

Career Pathways and Professional Skills of Post-Graduate Students from a Dental Research-Intensive Program

Introduction

Postgraduate education worldwide has significantly evolved in the past two decades. With increasing globalization and mobility, changing work force demands, advancing technologies, and evolving student expectations, postgraduate programs must adapt and improve to stay on top of current trends in graduate education (1). According to the 2017 Hong Kong University Report on Global Trends in Postgraduate Education, postgraduate institutions must be prepared to adapt to several challenges including increase in public expectations, decline in public trust, demands for greater accountability in research, diminishing resources amidst fiscal austerity and reduced funding, all while competing with many higher education institutions to attract excellent students (1). Since the 1990s, Canada's postgraduate education has become increasingly popular. In fact, the number of Masters and Doctoral graduates have increased five-fold from 1990 to 2008 (2). Historically, the number of doctoral degrees has always exceeded the number of available academic positions. For instance in 2007, there were over 5,000 new doctoral-level students (PhD) and 6,000 postdoctoral fellows in Canada, but only 2,600 faculty positions available (3). This disparity has expanded significantly during the last decade (4). Providing updated data on employment outcomes for graduate students is important as this can assist current and prospective students to gain insight into their future career paths. Moreover, this data can also assist postgraduate programs to better address student needs, provide students with essential skills for the job market, and adapt to current global trends.

There have been multiple studies conducted by different universities to identify postgraduate career outcomes in dentistry. For example, a study of 40 years of alumni of a general practice dental residency program by the Harvard School of Dental Medicine showed that their graduates were significantly more

likely to become specialists, hospital staff, or dental faculty members (5). In addition, a study by the University of Michigan School of Dentistry showed that several factors affected US oral maxillofacial surgery residents' career choices between private practice and academia, including gender, ethnicity, interest for research, preferences for different surgical procedures and professional activities (6). However, these reports were mainly about postgraduate dental students with a clinical specialty degree. Reports on employment outcomes for postgraduate students focused specifically in dental research (MSc and/or PhD) without a clinical specialty are scarce. Recently, the McGill's Tracking Survey of PhD Graduation Outcomes 2013 & 2014 surveyed two cohorts of PhD graduates: 2 years and 5 years after graduation. The survey reported that a large majority of McGill PhD graduates were employed, skillful, and satisfied with their incomes. The majority of graduates worked for the government and industry, while only a small percentage of graduates worked as university professors (7).

Taking advantage that our graduate research program is the largest one in Canada, with currently more than 90 graduate students pursuing full-time research training at the MSc or PhD levels (8), this study was initiated with the objective to investigate the post-graduation employment outcomes of MSc and PhD students from a research-intensive dental program. Our primary objective was to assess the employment outcome of these students who graduated within the past 15 years from the McGill University Postgraduate Dental Research Program. Our secondary objectives were to provide a post-graduation employment snapshot for our current and prospective students, as well as to provide future recommendations for our Graduate Research Program. Our ultimate goal is to make evidence-based improvements in order to align our program with student needs and current global trends in postgraduate dental education.

Materials and Methods

Ethics: Ethical permission was not obtained because McGill University's Policy on the Ethical Conduct of Research involving Human Participants states that, under Article 1.1 of the Tri-Council Policy Statement on Ethical Conduct For Research Involving Humans, "quality assurance studies, performance reviews, or testing within normal educational requirements should not be subject to Research Ethics Board review (9). Therefore, our study did not require approval from the Institutional Review Board. We ensured the confidentiality and anonymity of all participants, following the ethical guidelines.

Study Design

Selection and Description of Participants: The survey was directed towards the job outcomes of former graduate students from the Postgraduate Research Program of the Faculty of Dentistry at McGill University. Former Masters (MSc) and Doctoral (PhD) graduates from our postgraduate programs from 1999 to 2015 were included in this study. Our study included a total of 126 former postgraduate students from 1999-2015. No other selection criteria were set, such as age, gender and ethnicity. All of these former postgraduate students were invited equally with the same survey to avoid any compromise with the anonymity of the participants.

Technical Information: Our study consisted of an electronic survey done through the Lime Survey platform, (Lime Survey Project, Hamburg, Germany). We aimed to investigate the job outcomes of the postgraduate students from the Postgraduate Research Program. A Student Information System (SIS) list was generated by the McGill Student Enrollment Record System containing the names of all postgraduate students from 1999-2015 and the names of their research supervisors. All supervisors at the Faculty of Dentistry at McGill University were contacted through email and telephone to inquire about the current contact information of these former postgraduate students. All of these alumni were subsequently contacted through their email addresses provided by their supervisors or by McGill University. In

addition, we used social media platforms including LinkedIn and Facebook to contact the graduates whom we were unable to obtain a valid email addresses. In sum, we were able to reach a total of 109 students (out of 126) through their active contact details.

Our online survey consisted of 3 main sections: Section A) an introductory message with a request to complete the survey, Section B) an explanation of the research objectives followed by an explanation to potential subjects that their participation is voluntary, and their confidentiality and anonymity will be respected, Section C) the survey itself which consists of 10 questions that can be completed between 3-5 minutes. More specifically, the 10 questions are subdivided into three categories. Category A) Demographics included questions about when and which degree the subject was awarded, and what is his/her current employment status. Category B) Current Employment included questions about the subject's current jobs and satisfaction level. Category C) Impact of Post-Graduate Education at McGill on their Current Employment included questions on the professional skills acquired during the subject's postgraduate training and their challenges during job search after graduation. All 10 questions and answer choices are featured in the Appendix Section.

As a token of appreciation for their participation, 5 prizes valued at 100 CAD\$ were drawn among the participants. The study officially began in February 2015. We sent the first email and up to three reminders to participants who did not respond or complete the online survey. All data were collected between April to September 2015.

Results

Response Rate: Out of 126 former postgraduate students, 109 invitations were successfully sent by email to request for participation in the online survey. A total of 66 graduates responded to our invitation, which results in a participation rate of 61% for this study. Sixty two participants completed and submitted the survey online while four did not complete all questions or opted out from the survey (Fig 1).

