

Motivations and Future Life, Career and Practice Plans of Orthodontic Residents in Canada and the United States

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A thesis submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirement for the degree of

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**Motivations and Future Life, Career and Practice Plans of
Orthodontic Residents in Canada and the United States**

BY

James Noble

**A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of
Manitoba in partial fulfillment of the requirement of the degree**

Of

MASTER OF SCIENCE

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Abstract I

Motivations and Future Life, Career and Practice Plans of Orthodontic Residents in Canada

Purpose: To investigate the factors influencing career choice and to identify the future plans of Canadian Orthodontic residents.

Methods: All orthodontic residents in the five Canadian residency training programs were invited to complete an anonymous on-line survey in November 2006. Data were categorized by demographic variables and basic statistics including chi-square comparative analyses were performed.

Results: Of 54 residents surveyed, 44 (81.48%) completed the survey. “Intellectual stimulation/challenge” emerged as the most important factor (40%) influencing the decision to pursue a specialty training program in orthodontics, followed by a “passion for orthodontics” (29%). The decision to become an orthodontist was made by 42% of respondents while they were in dental school, 33% after completing dental school and 24% had already decided prior to starting their dental school studies. The majority of residents (82%) plan on practicing in a private practice environment. Only two residents (4.5%) indicated they will most likely practice primarily in an academic setting. Eighty percent said they will use self-ligating brackets in private practice and almost 80% said they will use Invisalign®. A total of 55% indicated that orthodontic residents should be mandated to undertake research leading to a Master’s of Science degree as part of their orthodontic program. A total of 77% felt that a 24 to 30 month program was too short to adequately prepare orthodontic residents for private practice.

Conclusions: Intellectual stimulation is the major attraction of most applicants to orthodontic programs and the decision to become an orthodontist is normally made during dental school or even earlier. Most residents intend to enter an urban/suburban private practice setting upon graduation with few considering academic career choices. Modern techniques such as self-ligating brackets and Invisalign® are expected to be popular among future orthodontists in Canada.

Abstract II

Motivations and Future Life, Career and Practice Plans of Orthodontic Residents in the United States

Purpose: To investigate factors influencing career choice and identify future life and clinical practice plans of orthodontic residents in the United States.

Methods: All program chairs and directors of all 65 orthodontic residency programs in the United States were contacted by email and telephone for permission to email their residents and invite them to take part in an online survey. A total of 335 residents from 37 programs were invited to complete an anonymous on-line 57 item questionnaire in May 2007. Data was categorized and basic statistics including chi-square comparative analyses were performed.

Results: A total of 136 (40.60%) residents completed the survey. "A passion for orthodontics" emerged as the most important factor (20.29%) influencing the decision to pursue orthodontics as a career, followed by "intellectual stimulation/challenge" (18.12%). Most residents decided to become an orthodontist before they were in dental school (44.93%). The majority of residents (89.05%) plan to engage in private practice and only two intend to pursue primarily an academic setting. The average resident debt was \$165,226 at the end of their program. A total of 63.04% of orthodontic residents plan to use self-ligating brackets, 84.06% plan to use Invisalign®, 92.03% plan to use temporary anchorage devices (TADs) and 72.26% plan on placing them themselves; 28.26% plan to use cone-beam computerized tomography, 92.75% plan to use a digital imaging program, 45.65% plan to use indirect bonding and 10.87% plan to use lingual

orthodontics. A total of 70.07% plan on using two-phase treatment in their office and 61.59% said they will use functional appliances. A total of 81.16% plan to become ABO certified however only 18.12% feel it should be mandatory for licensure; 36.50% indicated it should be mandated to undertake a Master's of Science degree in their program and 77.94% believe that a shorter duration 24 to 30 month program adequately prepares residents for future orthodontic practice.

Conclusions: The decision to become an orthodontist is made during the formative years of life prior to dental school and a passion for orthodontics is the motivational factor.

Residents plan to enter private practice and not choose a career in academia. The current shortage of academics and orthodontic research will not be resolved from the current pool of orthodontic residents. A possible solution to the academic crisis is to change the selection criteria in programs to accept orthodontic residents who develop a passion for orthodontics while in dental school or to recruit primary researchers and teachers to the profession. Residents plan to practice in an urban setting. Rural and under-served areas will likely continue to suffer a shortage of orthodontists in the future. Newer orthodontic technology such as self-ligating brackets, TADs and Invisalign® as well as functional appliances are expected to grow in popularity in the United States due to projected future use by orthodontic residents. Two-phase orthodontic treatment with functional appliance mechanics will continue to be used. Most orthodontic residents will become ABO certified but do not believe it is necessary for licensure and orthodontic residents in the US believe a shortened 2 year program adequately prepares them for private practice.

Dedication

The Road Not Taken

Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth.

Then took the other, as just as fair,
And having perhaps the better claim,
Because it was grassy and wanted wear;
Though as for that the passing there
Had worn them really about the same.

And both that morning equally lay
In leaves no step had trodden black.
Oh, I kept the first for another day!
Yet knowing how way leads on to way,
I doubted if I should ever come back.

I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I--
I took the one less traveled by,
And that has made all the difference.

-Robert Frost

I dedicate this thesis to Dr. Sandra Cassolato, Aida Noble, Joseph Noble, Dr. Jason Noble and Laura Noble.

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Introduction

1.1

Background

Orthodontics is one of the most popular postgraduate dental programs in Canada and the United States (US) (ADA survey center, 2005).

Currently, there are five graduate orthodontic programs in Canada associated with the faculties of dentistry at the Universities of Alberta, Manitoba, Montreal, Toronto and Western Ontario. The programs range in length from 35 to 36 months and three to four residents are accepted into each program each year. All programs have a compulsory research component and residents graduate with a Master of Science (MSc) degree upon completion. They also qualify to write the Royal College of Dentists of Canada (RCDC) board examination. Successful completion of the RCDC examination allows candidates to register for a specialty license across Canada. Residents in all Canadian programs are also eligible to write the American Board of Orthodontics (ABO) examination and become board certified. Every year in Canada, each of the five graduate programs receives 20 to 40 applications per available training position (personal communication, program directors in Canada). A total of about fifteen new orthodontists graduate from Canadian programs every year. The majority of these residents tend to remain and work in Canada. These residents and orthodontic residents from accredited programs in the United States who are interested in practicing in Canada, that graduate from their programs and pass the RCDC examination are eligible to practice the specialty of orthodontics in Canada. This adds to the current pool of over 600 practicing orthodontic specialists nationwide.

In the United States (US), there are approximately 700 orthodontic residents and 300 graduates each year (ADA survey center, 2005). There are currently a total of 65 orthodontic residency programs in the US and most programs are either two or three years in length and offer a certificate and/or MSc degree upon completion. Residents who graduate are eligible to write the ABO examination and become board certified; however board certification is not mandatory for licensure. Licensure varies within each State, with some States having a mandatory state licensure examination to practice as an orthodontist, and some only needing fulfillment of the requirements of graduation from an accredited orthodontic specialty program in the US or Canada.

Currently, there are three surveys that were conducted to orthodontic residents described in the literature (Keith, 1994; Keith, 1997; Bruner 2004). In 1994, Keith and Proffit published the results of a questionnaire of US residents distributed at the Graduate Residents' Orthodontic Conference (GORP) at the University of Michigan, Ann Arbor in August 1992 (Keith, 1994). This is a resident organized conference put on every year in August that invites orthodontic residents from all the orthodontic programs in the US and Canada. The main objective of the study was to understand what problems residents encounter in applying to orthodontic programs, problems they are experiencing in completing their training program and what didactic and clinical experience they are receiving and if it is what they had expected. The questions were in multiple choice formats, closed ended and the survey was anonymous. They also investigated how satisfied orthodontic residents are with their program. The questionnaires were given to the 218 attending residents. A total of 207 of these residents responded representing 41 of the 51 orthodontic programs in the United States at the time. The remaining 11

residents were from programs in Canada. The sample included 41 (25%) residents in their first year, 94 (56%) in year two, and 32 (19%) in year three and there was one individual who was in fourth year. The questions that were asked were directed towards residents' experiences in applying to their orthodontic residency program, their current experiences in their orthodontic program and their expectations for their future career.

Three years later, in 1997, Keith went on to undertake a similar study among orthodontic residents in the United Kingdom using a similar questionnaire, investigating the same questions that were asked in her US study (Keith, 1997). In this survey, Keith distributed the questionnaire through academic staff to all 89 orthodontic residents in the 13 orthodontic programs in the UK and obtained a response from 57, giving a response rate of 64%.

In 2003, Bruner administered a 27-item questionnaire and published the results of his survey in 2005. His survey was also administered at the GORP conference at Harvard University at Boston in August 2003 to US and Canadian residents and he obtained a response rate of 77%. In addition, to increase the number of participants, Bruner mailed his survey to those residents who did not attend the meeting (Bruner, 2005). His survey instrument assessed resident demographics, resident perspective on their current training and future goals and to make comparisons with the study undertaken by Keith in 1994. Similar to Keith, the questions were in the format of multiple choices and closed ended questions and the questionnaire was anonymous.

1.2

Motivations for choosing orthodontics

The investigation into what motivates individuals into professional careers has been investigated in the sociological, psychological and educational literature. Alberts found that career choice is one of the major areas of concern for young people who are near the end of their schooling (Alberts, 2003). The influences of a person in selecting their vocation are a complex phenomenon and are discussed in the literature. Ginzberg makes an argument that career choice is influenced by a young person's conceptualisation of his or her abilities and life preferences. They then try to pursue a match between these ideas and job requirements. This is also influenced by the young person's gender and place in the family (Ginzberg, 1951).

