclusion should be interpreted with caution.

The results of this study are congruent with the previous studies done in medicine and chiropractic. Wangler<sup>21</sup> asked participants for confidence 2 years after graduation, whereas Rademakers<sup>23</sup> asked participants for the importance attributed by final year medical students. Previous studies have identified manager, collaborator, health

advocate, and scholar competencies as the weak areas in perceived preparedness and confidence.<sup>11,23</sup> Contrarily, communication scored highly in previous studies.<sup>2,24</sup>

In the item “consulting effectively with other doctors and health care professionals,” part of collaborator role, respondents scored particularly low. In addition, most of the colleges rated low in the health advocate role. There may be several explanations for this. A previous study showed that medical residents and faculty did not understand health advocacy well.<sup>25</sup> This may also be the case for chiropractic graduates. Graduates may feel unprepared in consulting other health care professionals, as most of the countries have not integrated chiropractic into their health care systems.<sup>26</sup> The legal status of chiropractic varies among European countries. As chiropractic is not well integrated into the public health system, chiropractors may be unfamiliar with this role.<sup>21</sup> For instance, chiropractic in Spain has no legal recognition, and education is provided by private colleges.<sup>27</sup> It may explain why BCC graduates scored lower mean ( $3.93 \pm 1.04$ ) in the health advocate item “acting according to legislation” than those from other colleges ( $4.28 \pm 0.71$ ). Contrarily, graduates from the SDU perceived themselves to be the most prepared and subsequently demonstrated high perceived preparedness in all the competencies. Denmark is one of the few countries in Europe where chiropractic is part of the public health system. This may cause the differences in the perceived preparedness,

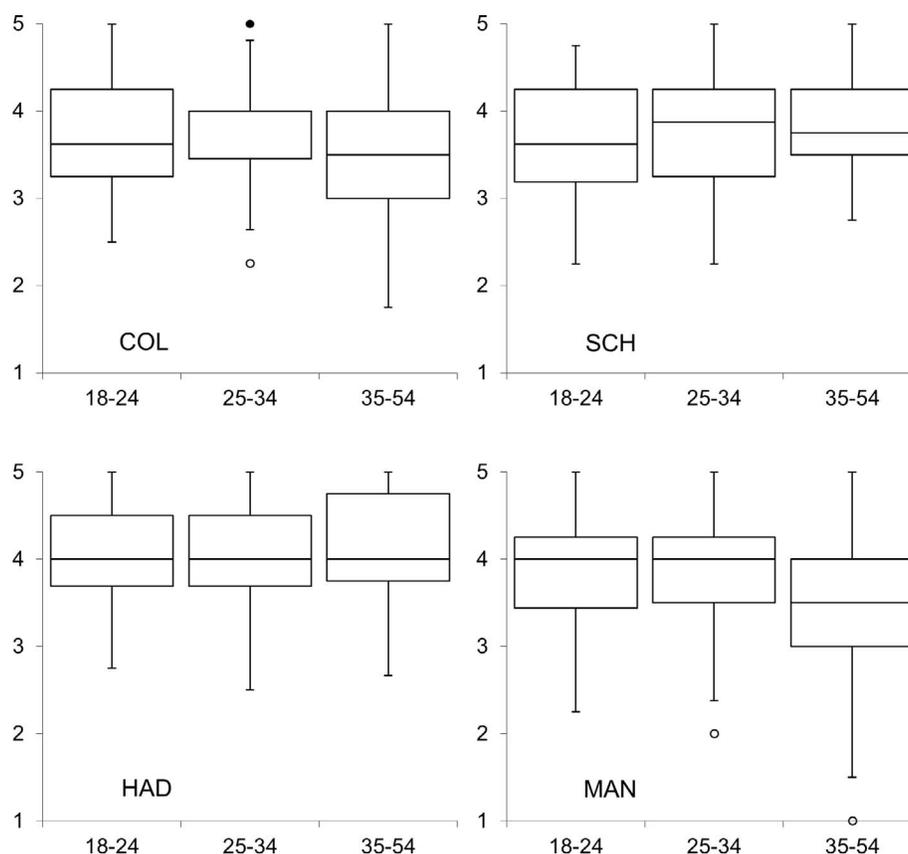


**Figure 2** - Perceived preparedness in competencies. All values are expressed as the percentage compared to the Expert competency.  $n = 121$ . EXP = chiropractic expert; COM = communicator; COL = collaborator; SCH = scholar; HAD = health advocate; MAN = manager; PRO = professional, Institut Franco-Européen de Chiropraxie Toulouse: COM 75%, COL 43%, and SCH 45%.

especially in collaborator and health advocate competencies.