Post-Graduation and Current Employment: The distribution of the sample highlights the variations of degrees obtained by graduate students from the Faculty of Dentistry at McGill University. Our results showed that the majority of our graduates, 67% (n = 44), obtained MSc degree in Dental Sciences (Fig 1). Among all participants, 70% (n = 46) were recent graduates that have complete their program of study between 0-3 years ago (Fig 2). In addition, the majority of graduates, 46% (n = 26) were still working in the province of Quebec where McGill University is located (Fig 3). Regarding their current employment, the two most frequent jobs were Professors 18% (n = 12) or PhD student for additional training 18% (n = 12) (Fig 4). It was also encouraging to note that 67% (n = 44) of graduates had secured positions in different university settings and were working in academia (Fig 5).

Work Dependent on Academic Research Skills: Although there was a wide range of employment trajectories among the graduates, the majority of subjects 93% (n = 53) indicated that their jobs were either highly dependent 63% (n = 36), or somewhat dependent 30% (n = 17) on their field of study (Fig 6). Furthermore, our results showed 71% (n = 47) of the graduates reported that “critical and creative thinking” to be the strongest acquired skill during their postgraduate training as well as the most important skill needed for their current position (Fig 7).

Challenges in Finding Current Employment: Regarding the challenges faced during their job searches, fierce competition for the position was the most common challenge encountered by 38% (n = 25) of the graduates (Fig 8). In addition, 27% (n = 18) of graduates found their first jobs through networking and connections, while 20% (n = 13) found their first job by responding to a job posting (Fig 9). More than half of the postgraduate students 54% (n = 31) expressed satisfaction with their income, either very satisfied, 21% (n = 12), or somewhat satisfied, 33 % (n = 19) (Fig 10).

Employment Categories per Degree Obtained: The breakdown of employment categories according to the degrees obtained by each participant (i.e. MSc, PhD, or Post-Doc). The reason behind the fluctuation of the numbers in each category was because the same participant may have been enrolled in more than one-degree program at McGill. From the participants' count, the total number of MSc were (n=44) but the data showed 41 MSc because two participants completed both a MSc and then a PhD in our program, and that one participant had completed a MSc, PhD, and Post-Doc degree in our program. The remaining 41 participants completed only a MSc degree. Analogously, there was a total of 20 PhDs, out of which one participant did a PhD and then Post-Doc degree, and another participant completed all three degrees from our program. is MSc +PhD + Post-Doc. The remaining 18 participants completed only a PhD degree in our program.

Given the small number of graduates from PhD and Post-Doc programs, final conclusions could not be drawn. However, we detected some trends, such as 1) MSc students continued their research training as PhD students (n=12), 2) PhD students tended to climb the academic ladder to become Post-Doc fellows (n=5) or Professors (n=5), and that 3) Post-Doc fellows tended to begin a career in academia as a Professor or Research Staff in an academic institution (n=6). MSc graduates had a wide variety of career paths including enrolment in a clinical dentistry program (n=8), in academia (n=4), in science related non-research positions (n=5) or non-science-related positions (n=5).

Discussion

Key Findings: The purpose of this survey was to describe career pathways for the students of the Graduate Research Program in Dental Sciences at the Faculty of Dentistry, McGill University, Canada. To our knowledge, this is the first study that aimed at surveying purely dental research graduates (who did not need to have a clinical training component during the course of their MSc and PhD degree studies) with respect to their graduation outcomes. In the past, analogous studies that involved post-graduation

job outcomes had been conducted on PhD graduates from McGill University. However, these studies did not specifically target the graduates from the Dental Sciences Program and their response rates were low from dental graduates (<10%). As McGill University has the largest graduate research program in Canada, this survey will inform future students on their job outcomes and the skills that will be acquired during their postgraduate studies.

The results of the survey generally draw a promising picture of employment for graduates with MSc or PhD degrees in Dental Sciences: the majority of the alumni are employed, have acquired essential skills during their training, and are satisfied with their incomes. The post-graduation job outcomes of this study seemed to concur with the McGill PhD Outcomes Survey conducted between 2013 and 2014 (7). In our survey, the employment rate was high (89.4%). Only 10-11% of graduates were unemployed. Both PhD Outcomes Survey and ours revealed that the most common type of employers were universities or in a university-related settings (7). Our survey showed that the respondents who did not occupy academic jobs were within the field of healthcare, including private practice and patient/health professional/public group. However, the McGill University PhD Outcomes Survey indicated most of their participants were working in the industry or for the government (7). This difference might be explained that students in our Dental Sciences Graduate Program were already dentists (i.e. possessing already a professional degree) and chose to pursue a postgraduate degree in order to become clinician-scientists. In both our survey and the McGill PhD Outcomes Survey, the vast majority (>90%) of participants indicated that their work was dependent on their academic research skills and graduate degrees. For the graduates that did not work in an academic and university setting, they were occupying jobs that allowed them to apply the academic research skills acquired during their postgraduate education. In other words, the skills that graduates developed through our Dental Sciences Postgraduate Program seemed to be transferable to their new job positions. Along the same line, critical and creative thinking were reported in both surveys to be the most commonly acquired professional skills during their postgraduate training. Other commonly

acquired skills reported in both surveys included personal effectiveness, integrity, ethical conduct, and research management. Moreover, both studies highlighted that the majority of graduates (> 50%) were satisfied with their income.

The topic that yielded discrepancy between our present survey (at the Faculty of Dentistry level) versus the McGill PhD Outcomes Survey (university-wide level) was how students made contacts that led to their first hiring. Our survey showed that the graduates from the Dental Sciences Postgraduate Program most commonly found their first jobs through networking, while the McGill PhD Outcomes Survey highlighted that most of PhD graduates found their first jobs by responding to a job posting. This might be explained that, because the Dental Sciences Program had fewer students and professors as opposed to other larger PhD programs (such as the Faculty of Medicine, Engineering, Arts, or Sciences), networking seemed to be an efficient way that led to most dental graduates' hiring. It was interesting to note that a significantly higher proportion of graduates from the Dental Sciences Program found their first jobs with their supervisors' help. These results concurred with our previous study, which showed that the majority of doctoral students had obtained help from their supervisors in their career development outside of the supervisory relationship (8).