The task of choosing a career is not a static process in an individual's life. Rather, it is ongoing and part of a continual developmental process that changes over time. Ginzberg suggests that there is an initial fantasy stage that an individual has about his or her future career in an individual that is present during the early to mid-childhood years. This is then followed by the early teenage years which are a tentative stage when individuals begin to think in a personal manner about their own unique and genuine interests, capacities and values. Next, during late adolescence, there is a realistic stage. At this stage, the individual shifts focus from his or her subjective needs and interests to appraising what the world has to offer to them and how they can fit in (Ginzberg, 1951). Once a vocation is selected by an individual, even a single career choice can, however, according to Ranson, lead to at least three different career paths (Ranson, 2003). These types of career paths can include stable employment with a single employer, changing jobs between different employers or self-employment. Once a career has started, any

choice that is made by an individual may proceed to any number of different paths (Ranson, 2003).

An individual's educational institution and their family are the main sources that both influence and guide the career choice of a young individual. Teachers in schools spend a considerable amount of time with young people and they often help to identify their aptitudes and abilities. They subsequently are involved in the encouragement and direction of students to select certain subject areas to pursue, or direct them to be involved in work experiences or visit employers in vocations that match their interests, aptitudes and abilities (Ranson, 2003).

Small demonstrated that parents provide an example and role model for children to emulate and that they have a very strong influence in having their children follow their footsteps when they are making a career choice (Small, 2002). Parents are also a main source to offer appropriate support for career choice, and they tend to recommend their own occupation to their children (Small, 2002). Many other influences in directing a young person towards a certain career exist within a family. Dunn emphasized the strong impression that siblings can have to influence career choice. He based this on the competition that can exist among brothers and sisters to please parents and teachers (Dunn, 1994). This competition can have its effect until as late as they are young adults or at the time when siblings are likely to embrace separate lives (Dunn, 1994).

There has been a long time link between birth order and occupation. Wealthy family's primogeniture traditionally allowed for the eldest son to inherit the entire family estate, while the second born son would be encouraged to join the Church and the third son would be directed to undertake a military career (Spraggs, 2002). Often, younger sons

who had no prospects would turn to criminal activity. Generally, if they were caught and displayed remorse, because of their status in society, they would be pardoned from the crime (Spraggs, 2002).

There has been recent evidence to suggest that birth order can influence patterns of marriage and prospects in a career (Wall, 1996). Wall demonstrated that in some occupations, the oldest son, instead of a younger son had more of a tendency to follow the occupation of the father. Interestingly, he did not show a similar effect with females (Wall, 1996). The gender of a young person can also be a factor in choice of career as investigated by Creed and others (Creed, 2003). They found that among adolescents, females matured earlier than males in their attitudes towards their career. They also found that females displayed a more mature reaction to early work experiences. Career choice for females has been shown to be influenced by aspects of the structure of a family as a greater deal of responsibilities tend to be given to females in the care of the family (Spitze, 1990). Wilgosh demonstrated that the stereotyping of individuals based on gender can have an impact on academic attainment in certain subjects. He showed that popular images that are present in the media can have an influence over the career choice of an individual (Wilgosh, 2002). As an example, he showed that teenage girls were focused on appearance and popularity. As a result, they had a tendency to avoid careers related to science. Miller also found that females were less likely to enter careers related to science. He went on to highlight the need for teachers to focus more attention to the changing attitudes of females (Miller, 2002). Heckert et al (2002) noted that female college students, more than males, in their criterion for choice of career put more emphasis on factors such as working conditions, facilities for child rearing, career

certainty and working hours (Heckert, 2002). Small also found a difference in career choice between males and females, with more males wanting to have their own business versus their female counterparts (Small, 2002). Noon argues that females obtain more intrinsic rewards from their careers than males (Noon, 1997). Holland related personal characteristics as a link to an individual's choice of career (Holland, 1985). He argued that people know their own interests and what they want to do with their life and they themselves actively seek out to a career appropriate to their interests.

Holland's model involved six main orientations of individuals which he says are not mutually exclusive to one another. These include: 1) Individuals who are linked with a preference for outdoor activities and physical work, who have few interpersonal demands; 2) Investigative individuals who are linked with thought and creativity, who harbour minimum social demands; 3) Individuals who are artistic and who have an aversion to structure and require intense involvement; 4) Individuals who are very social, and who are strong communicators and have an interest in helping others; 5) Enterprising individuals who have are linked with power and needing management behaviours; 6) Conventional individuals, who are highly structured, have self-control and low interpersonal demands.

The assumption that Holland makes, which may or may not be true is that an individual has the ability to make free choices which may not be true. Although many individuals may feel they are free to make their own choice of career, others may feel that this is not under their own control.

Despite its popularity as a specialty, the reasons why orthodontic residents have chosen to enter the orthodontic field have been poorly evaluated in the internationally orthodontic

community. There has not previously been such an investigation undertaken in Canada. Of the three previously published surveys of orthodontic residents, the two by Keith investigate the motivations why orthodontic residents choose orthodontics as a specialty and they were limited to residents in the US and UK (Keith, 1994; Keith, 1997). The studies by Keith have identified job satisfaction, intellectual stimulation, lifestyle and a good career structure as important variables which residents considered when choosing a career in orthodontics. The 1994 study by Keith found that future job satisfaction was the most common reason for choosing orthodontics as a career (89.7%) with the next most common reason being dissatisfaction with general dentistry (13.7%) (Keith, 1994). The questionnaire administered to UK orthodontic residents by Keith that was published in 1997 found a range of responses to the question, "Why did you choose orthodontics?" The principle reasons that were discovered included: job satisfaction, lifestyle, and financial status. Some orthodontic residents indicated that they chose orthodontics because of a preference to the professional lifestyle of an orthodontist over an oral surgeon. Similar to the Keith's US investigation, a significant reason for choosing orthodontics was dissatisfaction with general dentistry (21%).

The questionnaire undertaken by Bruner in 2003 to orthodontic residents at the GORP conference did not investigate the motivations of why orthodontic residents chose the profession of orthodontics (Bruner, 2003). There has never before been an investigation of the motivations of orthodontic residents in Canada.

The investigation into what motivates pre-dental students, dental students, or anyone in society to pursue orthodontic training specifically is an interesting question. This investigation may provide an insight into why orthodontics is such a strongly popular

specialty in Canada and the US. The determination of what precisely inspires an individual to choose orthodontics as a specialty is important information that could assist orthodontic educators in directing strategies to recruit the best and brightest individuals into the specialty. In interviewing candidates for positions in orthodontic programs, program directors can be equipped with the knowledge of potential preconceived notions candidates may have of the orthodontic profession. They would be able to better get in the minds of the candidates and identify those who have the motivations that they are looking for and then make a more effective selection. For instance, they may be interested in candidates who show a genuine intellectual interest for orthodontics rather than the lifestyle and earning potential derived from it. Program directors may be more searching for residents who will be inclined to give back the program while they are a residents and then beyond graduation. Their priority may be the selection of a variety of individuals: those who would give back to the profession at large through involvement and leadership in professional organizations; those who would be involved in research and scholarly activity; those who would be involved in the treatment of patients with limited access to care and an inability to afford treatment; those who are interested in teaching; those who are motivated to give financial contributions to academic institutions and the profession at large. Program chairs and directors may also be interested in the motivations of applicants to help them identify if any express a genuine interest in pursuing an academic and research career. Understanding motivation may assist programs in recruiting individuals who can fill the current gaps in academics and research and help alleviate the crisis in the lack of academics in orthodontics.

An understanding of the current residents' motivations could help the profession obtain an insight into what the future of the profession. Furthermore, the orthodontic profession can gain an insight into the reasons for its popularity amongst dental graduates which may assist in recruitment strategies particularly to under-serviced and rural areas.

1.3

Future Career and Life Plans

The questionnaire in 1984 by Keith found that upon graduation, 84% of orthodontic residents intended to go into private practice after graduation. Also, fewer than half expected to establish a solo practice or buy in as a partner immediately after graduation, while the others expected some sort of association in practice. Other career options that were considered include teaching and research, and the military service (Keith, 1994).

The UK study by Keith published in 1997 found that the short-term plans of orthodontic residents were that 61% of graduates wanted to stay in the hospital service as a senior registrar or in a staff grade post, and 24% wanted a specialist practice (Keith, 1997). Only 7% of orthodontic residents were interested in pursuing an academic career and even less wanted to enter the Community Dental Service or continue with their military career.

The long-term plans of UK orthodontic residents were also found to be in private practice and consultant status (Keith, 1997). The future career and life plans of orthodontic residents in Canada have not been previously investigated.

The study by Bruner found that when orthodontic residents were asked about their interest in pursuing full time academics after graduation, 40% indicated they would be interested in this option if there was improved income available for teaching (Bruner,

2005). Furthermore, 92% of orthodontic residents expressed an interest in part-time academics as an adjunct to their private practice. As a ten year goal, 87% of orthodontic residents indicated they want to become ABO certified. He found that both men and women intend to work four days per week, and that they had an annual expected income level of \$200,000 to \$600,000 US dollars (Bruner, 2005).

The determination of the future life plans of orthodontic residents is important for the profession at large. The crisis in recruitment and retention of orthodontic educators has been well documented (Larson, 1998; Haden, 2000; Meskin, 2000; Trottmann, 2002; Lindauer, 2003; Livingston, 2004; Nunn, 2004; Flores-Mir, 2007). However, it is important for the orthodontic community to provide supporting evidence that there will indeed continue to be a shortage of persons interested in pursuing academic careers. This evidence will underscore the need for strategies directed for a long-term solution. It also could result in providing the impetus for investment in time and money, such as re-direction of additional financial resources and the striking of committees at high levels of professional organizations and educational bodies to have conversations and ideas for a solution to the crisis.