Another item where graduates scored particularly low was “contributing to development of professional and scientific knowledge.” Studies have found that although chiropractors have a positive attitude toward research and evidence-based practice, they do not feel confident in their research skills.<sup>28,29</sup> This may be due to lack of training while at a chiropractic college,<sup>30</sup> lack of time, or personal attitude toward research.<sup>31</sup> In addition, scholar and health advocate had the lowest internal consistency ( $\alpha = .68$  and  $.61$ , respectively). The most common cutoff point is set up at  $\alpha = .7$ , especially for well-established questionnaires;

however, acceptable values may be as low as  $.5$  for preliminary results. The particular questionnaire used in this study was previously used by Wangler and Rademakers, although the phrasing of the questions was different. In all these cases, the Cronbach’s alpha values are above  $.7$ , with some above  $.9$ . Strikingly, the difference in some cases between both studies showed significant differences ( $.912$  to  $.71$  for health advocate). In the present study, we calculated the corrected interitem correlation and the Cronbach’s alpha with missing item individually, and the results did not support discarding any of the items. The consideration of all these results suggests that the questionnaire is seemingly a valid tool. However, the



**Figure 3** - Competencies associated with the lowest scores by age-groups. (A) 18–24; (B) 25–34; (C) 35–54. ○ = minimum outlier; • = maximum outlier; COL = collaborator; SCH = scholar; HAD = health advocate; MAN = manager.

questionnaire may need some refinements to improve its consistency.

CanMEDS defined manager role as “as managers, physicians are integral participants in health care organizations, organizing sustainable practices, making decisions about allocating resources, and contributing to the effectiveness of the health care system.”<sup>19</sup> Studies report that medical residents, chiropractic students, and chiropractors perceive management competency as the least

important competency.<sup>21,22,32</sup> Another study found that medical students rate their level of competency in management competency the lowest.<sup>33</sup> A study done with medical doctors proposed that this role may be rated of less importance because most doctors focus on the relationship with patients and only a small fraction held leading positions in organizations.<sup>33</sup> Chiropractors may be unfamiliar with this role since it is more uncommon for them to work in health care organizations of a large size

**Table 3** - Comparison of Perceived Preparedness Among Different Groups<sup>a</sup>

	Gender <sup>b</sup>		Year of Graduation <sup>c</sup>			Employment Status <sup>d</sup>		
	Female	Male	2014	2015	2016	Self-Employed	Paid Employee	Not Working
EXP	4.22 ± 0.56	4.02 ± 0.65	4.24 ± 0.58	4.17 ± 0.68	4.03 ± 0.54	4.23 ± 0.53	4.04 ± 0.69	3.94 ± 0.44
COM	4.15 ± 0.65	4.00 ± 0.67	4.25 ± 0.63	4.09 ± 0.76	4.00 ± 0.58	4.15 ± 0.61	4.02 ± 0.73	3.97 ± 0.60
COL	3.74 ± 0.69	3.77 ± 0.71	3.97 ± 0.69†	3.90 ± 0.66‡	3.52 ± 0.66	3.81 ± 0.72	3.71 ± 0.69	3.59 ± 0.53
SCH	3.78 ± 0.70	3.78 ± 0.70	4.06 ± 0.72†	3.84 ± 0.73	3.59 ± 0.60	3.92 ± 0.68†	3.68 ± 0.71	3.38 ± 0.40
HAD	3.93 ± 0.62	4.08 ± 0.57	4.15 ± 0.55	4.07 ± 0.60	3.87 ± 0.60	4.09 ± 0.55	3.92 ± 0.67	3.88 ± 0.40
MAN	3.76 ± 0.81	3.86 ± 0.73	3.96 ± 0.83	3.92 ± 0.68	3.64 ± 0.81	3.81 ± 0.81	3.82 ± 0.75	3.75 ± 0.72
PRO	4.48 ± 0.53	4.29 ± 0.71	4.72 ± 0.42*†	4.29 ± 0.72	4.32 ± 0.56	4.44 ± 0.54	4.34 ± 0.73	4.41 ± 0.44

<sup>a</sup> EXP = chiropractic expert; COM = communicator; COL = collaborator; SCH = scholar; HAD = health advocate; MAN = manager; PRO = professional.

<sup>b</sup> No significant difference was found.

<sup>c</sup> Year of graduation. Significant difference was detected if  $p < .05$ : \* (2014 vs 2015), † (2014 vs 2015), ‡ (2015 vs 2016).

<sup>d</sup> Employment status. Significant difference was detected if  $p < .05$ : † (self-employed vs not working).

and they may not relate to these areas of the manager role. The definition of this role is more appropriate for physicians and may need some modification to describe chiropractic management needs more accurately.