In comparison to the job outcomes of MSc graduates in our survey, PhD graduates tended to have more positive job outcomes in terms of gaining academic positions and employment rate. This might be explained by the longer duration of post-graduate training of PhD graduates. In this survey, a few MSc graduates 18% (n = 12) chose to pursue a PhD degree, and only 8% (n = 5) of MSc graduates were unemployed. This observation seemed to concur with researches conducted previously on PhD outcomes (7). For example, the McGill's PhD Outcomes Survey showed that the majority of PhD graduates believed that their doctoral degree was required for their work. Perhaps, the MSc graduates did not see the benefits of getting an additional PhD training. This problem could be addressed by designing mandatory information sessions for MSc students to highlight the fact that a tertiary education (PhD

degree) would make them more competitive for academic positions and the labor markets. The current situation may also be improved by providing Master's students with assistance and information on PhD program applications. Another strategy is to increase the number of PhD positions in Dental Science programs. It will be valuable if future iterations of the survey ask the PhD graduates from Dental Science programs whether they feel their doctoral degree is required for their current jobs. These data will serve to encourage MSc students to pursue a PhD degree.

Strengths and Limitations: Our study at the Faculty-level was able to achieve a response rate of 61%, which was significantly higher than the response rate of 30% obtained by the McGill's PhD Outcomes Survey conducted in 2013-2014. The set of questions used in our study was originally created by McGill University in a career survey, which was sent to PhD students from all Faculties. Given that the Faculty of Dentistry has few graduate students, the results were combined with graduate students from the Faculty of Medicine. Thus, key information that would help the Faculty of Dentistry analyze and improve its graduate program is missing. The questions used for this current study were a selected subset of 10 questions from the original survey that had 39 questions where some of them had several sub-questions within them. We selected 10 questions and aimed for a length of fewer than 5 minutes to answer our survey, as compared to 20 min for the original McGill survey to all faculties. Our shortened format of the questionnaire (with only 10 questions as opposed to 39 questions used for the University-level survey) aimed to facilitate participation, data collection, interpretation, and analysis.

Our survey contained several limitations. First of all, only descriptive statistics (namely percentages and frequencies) were used to analyze the data. No statistical test was performed in this study to relate statistical significance. Little interpretative qualitative analysis was used, and respondents were not allowed to comment to add nuance or depth to our understanding of postgraduate outcomes and experiences. Because of a small sample size of participants, this survey did not analyze in depth results

according to respondents' level of education (MSc, PhD or Postdoc) or the number of years after graduation. It would have been useful to analyze how results vary over time (for example, 2 years post-graduation vs. 5 years post-graduation). Lastly, the lack of power due to our small sample size has limited the reliability of the results. Although with all these limitations, we reiterate that our survey is the first among purely dental research graduates (who did not include a clinical specialty component during the course of their studies) with respect to their graduation outcomes.

Interpretation and Implications: Our study specifically targeted the research graduates from the Dental Sciences Graduate Program at McGill University. Our results will help current students to better understand their career pathways after graduation and to better prepare them for their post-graduation job search. Our data will also help prospective students to decide if pursuing a postgraduate dental training in research is a good fit for their professional goals. This survey also illustrated how well our Dental Sciences Graduate Program prepared graduates for the labor markets. In addition, this survey has contributed to actions to improve our Graduate Program. In fact, our Faculty has recently submitted a new PhD Program request to the government, which will aim Interdisciplinary research. Our MSc program will be undergoing a revision on its curriculum to cater to the needs of our students to adapt to the current job market.

Future Research Directions: Future iterations of the survey may include open-ended questions to add nuances and depths to our understanding of graduate outcomes and experiences, specifically regarding how graduates perceive that their postgraduate training had prepared them for the realities of the job market. Future surveys may also ask respondents to identify the skills that they wish they had learned during postgraduate studies and the relationship between studies and non-academic profession. It will

also be interesting to include several follow-up questions regarding their current job titles (for example, a follow-up question to ask if the academic position is a tenure-track or not).

In addition, future studies are needed with additional questions and a larger number of participants in order to examine the employment outcome of MSc, PhD and Post-Doc Fellows separately to address specific needs of these groups of students, and compare the difference between employment trends of these graduates. In fact, additional questions will be designed to reveal trends about our graduate including whether graduates with previous clinical dentistry degree are more likely to find employment in an academic vs. nonacademic setting, whether graduates have extramural research support, whether competition for position placement is more fierce for graduates searching for positions in academic institutions.

Furthermore, future studies will include additional questions to understand the views of graduates who are currently unemployed and explore in depth the reasons behind unemployment; whether unemployment is by personal choice, whether unemployment is related to the type of training provided by our graduate program, etc. This will help us identify areas of our graduate program that can be further improved to better prepare our students to adapt to the job market.

Conclusion

The data drawn from our study showed a promising picture of employment for postgraduates of dental research programs. These graduates were, for the most part, employed, doing work that drew on their expertise and skills, and felt satisfied with their incomes.

Disclaimers

The authors hereby certify that they have sufficiently contributed to this manuscript and that the ideas in it are their original owns and not those of a research institution or funder.

Conflict of Interest Declaration

This research does not involve any conflict of interests.