It is also important to determine if orthodontic residents plan to practice in rural and underserved areas after graduation or in urban centres. This could serve to identify if there will be future access to care issues in the profession and in the same way, implement changes at the organizational and educational levels now to prevent this from developing or worsening in the future.

1.4

Future Practice Plans

The future of the orthodontic specialty is of great interest to practitioners, professional organizations and orthodontic manufacturers and companies. The recent 50th anniversary Journal of Clinical Orthodontics was celebrated by the dedication of two issues, in September and October 2007, that focus on the topic of the future of the orthodontic specialty. Further, the American Journal of Orthodontics and Dentofacial Orthopaedics has an entire section dedicated to refereed articles on technology, called, “Technobytes”. This illustrates the interest our profession has for its future.

Indeed, orthodontics is a specialty that is progressively and constantly changing. It is a very exciting time in the orthodontic profession as new technologies are quickly emerging, developing rapidly and improving readily. Such technologies include temporary anchorage devices (TADs), cone-beam computerized technology, customized brackets (eg. Insignia™, Suresmile™, iBraces™), tooth movement by means of clear plastic retainers (eg. Invisalign™, Simply Five™, Raintree Essix™), digital models and imaging, digital intraoral scanners, lingual orthodontics, super-wires, Class II correctors (eg. Forsus™, Twin Force™, Jasper Jumper™), self-etching primers, adhesives that change colour with temperature (eg. Bluegloo™, Greengloo™), self-ligating brackets, indirect bonding, and the list goes on. Orthodontists have shown an enthusiasm and willingness to adopt these developing technologies into their clinical practice in spite of limited independent and unbiased scientific evidence displaying efficacy. Technological innovation certainly has an important place in current orthodontic practice and oftentimes determines how orthodontics is practiced. The role of manufacturer involvement in the

advancement of orthodontics and determining how it will be practiced has increased and this trend is likely only going to continue.

Universities and orthodontic industry are the main groups involved in the development of innovative products and technologies; however it is the orthodontists themselves who are the real determinants of what specific technologies will be utilized in clinical practice.

Similarly, it is the attitudes and aspirations of orthodontic residents that will shape the future practice of orthodontics. To understand the future practice of orthodontics, it is therefore important to capture the perceptions of the orthodontic residents.

Previous questionnaires in the literature do not investigate the future clinical practice plans of orthodontic residents (Keith, 1994; Keith, 1997; Bruner, 2005). Indeed, there has not been a previous investigation in the literature from any country that interviews or surveys orthodontic residents to determine their future clinical practice plans. The knowledge of the future clinical practice plans of orthodontic residents is valuable information, as it can provide the profession with a window into what is the future of orthodontic practice.

Further, this information will assist educators with the development and evolution of their curriculum and graduate clinic techniques and philosophies taught so they can assure their programs provide their residents with the most current and up to date level of education and training. It also ensures that residents would be satisfied with their training because the technologies that they plan to utilize are being provided by their program.

In addition, this information would provide considerable insight to the orthodontic industry into technologies they should focus and invest their research and development and technologies where they should not.

Of further interest, is the assessment of which orthodontic manufacturers residents plan to purchase from upon graduation. Due to inventory issues, it is not feasible for orthodontists in practice to have the opportunity to try a variety of bracket systems. As a resident in a graduate program, there is the opportunity to try a wide variety of products and directly compare them against one another. Residents can therefore make an informed decision based on what product they like using, quality, customer service provided and ease of use. Because orthodontic residents try numerous products, identifying of which manufacturer they plan to purchase from after graduation, could be an indication as to which product is of superior quality, easier to use or which orthodontic manufacturer is most successful at marketing.

2.0. OBJECTIVES AND HYPOTHESIS

Objective #1:

To determine the motivations why orthodontic residents in Canada and the US enter the orthodontic profession.

Hypothesis #1: Orthodontic residents in Canada and the US choose to enter the orthodontic profession while they are in dental school because they have an intellectual stimulation to the field of orthodontics and also because of doctor/patient relationship they can develop.

Objective #2:

To determine the future life and career plans of orthodontic residents in Canada and the US.

Hypothesis #2: After graduation from their program, orthodontic residents in Canada and the US plan to enter into private practice and do not have an interest in an academic career.

Hypothesis #3: After graduation from their program, orthodontic residents in Canada and the US plan to work in urban areas and do not have an interest in working in rural or underserviced areas.

Objective #3:

To determine the future clinical practice plans of orthodontic Residents in Canada and the US.

Hypothesis #4:

Orthodontic residents in Canada and the US will use new technologies in their clinical orthodontic practice such as self-ligating brackets, Invisalign™, temporary anchorage devices, indirect bonding, lingual orthodontics, cone-beam computerized tomography and a digital imaging program.

3.0 METHODOLOGY

3.1 CANADIAN ORTHODONTIC RESIDENTS SURVEY

Ethics approval was obtained to conduct this study from the University of Manitoba Research Ethics Board, Winnipeg, Manitoba, Canada (Appendix 9.1). The program heads of the five Canadian orthodontic programs (Universities of Alberta, Manitoba, Montreal, Toronto and Western Ontario) were contacted and permission was obtained to contact their residents to complete the survey (Appendix 9.2). The email addresses of all fifty-four residents enrolled in Canadian orthodontic residency training programs were obtained. All orthodontic were sent an email (Appendix 9.3) with an on-line link and were invited to complete an anonymous, 41-item survey in November of 2006 with most of the questions being in multiple-choice format or one line answers (Appendix 9.7). It was clearly emphasized to the residents that the survey was anonymous and there was no possible way to track the source of the answers.

Reminders were sent out on several occasions to those who did not complete the survey in order to increase participation and response rate. The survey was completed by an on-line program, QuestionPro™, that sent each resident a personalized link to their email to prevent respondents from completing the survey more than once.

No personal information was collected in order to ensure the privacy and anonymity of the respondents, and they informed that the results would not be presented as grouped data to further assure them anonymity.

The survey was divided into sections which included: demographics, reasons for choosing orthodontics, evaluation of the program and future directions. The survey data were collected into a Microsoft™ Excel spreadsheet and categorized by demographic

variables. Basic descriptive statistics as well as comparative analyses using chi squared testing was undertaken between gender groups.

3.2 UNITED STATES ORTHODONTIC RESIDENTS SURVEY

The study received ethics approval from the Research Ethics Board from the University of Manitoba, Winnipeg, Manitoba, Canada (Appendix 2). An email was sent to both the program chairs and directors (in some programs this was the same person) of all 65 graduate orthodontic programs in the United States of America, as identified in the American Dental Association's listing of accredited orthodontic programs. The questionnaire was an attachment to the email that was sent, and a request was made for permission to contact their residents by email and invite them to participate anonymously in the study (Appendix 9.5). Their resident email addresses were also requested. Those programs who did not respond to the email request were subsequently contacted an additional three times by telephone after which, if they failed to respond, they were excluded from the study. An on-line program, QuestionPro™, was used to send an email with a personalized on-line link to a total of 335 residents from 37 orthodontic programs (Appendix 9.6). The personalized on-line link prevented any respondent from attempting to complete the survey more than once. Residents were invited to complete an anonymous 57-item survey containing multiple choice and one line answers in May 2007 (Appendix 9.8).

As an incentive to complete the survey, US residents were informed that those who completed the survey in its entirety would be entered into a random draw to win a new orthodontic curing light valued at approximately \$1300 US dollars. This orthodontic curing light was graciously donated by 3M/Unitek.

To ensure privacy and anonymity, no personal information was collected and this was clearly emphasized to all residents with each email communication. They were informed

that the data would not be grouped and there would be no way of tracking respondents. Participants were assured that the results of this study would be reported only as group data and could not be traced. The survey was divided into the following segments: demographics, reasons for choosing orthodontics, evaluation of their orthodontic program, and future directions. Data from the survey was then compiled into a Microsoft™ Excel spreadsheet and categorized by demographic variables. Basic statistics and comparative analyses using chi-squared analysis for the variable of gender were undertaken.

4.0 RESULTS

4.1 SURVEY OF ORTHODONTIC RESIDENTS IN CANADA

All five program directors of the graduate orthodontic programs in Canada responded to the email. They all provided permission to contact their residents to conduct the survey. They also provided the email addresses of their residents, which was a total of 54 email addresses.

A total of 47 of the 54 (87%) orthodontic residents started the survey and 44 (81%) followed through the entire survey and completed it. Of the respondents, 30 (64%) were male and 17 (36%) were female and the majority were in the 25 to 34 years of age category. Table 1 depicts the gender, age and the year of program of the residents who started the survey.

Table 1: Demographic information of orthodontic residents in Canada who responded to the questionnaire.

Respondents	Number (%)
Age	
<25	0 (0)
25-30	23 (48.9)
30-34	23 (48.9)
35-39	1 (2.1)
>40	0 (0)
Gender	
Male	30 (63.8)
Female	17 (36.2)
Year in program	
1	17 (36.2)
2	18 (38.3)
3	12 (25.5)

Chi squared analysis revealed no significant difference when male and female residents were compared ($p > 0.05$) for any of the categories of results presented (Table 2).

Table 2. Chi-squared compared analysis for gender of Canadian orthodontic residents for questions asked.