We analyzed the percentage of agreement compared to that expressed for the expert competency. Graduates tend to feel prepared as communicators and professionals but not as collaborators, scholars, or managers. The findings of this study demonstrate that the more time that has passed since graduation, the more prepared the chiropractors perceived themselves. This occurrence may be attributable to recall bias. Graduates may have already been in practice for 1 to 2 years, and this may have influenced the answers and led graduates to overestimate their perceived preparedness. In addition, postgraduate careers can be quite different, depending on the country they are working. Some countries require compulsory postgraduate training. In other countries, recent graduates have to work for other chiropractors for a certain time before they can open their own clinic, whereas other countries have no restriction at all. The questionnaire was rephrased to put the focus on “at the time of graduation.” However, the possibility that their immediate postgraduate training had affected their perception cannot be ruled out. This study found that self-employed graduates, as well as graduates working as paid employees, perceive themselves to be more prepared than those not working as chiropractors. The causal relationship is not known, and it is plausible that it may need further research.

With the current shift to CBE and recognition of its competencies by the ECCE, all the colleges included in this study utilized competencies. Besides the confusion of defining competency, there is a challenge in interpreting competency frameworks and translating them into curricula and teaching. A major challenge is the assessment of the competencies due to lack of appropriate assessment tools. Often competencies are translated into checklists, which can be problematic. They tend to cut the competency into pieces that are too small and lose the general meaning of the competency.<sup>34,35</sup> Misinterpretations and mistranslations of the competencies may affect the preparation of the students. Although there is a growing body of literature supporting CBE, due to its challenges, widespread adoption remains more of an ideal than a reality.<sup>35</sup> A recent systematic review found that in medical schools, problem-based learning has positive effects on physicians’ competencies, especially in the social and cognitive dimensions.<sup>36</sup>

### **Strengths and Limitations**

The strength of this research is that it was the first study to look at perceived preparedness in several chiropractic colleges across Europe. Recall bias was minimized by asking only cohorts who graduated in 2014–2016; this ensured that the participant had graduated a maximum of 2 years before the survey. Another strength of this study was the utilization of a questionnaire that has been previously used albeit with a minor modification.<sup>21,22</sup> It has been shown that questionnaire length affects survey response rate.<sup>37</sup> The questionnaire

was modified to ask about “preparedness” instead of “confidence” and “importance” to reduce the number of questions. There are several advantages to conducting surveys of health professionals via the Internet. Internet surveys do not require extensive programming skills or time, software is free or inexpensive, and sending e-mail invitations and reminders does not bear any cost. Data are automatically transferred into a database, saving time and decreasing the chance of errors. A study about conducting surveys online found that there is a substantial increase in response rate following reminders in other electronic surveys of health professionals.<sup>38</sup> Online surveys also provide access to individuals who would be otherwise hard to reach.<sup>39</sup> The differences in Cronbach’s alpha results suggest that the questionnaire is reasonably valid but may benefit from some reevaluation of certain competency questions.

The major obstacle in electronic questionnaires is how to obtain a representative sample and adequate response rate.<sup>38</sup> The response rates were relatively low, a major limitation of this study. Self-selection bias is another limitation because there are individuals who are more likely to participate than others.<sup>39</sup> We contacted the graduates via different channels, presenting the possibility that they received the questionnaire more than once. Because the questionnaire was anonymous and the participants did not need to sign up to respond to it, there is a possibility that the same person could have answered it more than once. Finally, language may be a potential limitation due to the fact that not all the participants were native English speakers.

## **CONCLUSION**

This study was designed to look at any gaps in the perceived preparedness of European chiropractic graduates. The preliminary findings of this study show that there may be a gap between education and professional practice regarding perceived preparedness in the areas of collaborator, scholar and manager competencies. These results are congruent with previous studies that indicate a widespread lack of achievement in these competencies at graduation. Review of curricula for chiropractic education may be considered to bridge the gap between education and professional practice to provide better care for the patients. It remains to be elucidated if this gap is better to cover in undergraduate program or would be more beneficial if it were addressed as part of postgraduate training. CanMEDS provides a framework for health care providers’ key roles, which are fundamental for effective patient care. It may be used to guide continuous professional development, which is a common requisite for chiropractors in many countries. Due to low response rates, the results remain inconclusive, and the study should be repeated with a larger sample size. Further studies could potentially compare the perceived preparedness and externally measured objective preparedness in competencies. More studies on the topic are needed to try to identify what causes this lack of

perceived preparedness and the best strategies to train future chiropractors.

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## Author Contributions

Concept development: EP. Design: EP. Supervision: PP. Data collection/processing: EP. Analysis/interpretation: EP, PP. Literature search: EP. Writing: EP. Critical review: EP, PP.

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