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Figures

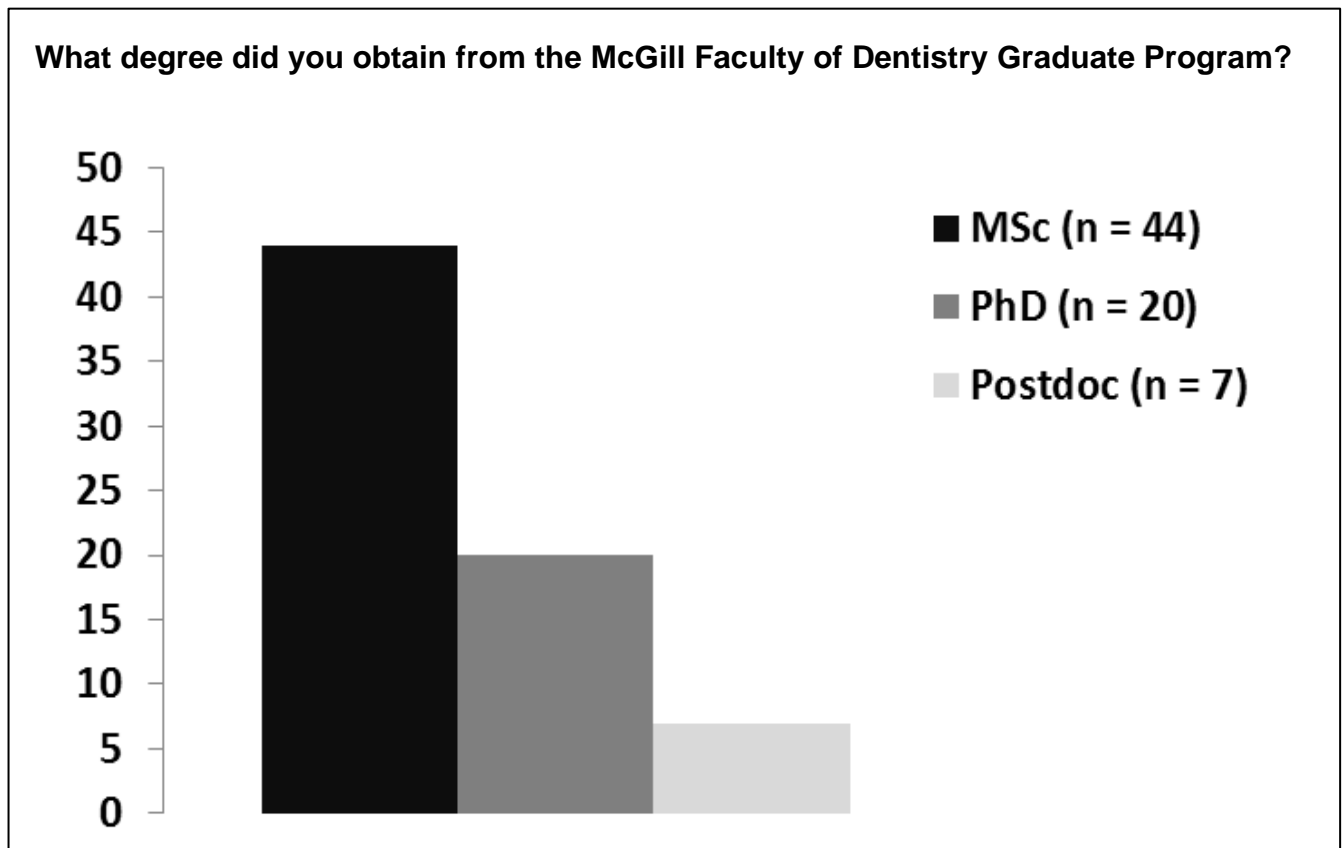


Fig 1: Participants' response to the question: "What degree did you obtain from the McGill Faculty of Dentistry Graduate Program?" The total count of the degrees ($n = 71$) was higher than the number of participants ($n = 66$) because some of the participants had graduated with more than one degree from our graduate program.

When did you graduate from the McGill Faculty of Dentistry Graduate Program?

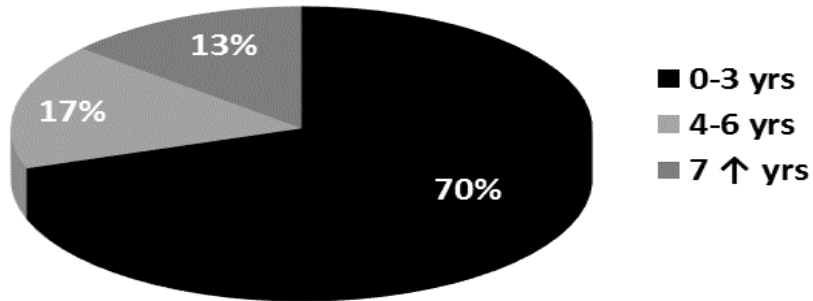


Fig 2: Frequency distribution of participants' response to the question "When did you graduate from the McGill Faculty of Dentistry Graduate Program?"