<u>QUESTION</u>	<u>P-VALUE</u>
What was the single most important factor influencing your decision to pursue an Orthodontic residency training program?	0.273
When did you decide to pursue an Orthodontic training program?	0.730
What are your future plans after training?	0.254
What type of setting will you most likely practise in?	0.430
What type of population do you plan on primarily serving?	0.860
What type of practice will you work in?	0.081
Do you plan on practising part-time or full time?	0.517
Approximately how much time will you dedicate to research (basic or clinical)?	0.339
Do you plan to include the treatment of cleft lip and palate and craniofacial anomaly patients in your practice?	0.387

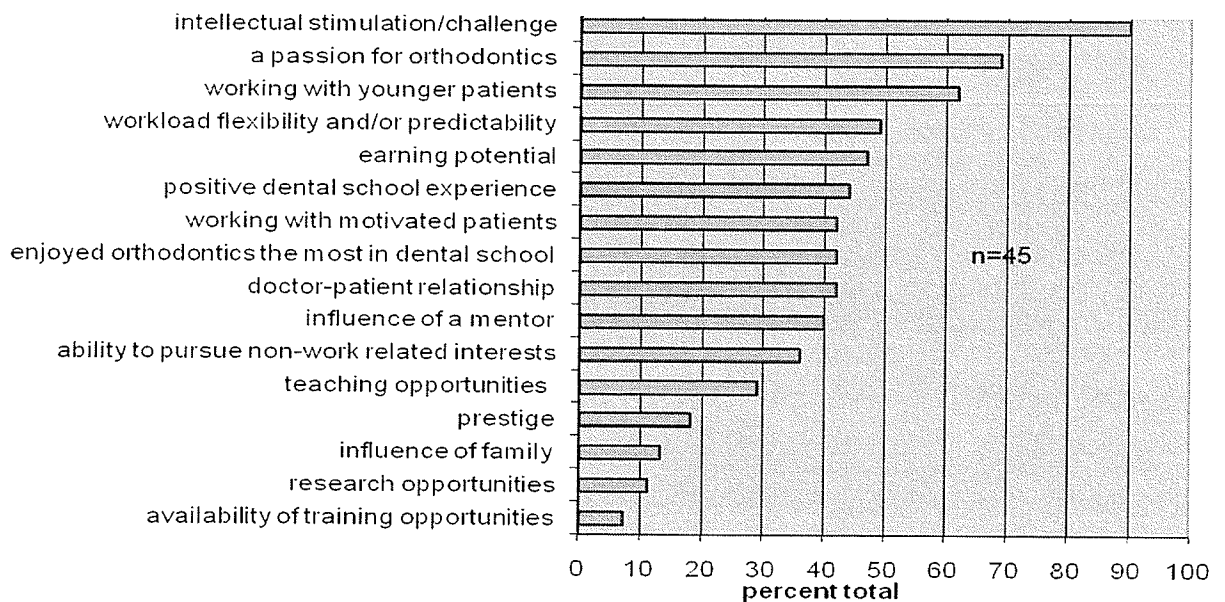
Factors Influencing Career choice

A total of 45 residents responded to this question. The most common reasons why Canadian residents chose orthodontics as a career is intellectual stimulation (89%) and a passion for orthodontics (69%). Working with younger patients (62%) and work flexibility (49%) were also identified as important factors (Figure 1.).

Figure 1.

Response to the question by Canadian Orthodontic Residents: "What were the main factors influencing your decision to pursue an Orthodontic residency training program?"

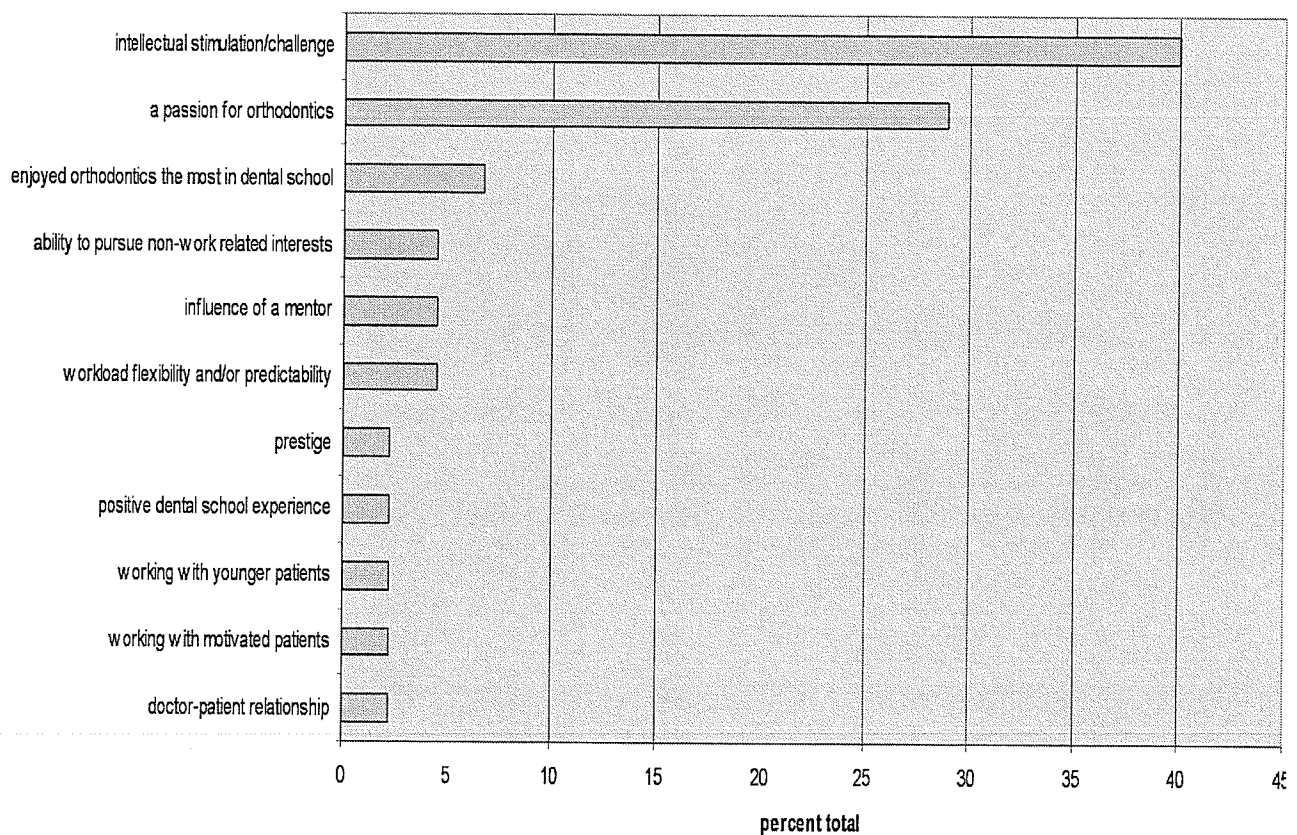
Respondents were given the option to select all answers that apply.



Canadian Orthodontic Residents were asked what the single most important factor was for choosing orthodontics. Similar identifiers were obtained to when they were permitted to enter multiple answers. Amongst the single most important reasons identified were: intellectual stimulation (40%), a passion for orthodontics (29%) and having enjoyed orthodontics the most in dental school (6.7%) (Figure 2).

Figure 2.

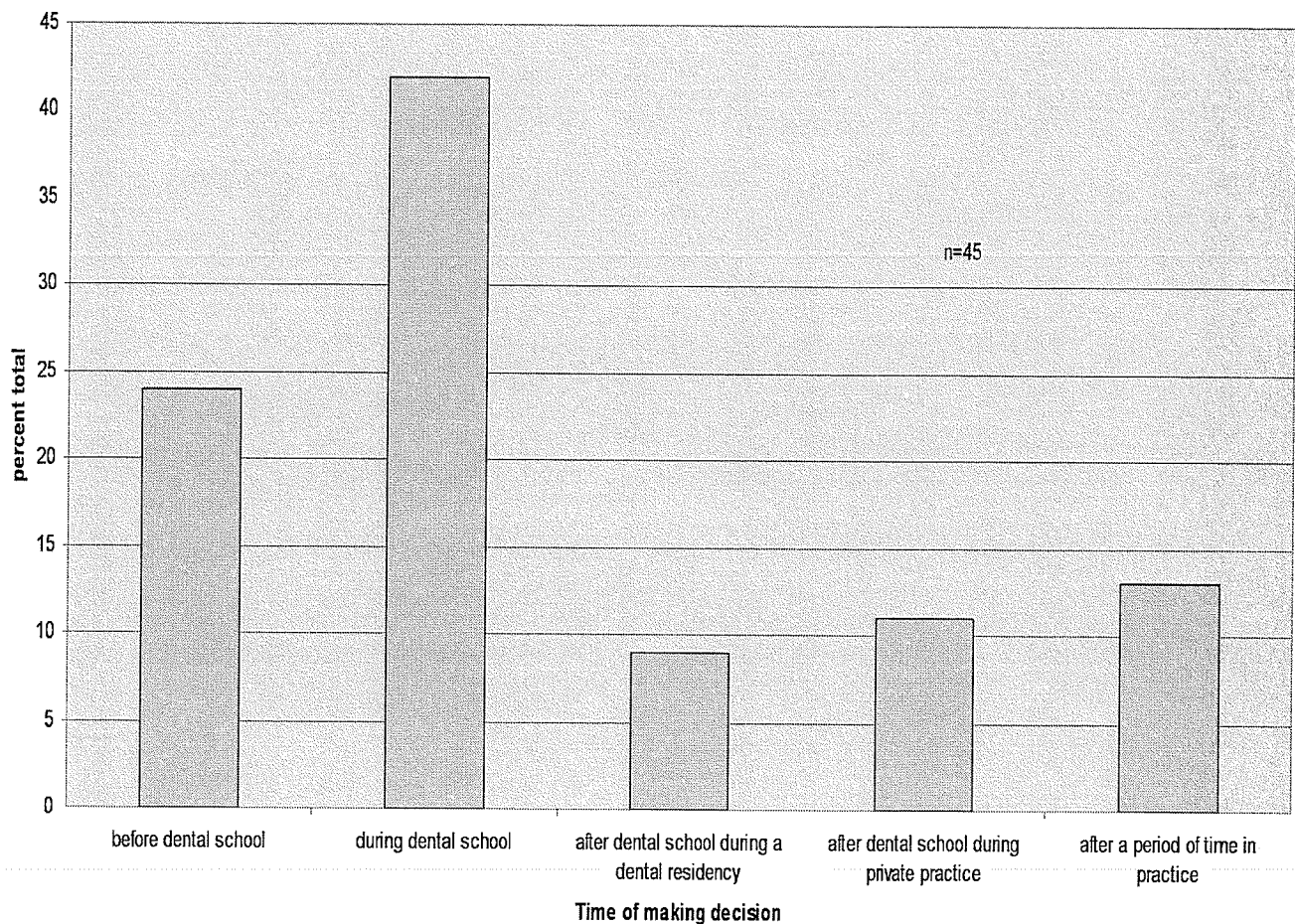
Responses of Canadian Orthodontic Residents to the question: "What was the single most important factor influencing your decision to pursue an Orthodontic residency training program". Residents were allowed to choose only one answer. N = 45.



The majority of residents (42%) indicated that they made the decision to pursue orthodontics as a specialty while they were in dental school, 33% made the decision after dental school and 24% knew before entering dental school that they would want to be an orthodontist (Figure 3).

Figure 3.

Response of Canadian Orthodontic Residents to the questions: "When did you decide to pursue an Orthodontics training program?" N=45



Future Life and Career Plans of Orthodontic Residents in Canada

When asked about their future plans following graduation, the majority of residents indicated that they intend to practice orthodontics as an associate in the private sector (44%). Twenty-two percent indicated that they intend on buying an existing orthodontic practice and 13% plan to start a brand new orthodontic practice. Only 4% indicated that they intend to pursue a full-time research and teaching career (Table 2).

Table 3.

Future Career Plans of Orthodontic Residents in Canada, expressed as a percent.

Practice orthodontics as an associate	44.4
Practice orthodontics by buying into an existing practice	22.2
Practice orthodontics by starting a new practice from scratch	13.3
Apply for fellowship training in Canada	2.2
Pursue a full-time research and teaching career	4.4
Undecided	13.3

The majority of residents (66%) indicated that they plan to practice in an urban or suburban setting, and 9% plan on practicing in an inner city setting. No residents were considering practicing in a rural location. A large majority of residents (82%) indicated they plan to work in a private practice setting while 9% said they plan to practice in a combination of community and academic settings. Only 5% said they would primarily work in an academic setting and none were considering work primarily in a community setting. Forty-three percent indicated that they wanted to work in a group practice, 30% in a solo practice and 27% were undecided. All residents responded that they intend to be involved in direct patient care, as opposed to a pure research career.

Most residents (84%) intend to practice full time (more than three days per week) and 9% intend to practice part-time (less than three days per week). Three of the four residents who said they plan to practice part-time were males.

When asked what percent of time they would dedicate to either clinical or didactic research, 32% indicated no involvement, 32% were unsure, 30% planned on using 25% of their time and 7% wanted to spend 50% or more of their time on research (Figure 4).

Regarding the treatment of patients with cleft lip and palate and craniofacial anomalies in their practice, 30% were considering doing so and 14% were not, 48% said maybe and 9% were unsure.

The respondent's views concerning the importance of research in the program and the attainment of a Master's of Science degree indicated that 55% were in favour, 23% said maybe, 14% were opposed and 9% were unsure. When asked their opinion if a shortened 24-30 month orthodontic training program adequately prepares their residents, 77% said no and 23% said yes.

Future Clinical Practice Plans of Orthodontic Residents in Canada

A total of 80% were planning on using self-ligating brackets in their practice, 11% said maybe and 7% were unsure and only 2% said they would not. When asked if they plan to use Invisalign™, 80% said they would, 16% said maybe, 5% were unsure and no residents said that they would not.

4.2

SURVEY OF ORTHODONTIC RESIDENTS IN THE UNITED STATES OF AMERICA

A total of 18 program chairs or directors responded to the email request. After three additional phone calls to the program department, as listed by the American Dental Association, the email addresses of residents from 37 programs were obtained. In some cases, program chairs forwarded the email to all their residents and asked them to contact the author if they were interested in participating. Therefore, in some cases, a single resident from a program was invited to participate. A total of 335 resident email addresses were finally obtained. From these residents, a total of 138 started the survey and 136 completed it in its entirety resulting in a response rate of 40.60%. The average time taken to complete the survey was 12 minutes. A random draw for a curing light that was graciously donated by 3M/Unitek and was made for all 136 residents who completed the entire survey and the 3M/Unitek curing light was won by an orthodontic resident from the University of West Virginia.

The gender, age and year of study of the residents is illustrated in Table 4.

Table 4.

Demographics of orthodontic residents in the United States to the questionnaire.

Respondents	Number (%)
Age	
<25	1 (0.72)
25-29	71 (51.45)
30-34	54 (39.13)
35-39	8 (5.80)
>40	4 (2.90)
Gender	
Male	89 (64.49)
Female	49 (35.51)
Year in program	
1	31 (22.63)
2	67 (48.91)
3	34 (24.82)

There were a total of 89 male and 49 female respondents and the majority of residents were in the age range of 25-34 years. Most residents were in the second year of their programs. Most of the residents (64.23%) entered their graduate residency program directly from dental school and only 9 (4.95%) had a previous graduate degree.

Chi squared analysis was undertaken and revealed no significant difference when male and female residents were compared ($p > 0.05$) for any of the results presented (Table 5).

Table 5.

Chi-squared compared analysis for gender of orthodontic residents in the US for questions asked.

<u>QUESTION</u>	<u>P-VALUE</u>
What was the single most important factor influencing your decision to pursue an Orthodontic residency training program?	0.266
When did you decide to pursue an Orthodontic training program?	0.638
What are your future plans after training?	0.539
What type of setting will you most likely practise in?	0.453
What type of population do you plan on primarily serving?	0.297
What type of practice will you work in?	0.189
Do you plan on practising part-time or full time?	0.080
Approximately how much time will you dedicate to research (basic or clinical)?	0.067
Do you plan to include the treatment of cleft lip and palate and craniofacial anomaly patients in your practice?	0.224

Factors Influencing Career choice

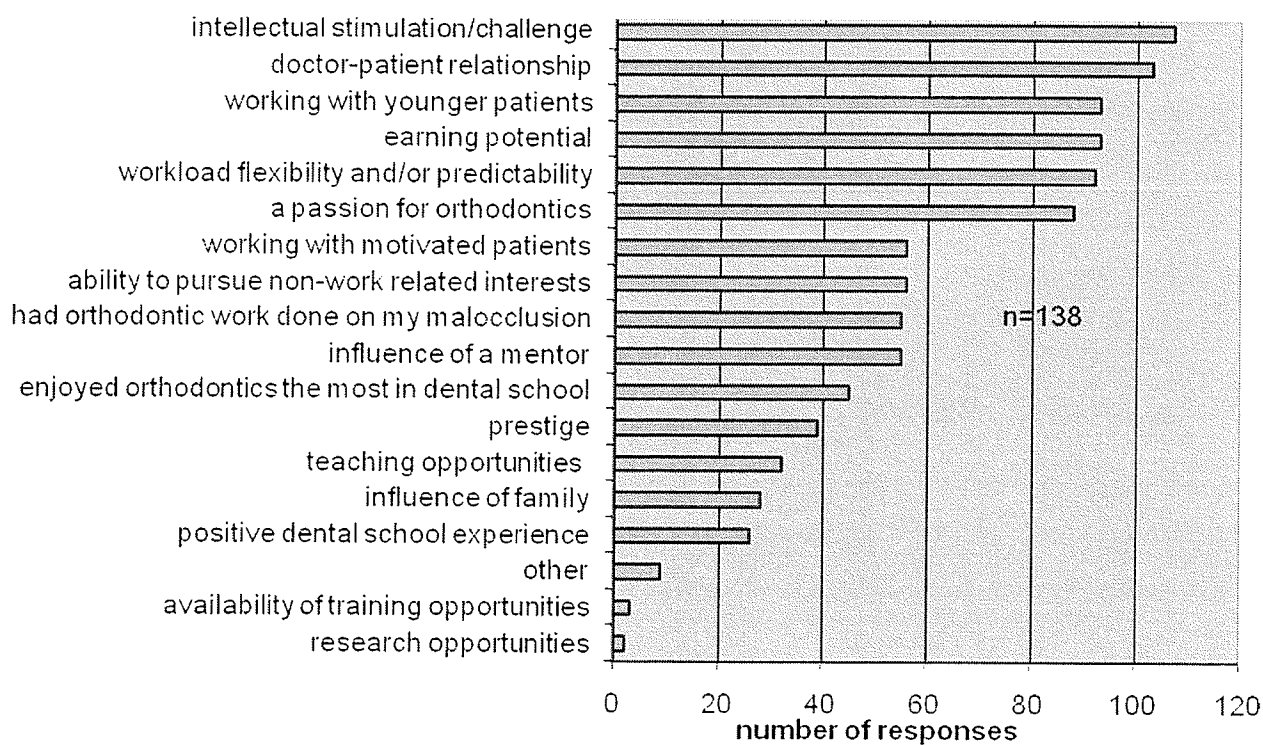
Respondents were presented with a list of factors influencing their desire to pursue graduate orthodontics and were encouraged to select as many factors that influenced their decision. Intellectual stimulation/challenge emerged as the most common reason for

respondents in the US to choose orthodontics as a career. Doctor/patient relationship, a passion for orthodontics, earning potential and working with motivated patients were other important factors identified by respondents (Figure 4).

Figure 4.