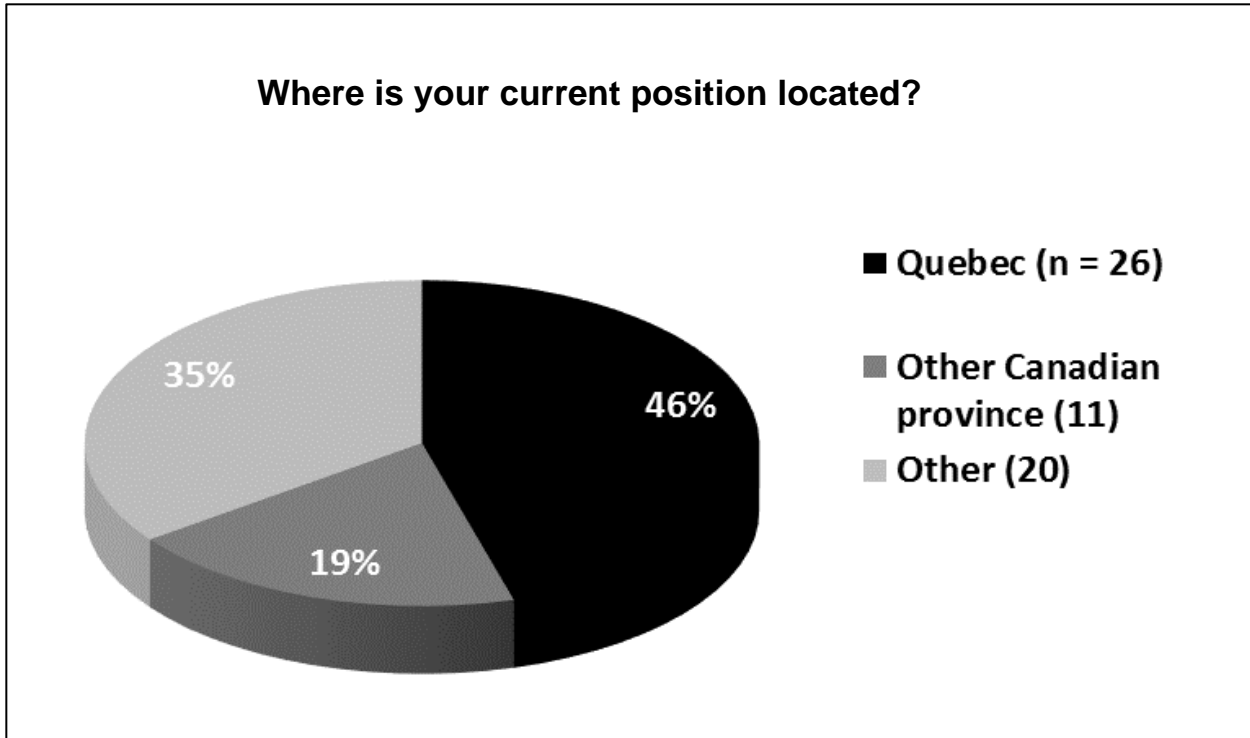


Fig 3: Frequency distribution of participants' response to the question: "Where is your current position located?" The number of participants' answers for this question (n = 57) was fewer than the total number of participants (n = 66) because 7 among them were unemployed and 2 opted not to answer this question.

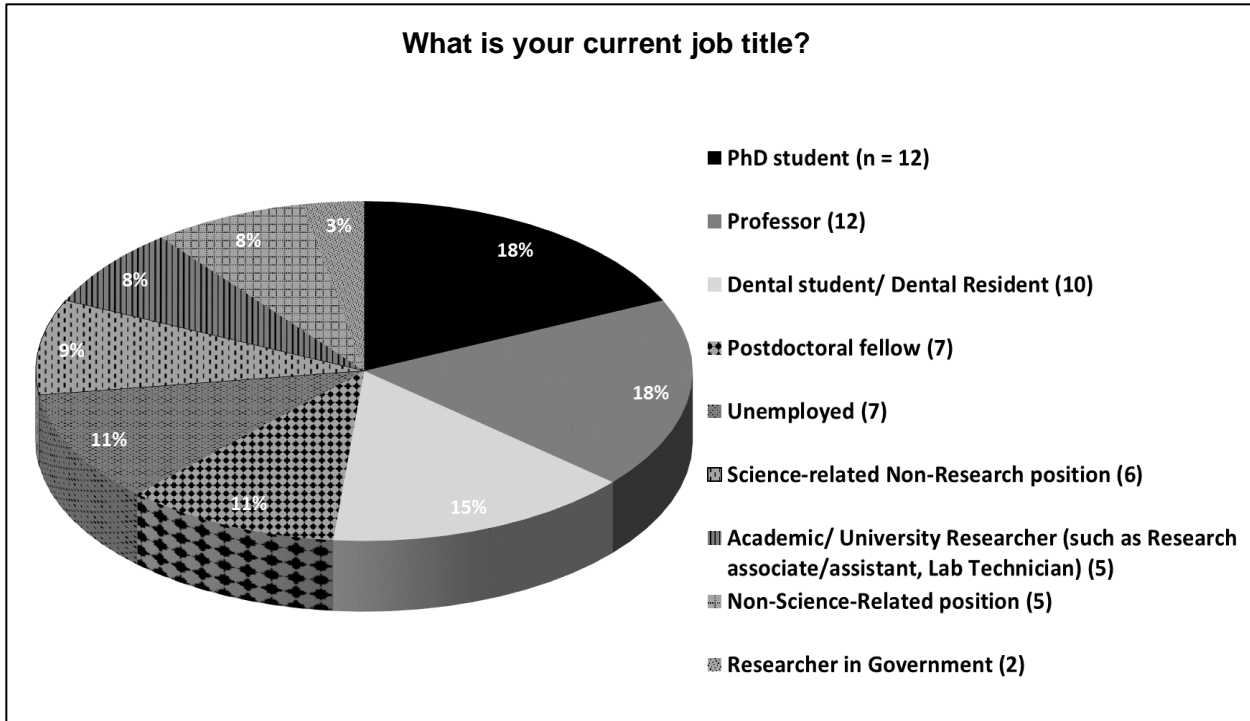


Fig 4: Frequency distribution of participants' response to the question: "What is your current job title?"