Response of orthodontic residents in the US to the question "What were the main factors influencing your decision to pursue an Orthodontic residency training program?"

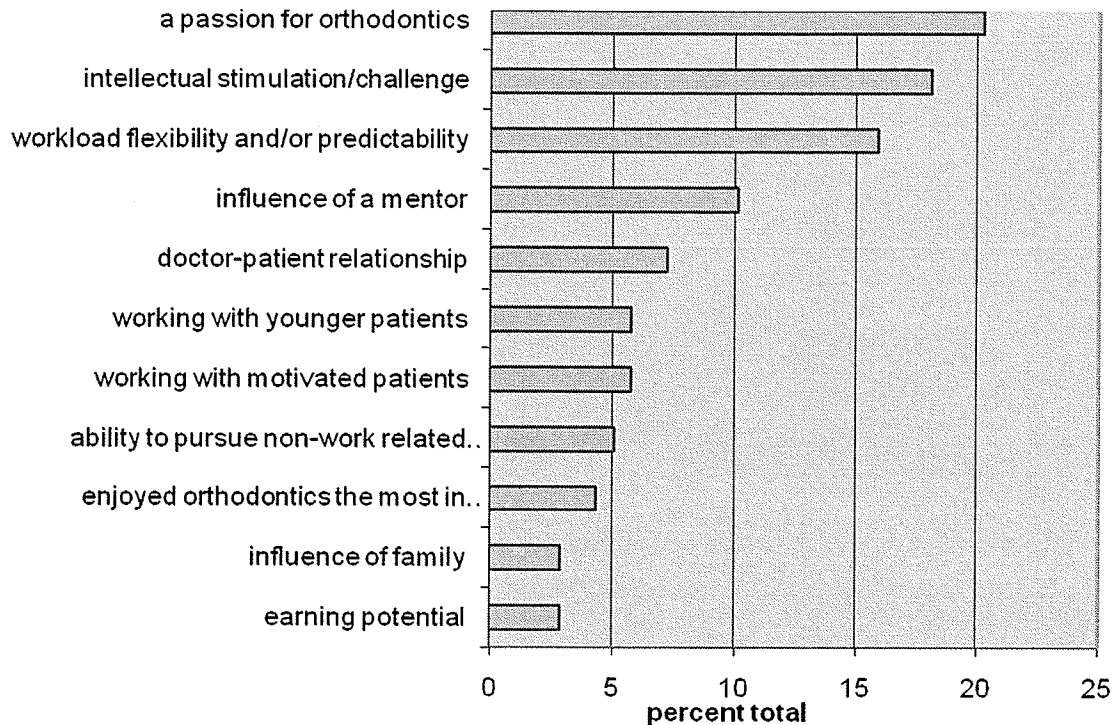
Respondents were given the option to select all answers that apply.



Residents were then asked to identify the single most important factor for choosing orthodontics. The results were: a passion for orthodontics (20.29%), intellectual stimulation (18.12%) and workload flexibility and/or predictability (15.94%) (Figure 5).

Figure 5.

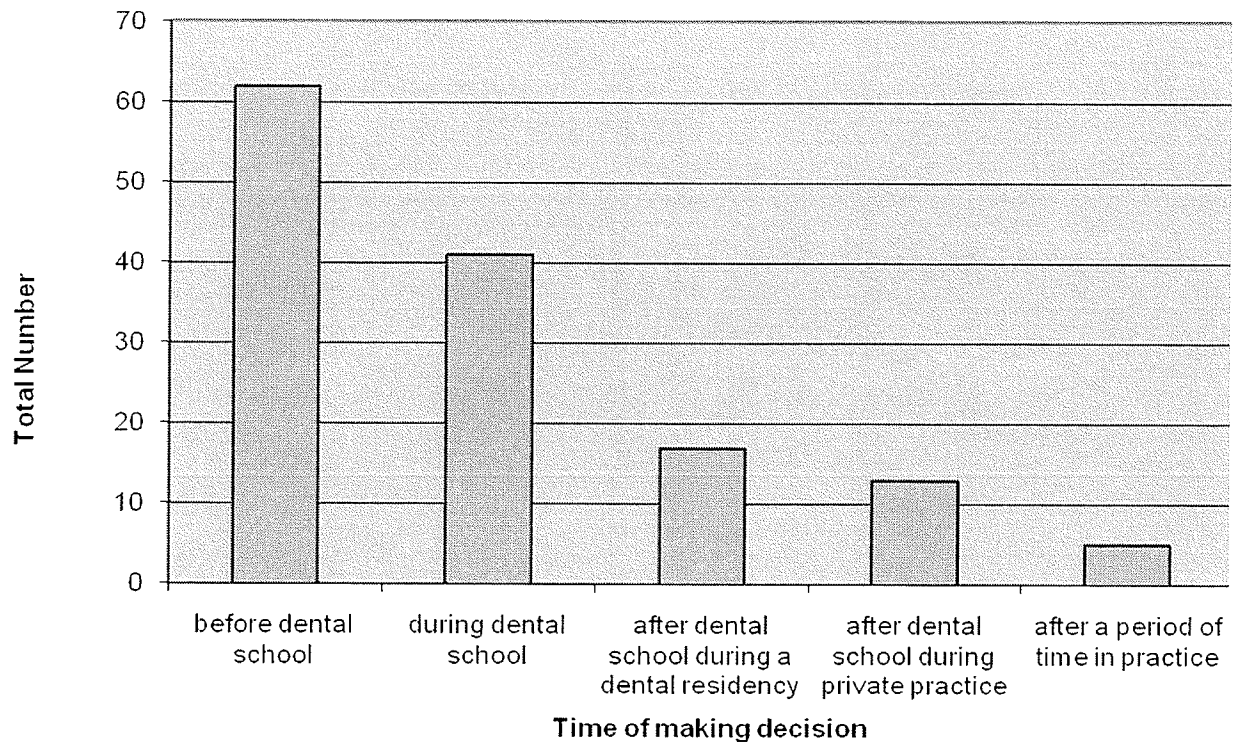
Responses of US residents to the questions, "What was the single most important factor influencing your decision to pursue an Orthodontic residency training program", n=138.



When asked when they made the decision to pursue graduate orthodontics as a career, most respondents (44.93%) said that they decided to pursue orthodontics before they were in dental school, while 29.71% decided during dental school and 12.31% decided after dental school during a dental residency (Figure 6).

Figure 6.

Response of orthodontic residents in the US to the question, "When did you decide to pursue an Orthodontics training program?"(n=138).



Debt and Future Income

The average debt of orthodontic residents upon graduation in US dollars was found to be \$165,226 (n=127) with a range of \$0 to \$500,000 in US dollars. When asked about projected income one, five and ten years after graduation, the results in US dollars were as follows: one year after graduation, residents expect on average to make \$137,570 (n=116) with a range of \$60,000 to \$250,000; five years after graduation \$306,336

(n=116) with a range of \$75,000 to \$1,000,000; ten years after graduation \$645,307 (n=116) with a range of \$200,000 to \$5,000,000.

Future Life and Career Plans of Orthodontic Residents in the US

Residents were asked what their practice plans were following graduation. Respondents were allowed to indicate all answers that applied. The most popular choice was to practice orthodontics as an associate (32.35%, n=55) followed by buying into an existing practice (31.18%, n=53), and then starting their own orthodontic practice (21.76%, n=37). Only 1.76% (n=3) intend to pursue a full-time research and teaching career and 1.76% (n=3) intend to pursue graduate training in the form of an MSc or PhD or work in research (Table 6).

Table 6.

Future career plans of orthodontic residents in the US expressed as a percent.

Table 6. Future plans of Orthodontic Residents (percent).	
Practice orthodontics as an associate	32.35
Practice orthodontics by buying into an existing practice	31.18
Practice orthodontics by starting a new practice from scratch	21.76
Military	2.35
Pursue a full-time research and teaching career	1.76
Pursue a graduate degree (MSc, PhD) or work in research	1.76
Apply for fellowship training	1.18
Undecided	7.65

Further, when asked what type of practice setting they will practice in, 89.05% (n=122) said private practice, 1.46% (n=2) said primarily a community setting, 1.46% (n=2) said

primarily an academic setting (i.e., teaching hospital or research institute), 6.57% (n=9) a combination of a community and academic setting and 1.46% (n=2) were undecided. Most residents plan to practice in an urban or suburban setting (75.91%). Only 13.14% plan to practice in a rural setting and 2.92% in an inner city. A total of 42.34% indicated that they want to work in a solo practice, 30.66% in a group practice and 26.28% were undecided. Although not significant, there was a trend towards more females associating and males buying or starting a practice. Most residents (92.75%) intend to practice full-time, defined as more than three days per week. Once in practice 41.61% of respondents indicated no time commitment devoted to clinical or didactic research; while 21.17% said they would like to spend 25% of their time on research.

Future Practice Plan of Orthodontic Residents in the US

Responses to questions about projected practice mechanics indicated that:

- 1) 63.04% of orthodontic respondents were planning on using self-ligating brackets in their practice, 30.43% said maybe and 2.17% were unsure and only 4.35% said they would not.
- 2) A total of 45.65% of residents said they will use indirect bonding, 39.13% said maybe, 12.32% said no and 2.90% were unsure.
- 3) Only 10.87% of residents said they plan on using lingual orthodontics in their private practice while 61.59% said no, 23.19% said maybe and 4.35% were unsure.
- 4) When asked if they plan to use Invisalign™, 84.06% said they would, 13.04% said maybe and 2.9% said no.

5) A total of 92.03% of residents said they plan on using temporary anchorage devices (TADs), 6.52% said maybe, 1.45% were unsure and not a single resident said no. When asked if they would place the TADs themselves, 77.26% said yes, 17.52% said maybe, 6.57% said no and 3.65% were unsure.

6) Most residents (70.07%) indicated that they plan to use two-phase treatment in private practice, 25.55% said maybe, 3.65% said no and 0.73% were unsure.

7) A total of 61.59% of residents said they plan to functional appliances, 27.54% said maybe, 8.70% said no and 2.17% were unsure.

8) The residents were asked if they will use cone-beam computerized tomography in their practice. A total of 28.26% said yes, 47.10% said maybe, 17.39% said no and 7.25% were unsure.

9) When asked if they will use a digital imaging program, 92.75% said yes, 5.07% said maybe, 1.45% said no and 0.72% were unsure.

This is further illustrated in Table 7.

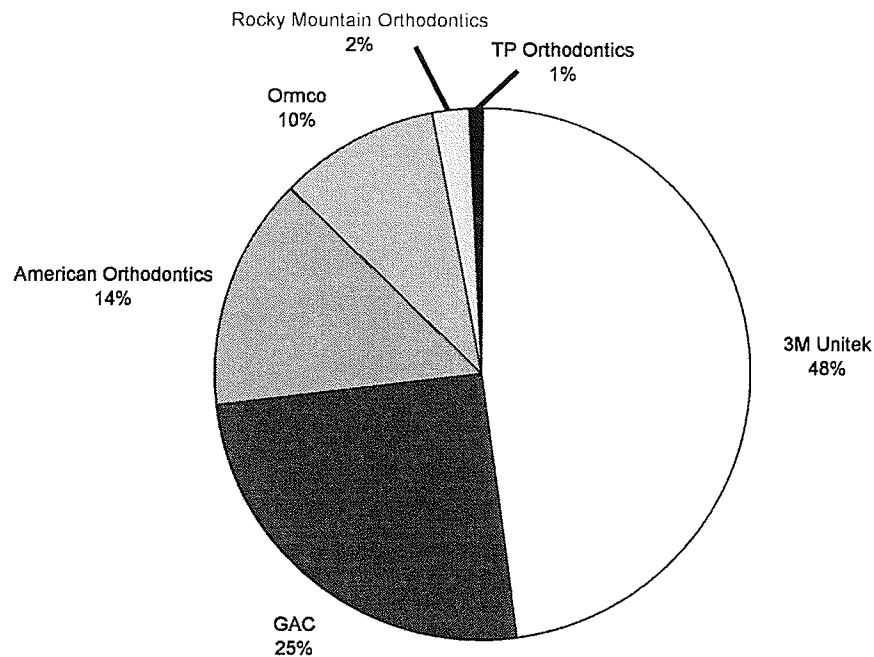
Table 7.

Future clinical practice plans of orthodontic residents in the United States.

	Yes (%)	No (%)	Maybe (%)	Unsure (%)
Do you plan on using self-ligating brackets in your practice?	63.04	4.35	30.43	2.17
Do you plan on using Invisalign® in your practice?	84.06	2.90	13.04	0.00
Do you plan on using temporary anchorage devices in your practice?	92.03	0.00	6.52	1.45
If yes, do you plan on placing these temporary anchorage devices yourself?	72.26	6.57	17.52	3.65
Do you plan on using cone-beam computerized tomography in your practice?	28.26	17.39	47.10	7.25
Do you plan on using a digital imaging program in your practice?	92.75	1.45	5.07	0.72
Do you plan on using indirect bonding in your practice?	45.65	12.32	39.13	2.90
Do you plan on using lingual orthodontics in your practice?	10.87	61.59	23.19	4.35
Do you plan on performing two-phase treatment in your practice?	70.07	3.65	25.55	0.73
Do you plan on using functional appliances in your practice?	61.59	8.70	27.54	2.17
Do you plan on receiving ABO certification after graduation?	81.16	5.80	12.32	0.72
Should it be mandatory for all orthodontic graduates to receive - ABO certification to practice orthodontics in the US?	18.12	64.49	11.59	5.80

Residents were asked from what company they plan to purchase brackets; 3M/Unitek emerged as the favored company followed by GAC and American Orthodontics (Figure 7).

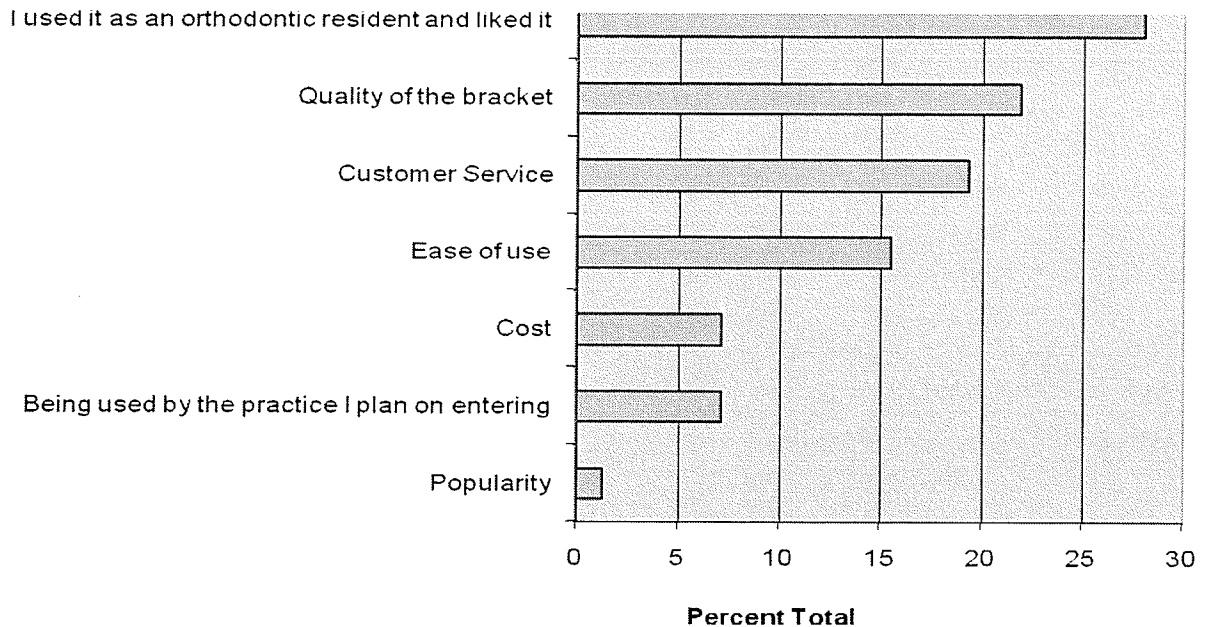
Figure 7.



When probed for the reason(s) for their preference, respondents indicated that the most important reasons were that they used the company product as a resident and liked it (27.97%), quality of the bracket (21.86%), customer service (19.29%) and ease of use (15.43%) (Figure 8).

Figure 8.

Why residents in the US plan on purchasing brackets from a specific company (residents were allowed to select more than one choice).



Residents were asked about the appropriate length of graduate orthodontic programs and the requirement for a Master of Science as a component of the program.

Most residents (77.94%) felt that a shorter 24 to 30 month program adequately prepares orthodontic residents and the exact same amount (77.94%) said that a 36 month full-time University Standard length of program should not be enforced for licensure.

Residents were asked if they felt that orthodontic residents should be required to undertake a Master of Science component during their education program. A total of 36.50% said yes, 36.50% said no and 25.55% said maybe.

When asked about plans to become certified by the American Board of Orthodontics (ABO), 81.16% of respondents said yes, 12.32% said maybe and 5.80% said no (Table 7 above). However, only 18.12% felt ABO certification should be mandatory to practice in the US, while 64.49% said it should not be mandatory.

4.3 COMPARISON OF ANSWERS OF CANADIAN VERSUS US ORTHODONTIC RESIDENTS

The responses of the Canadian Orthodontic residents were compared with the orthodontic residents from the US using chi-squared comparative analysis and the results are depicted in Table 8.

Table 8.

Chi-squared compared analysis comparing responses of orthodontic residents from Canada and the US.

<u>QUESTION</u>	<u>P-VALUE</u>
What was the single most important factor influencing your decision to pursue an Orthodontic residency training program?	<0.001
When did you decide to pursue an Orthodontic training program?	<0.001
What are your future plans after training?	0.310
What type of setting will you most likely practise in?	0.405
What type of population do you plan on primarily serving?	<0.001
What type of practice will you work in?	0.351
Do you plan on practising part-time or full time?	0.187
Approximately how much time will you dedicate to research (basic or clinical)?	0.110
Do you plan to include the treatment of cleft lip and palate and	0.0447

craniofacial anomaly patients in your practice?	
Do you plan on using self-ligating brackets in your practice	0.0349
Do you plan on using Invisalign™ in your practice?	0.0497

The results indicate that orthodontic residents from Canada and the US have different motivations for becoming an orthodontist. A significant number of more Canadian orthodontic residents versus US orthodontic residents indicated that they are more likely to become an orthodontist because of intellectual stimulation and a doctor patient relationship ($P < 0.001$). A significant number of more US orthodontic residents versus Canadian orthodontic residents are more likely to become an orthodontist because of a passion for orthodontics (< 0.001).

A significantly number of more US orthodontic residents versus Canadian orthodontic residents decided to become an orthodontist prior to entering dental school and less choose to enter the orthodontic profession during dental school (< 0.001). More Canadian orthodontic residents decided to become an orthodontist during dental school and Canadian orthodontic residents are significantly less likely than their US counterparts to decide to become an orthodontist before dental school ($p < 0.001$). Canadian orthodontic residents are less likely to practice in rural settings and more want to practice in urban centres versus their US counterparts ($p < 0.001$). Orthodontic residents in the US are more likely to say “yes” to treating patients with cleft lip and palate and craniofacial anomalies after they graduate ($p < 0.0447$) than Canadian orthodontic residents. A significant number of more Canadian orthodontic residents versus US orthodontic residents are more likely to say “Yes” to using self-ligating brackets in their clinical orthodontic practice

($p < 0.0349$), although there were many orthodontic residents in the US who said “maybe”.