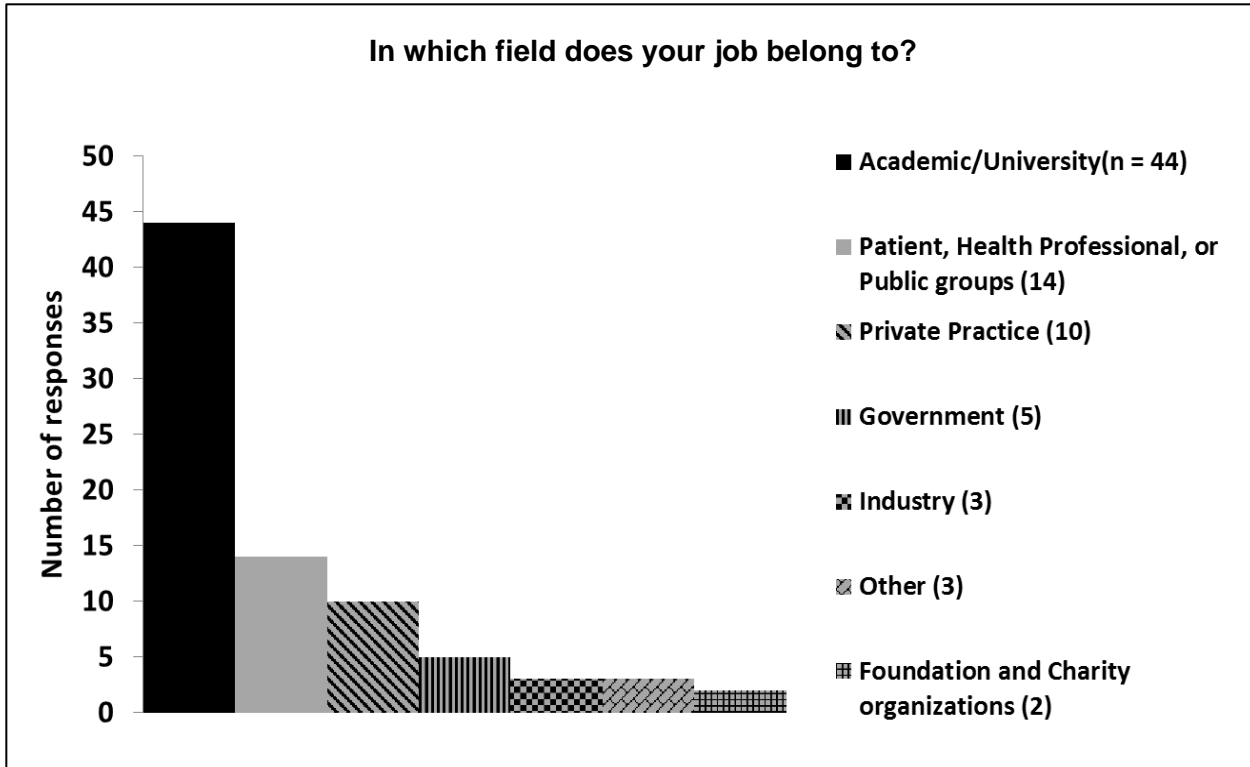


Fig 5: Participants’ response to the question: “In which field does your job belong to?” The total count of responses was higher than the total number of participants because participants were allowed to choose more than one answer.

To what extent is your work dependent on your academic research skills?

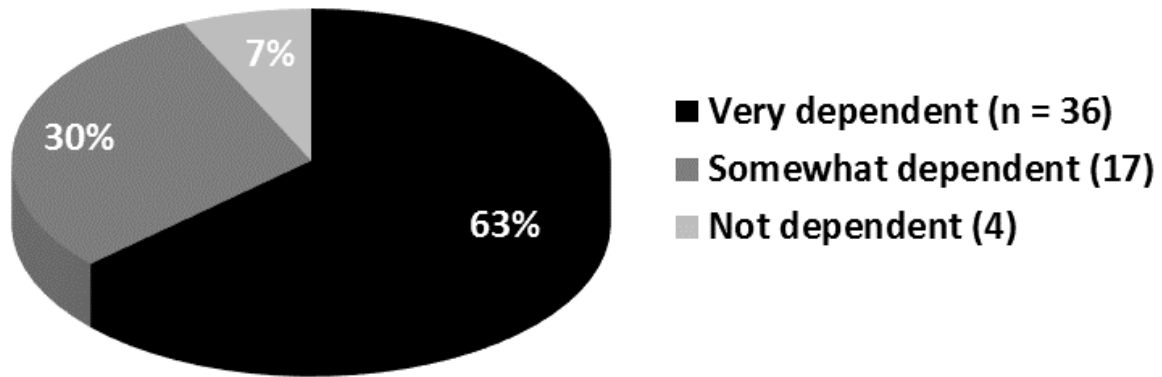


Fig 6: Frequency distribution of participants' response to the question: "To what extent is your work dependent on your academic research skills?" The number of participants' answers for this question (n = 57) was fewer than the total number of participants (n = 66) because 7 among them were unemployed and 2 opted not to answer this question.

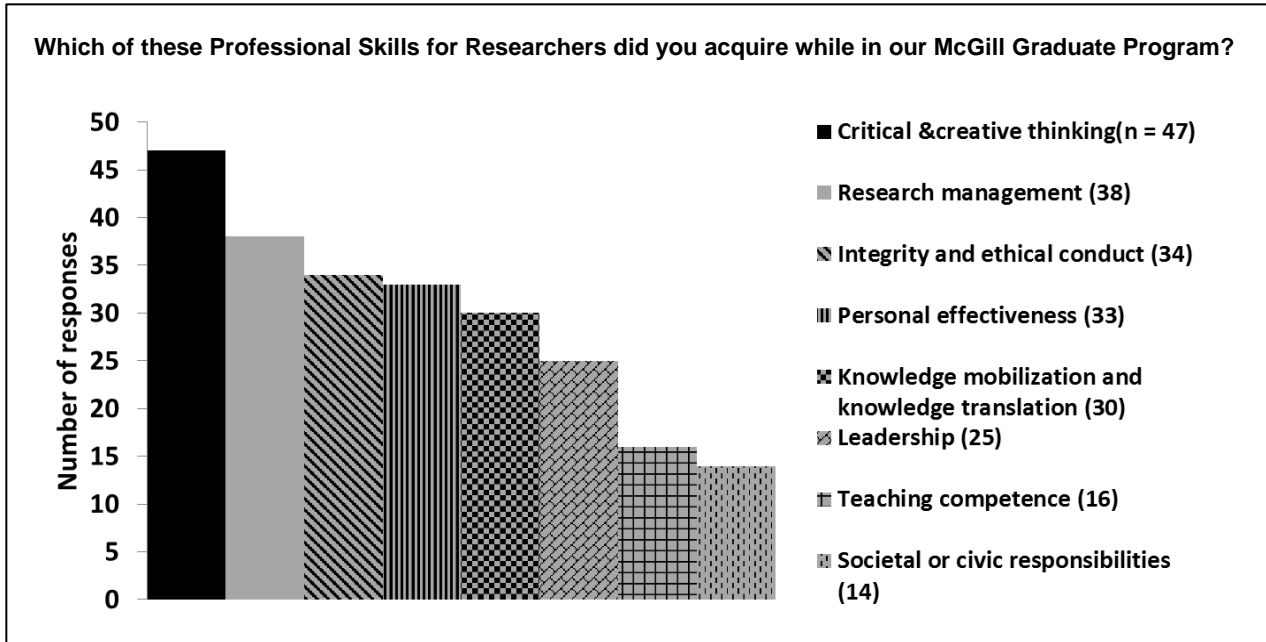


Fig 7: Participants’ response s to the question: “Which of these Professional Skills for Researchers did you acquire while in our McGill graduate program?” The total count of responses exceeded the total number of participants because each participant was allowed to select more than one answer.

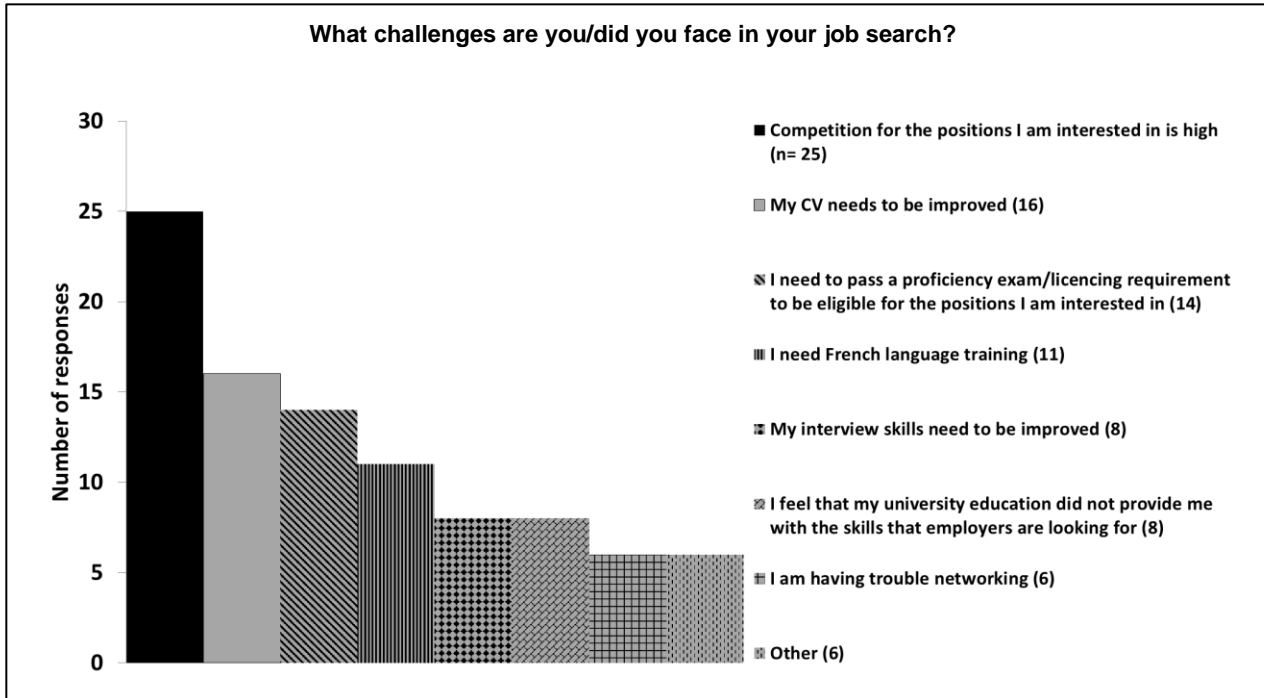


Fig 8: Participants’ response to the question: “What challenges are you/did you face in your job search?”
 The total count of responses exceeded the total number of participants because each participant was allowed to select more than one answer.

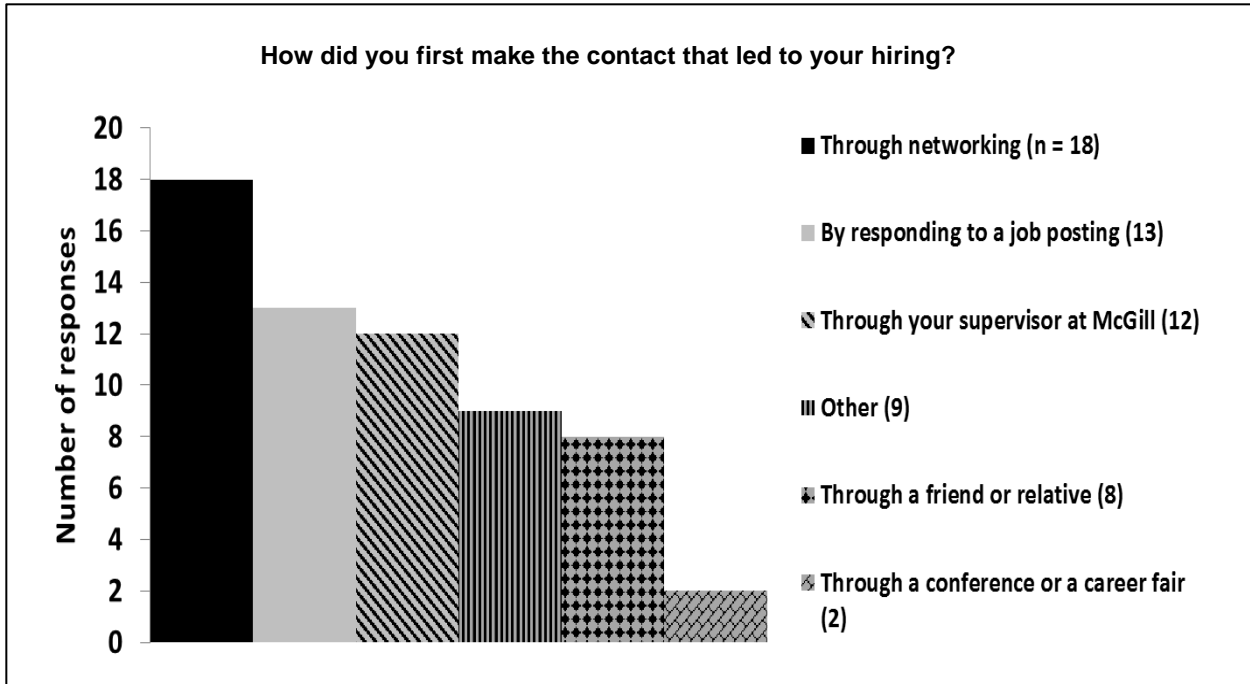


Fig 9: Participants' response to the question: "How did you first make the contact that led to your hiring?"

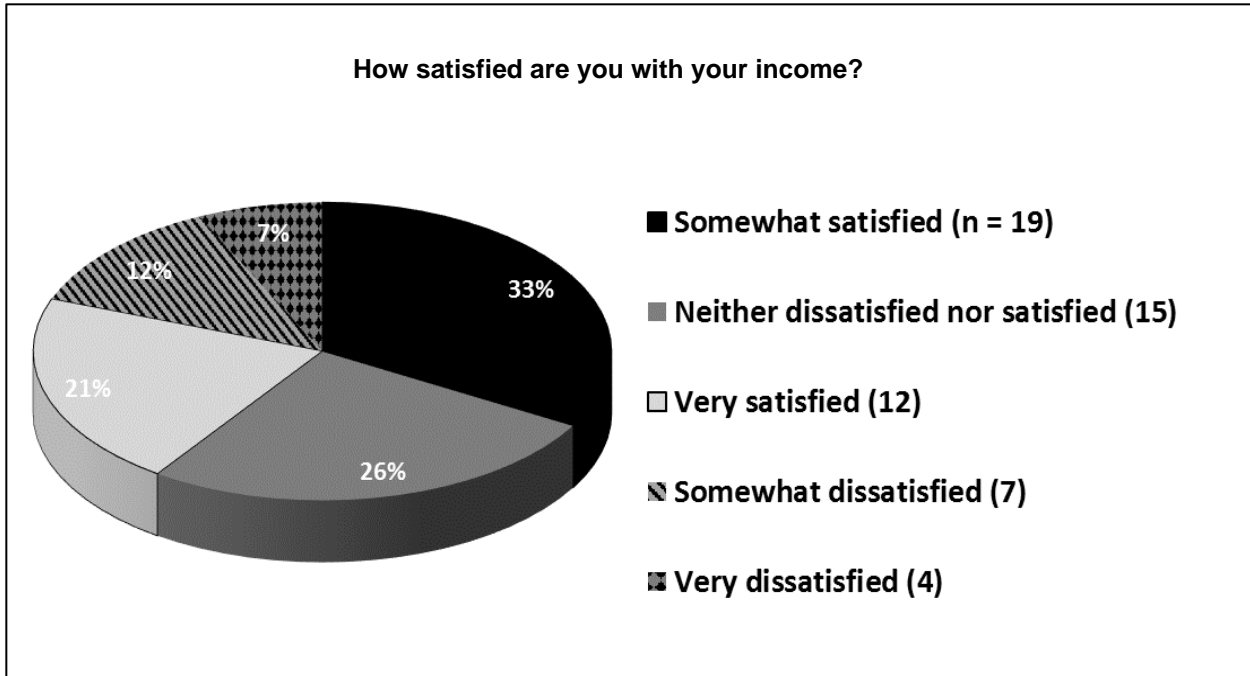


Fig 10: Frequency distribution of participants' response to the question: "How satisfied are you with your income?" The number of participants' answers for this question (n = 57) was fewer than the total number of participants (n = 66) because 7 among them were unemployed and 2 opted not to answer this question.

Appendix

Online Survey Questions

Category A

1. What degree did you obtain from the McGill Faculty of Dentistry Graduate Program? (Please select all that applies)

MSc

PhD

Postdoc

2. When did you graduate from the McGill Faculty of Dentistry Graduate Program?

0-3 years ago

4-6 years ago

7 or more years ago

3. What is your current job title?

PhD Student

Postdoctoral Fellow

Dental Student/Dental Resident

Professor

Academic/University Researcher (i.e. Research Associate/Assistant, Lab Technician)

Researcher in Industry

Researcher in Government

Science-Related Non-Research Position

Non-Science-Related position

Unemployed

Category B

4. In which field does your job belong to? (Please select all that applies)

Academic/University

Private Practice

Industry

Government

Foundation and Charity Organizations

Patient, Health Professional, or Public Groups

Other (Please describe) _____

5. To what extent is your work dependent on your academic research skills?

Not dependent

Somewhat dependent

Very dependent

6. Where is this position located?

Quebec

Other Canadian province

Outside Canada (Please specify country) _____

7. How satisfied are you with your income?

Very satisfied

Somewhat satisfied

Neither dissatisfied nor satisfied

Somewhat dissatisfied

Very dissatisfied

Category C

8. Which of these Professional Skills for Researchers did you acquire while in our McGill graduate program? (Please select all that applies.)

- Critical and creative thinking
- Personal effectiveness
- Integrity and ethical conduct
- Teaching competence
- Leadership
- Research management
- Knowledge mobilization and knowledge translation
- Societal or civic responsibilities

9. How did you first make the contact that led to your hiring? (Please select all that applies.)

- Through your supervisor at McGill
- By responding to a job posting
- Through a conference or a career fair
- Through networking
- Through a friend or relative
- Other

10. What challenges are you/did you face in your job search? (Please select all that applies)

- My CV needs to be improved
- Competition for the positions I am interested in is high
- My interview skills need to be improved
- I feel that my university education did not provide me with skills that employers are looking for

I need to pass a proficiency exam/licensing requirement to be eligible for the positions I am interested in

I need French language training

I am having trouble networking

Other (please specify)