A significant number of Canadian orthodontic residents are also more likely to use

Invisalign™ in clinical practice versus their US orthodontic resident counterparts

($p < 0.0497$).

5.0 DISCUSSION

There are currently no validated instruments to administer to postgraduate residents in health care to evaluate education, motivations and future career, life and practice plans. The two studies by Keith administered to orthodontic residents in the US and UK had similar questions, however the study by Bruner was different (Keith, 1994; Keith, 1997; Bruner 2005). It was therefore decided to construct a novel instrument to administer to Canadian orthodontic residents (Appendix 9.7). Following the administration of the questionnaire to Canadian orthodontic residents, it was decided to administer the questionnaire to orthodontic residents in the US. The questionnaire was then expanded; additional questions were included in the future clinical practice plans section and modifications were made because the questionnaire was being administered in a different country. Questions about the ABO examination were also included. The results from the survey to orthodontic residents in Canada and the US can therefore be compared directly as both studies utilized identical multiple choice questions and options.

Response Rate

The literature describes two surveys of residents from the US published over the past 13 years (Keith, 1994; Bruner, 2005) and one survey of residents in the UK (Keith, 1997). Keith and Proffit published a survey of orthodontic residents attending the Graduate Resident's Orthodontic Conference (GORP) and were able to obtain a response from 168 residents or 81% of those attending (Keith, 1994). Bruner conducted a similar study at the GORP meeting in 2003 in addition to mailing a survey and was able to obtain

participation from 330 residents or a response rate of 77% which represented a total of 46% of US orthodontic residents (Bruner, 2003). Keith also conducted a survey of orthodontic residents in the UK and obtained a response from 57 residents representing a response rate of 64% (Keith, 1997).

Our response rate in the present Canadian study of 81.48% is comparable to that obtained by Keith and Proffit¹ of 81% in the United States and represents a higher response rate than the other studies undertaken in the US and the UK. This excellent response rate is likely a result of the cooperation of program directors and chairs in Canada who all agreed to allow their residents to participate in this study and provided the email addresses of their residents. Also, Canadian orthodontic residents are likely more willing to assist a fellow orthodontic resident from their home country of Canada complete a research project, particularly those residents who belong in the same program from which the study was conducted. There is indeed a strong fellowship and camaraderie that exists amongst orthodontic residents in Canada. They initially meet one another during the interview process at different orthodontic programs throughout Canada and then meet once a year at the 3M/Unitek bottom line conference and see each other at other conferences such as GORP, the AAO or CAO. There is a sense of friendship and support at these meetings and this was further displayed by the response rate obtained in this survey.

In the questionnaire administered to orthodontic residents in the US, 136 residents of the 335 who were sent an email completed the entire 57-item survey representing a response rate of 40.60% (138 residents started the survey, but two residents did not complete the survey in its entirety). This is a smaller sample size than the two previous US studies.

The response rate is significantly less than the Canadian orthodontic residents survey and the previous surveys conducted in the literature of orthodontic residents in the US and UK. The smaller sample size was influenced by access to graduate resident email addresses since many program chairs/directors did not overwhelmingly cooperate in providing their resident email addresses. Further, some programs did not only fail to respond to emails sent, but did not respond to phone messages even after three attempts. In some cases, when a phone call was made, the receptionist indicated that the program chair or director did not want to talk and simply wanted to tell me that they're not interested in participating.

It was disappointing that only 18 of the 65 program directors and chairs of US programs responded to the initial email that was sent out. Program directors themselves have students who undertake research projects, and part of the mission of Universities should be to support research and the promotion of knowledge in the literature. The lack of response to emails and phone messages and the unwillingness demonstrated by program directors and chairs to provide permission for their residents to participate in a University based study that has received ethics approval from an independent University research ethics board, may be an indication of program directors to apathy towards research and helping other Universities conduct research. Program directors may not have wanted to participate because this was not a study funded by the American Association of Orthodontists, the American Dental Education Association, or the American Dental Association. They may have also felt that a University from a foreign country should not be undertaking such an extensive research investigation of residents and programs in their

domestic country. Another reason could be that program chairs and directors are much too busy to respond to emails.

Further, some program directors and chairs did express that they were unwilling to share resident personal information due to privacy issues reported in the Health Insurance Portability and Accountability Act of 1996 (HIPAA).

The low participation rate of US orthodontic residents also may have been due to them not being interested in participating in a relatively lengthy questionnaire containing 57 questions, even though they were advised that the survey would take only 10-15 minutes to complete. Also, US orthodontic residents may have been reluctant to participate in a study from a University in another country that they may never have even heard of.

However, despite a smaller sample size than the two previous studies, the sample nevertheless represents orthodontic residents from 37 programs distributed throughout the US allowing for tentative conclusions to be drawn.

On-Line Questionnaire

The previous investigations in the literature gave orthodontic residents a questionnaire in the GORP meeting. The advantage of an on-line questionnaire was that it allowed residents to complete the survey on their personal computer at a time and location convenient and comfortable to them. They were not constrained by time limits or feeling rushed while attending an orthodontic resident conference, but could sit and reflect over the questions being asked. Further, because this was an on-line questionnaire, the data was assembled into an MS Excel file and there were no data entry error that occurred. There was also no opportunity for residents to enter ambiguous or multiple answers, as

they may do in a paper questionnaire. There is also no issue of having to interpret illegible handwriting.

5.1 Orthodontic Residents in Canada

There has never been a published survey of Canadian orthodontic residents. The current study helps to identify the motivations of orthodontic residents in Canada for choosing orthodontics and their future practice, career and life plans.

Reasons for choosing orthodontics

Keith and Proffit found that the most common reason for US residents choosing orthodontics as a career was expected future job satisfaction (89.7%) (Keith, 1994). They also found that 13.7% of orthodontic residents in the US chose orthodontics as a career because they were dissatisfied with general dentistry.

Keith found that the most common reason for UK residents choosing orthodontics as a career was also expected job satisfaction (93%) (Keith, 1997). Other reasons emerging from Keith's study included: lifestyle (39%), good career structure (44%), no "on-call" (33%), financial security (25%), dissatisfaction with general dentistry (21%) and an alternative to oral surgery (18%).

The current study of Canadian orthodontic residents found that they decided to pursue a career in orthodontics because of intellectual stimulation, a passion for orthodontics, working with younger patients, workload flexibility and/or predictability, earning potential and a positive dental school experience in orthodontics.

Intellectual stimulation and a passion for the specialty are probably closely related to an expectation for “future job satisfaction”, which would dovetail with the main reason why residents choose orthodontics in Canada, the UK and the USA. Canadian residents also identified with UK residents with respect to career structure, workload flexibility/predictability as well as earning potential of their future career. While orthodontic practice may differ in the UK and North America, there nevertheless appears to be a common thread in residents’ perceptions in the three countries. The multiple choice options offered to Canadian residents was different than those offered in the previous studies, which makes it difficult to compare the studies directly.

Future Plans after graduation

In terms of future plans after graduation, Keith and Proffit found that 84% of residents’ intentions were to enter private practice with about 50% planning on establishing a solo practice or immediately buying in as a partner, with the other 50% expecting to enter an associateship type of practice (Keith, 1994). Unfortunately, only 6% of respondents planned to teach after graduation. Bruner found similar results where in his questionnaire he found that 82% of residents indicated that they intend to enter private practice after graduation, while only 3% of residents had plans for academia and 4% considered either academia or something else (Bruner, 2003). Interestingly, 40% of residents reported that they would be interested in full-time academics if the salaries at universities would improve. This suggests that the decreased salaries offered by universities as compared with private practice is an important reason for the low interest of residents in pursuing an academic career.

Orthodontic residents in the UK had comparable responses with only 7% indicating an interest in an academic career after graduation. Similar results were found in the current study among Canadian orthodontic residents with 82% indicating they intend to work in a private practice setting. Also, after graduation, 45% intended on becoming an associate in an existing practice, 13% were planning on starting their own practice and 23% planned to buy an existing practice.

Only a mere two Canadian orthodontic residents indicated that they were interested in pursuing an academic career after graduation. Our present study further confirms the concerns of educators and professional organizations that the future of orthodontic education is in a crisis situation due to a lack of full-time orthodontic professors (Larson, 1998; Haden, 2000; Meskin, 2000; Trotman, 2002; Lindauer, 2003; Livingston, 2004; Nunn, 2004; Flores-Mir, 2007; Noble, 2007). Indeed, the specialty of orthodontics in Canada, the US and the UK is not immune to the concerns of the dental profession at large regarding the ability to recruit and retain residents who will eventually opt to become full-time, tenured academics.

Most orthodontic residents indicated that they plan to practice in major urban cities and there was not a single orthodontic resident who indicated that they plan to practice in smaller cities or rural areas. This may indicate a future need for orthodontists in these potentially under-serviced areas. Government, professional organizations and academic institutions may want to institute measures, either independently or collaboratively, to address these potential issues. Otherwise, there may be access to care issues that exist or that are exacerbated in the orthodontic profession in Canada. This may shed a negative image of the orthodontic profession in the eye of the Canadian public.

Most residents intend to work more than three days per week, which was defined as full-time. No significant difference was demonstrated between gender and the decision to work full-time or part time. This was similar to the results of Bruner in his 2003 study (Bruner, 2005). It may therefore be a generalized misconception that female orthodontists plan to practice more part-time than their male counterparts.

Future Practice Plans

An interesting finding of our study was that an overwhelming number of residents indicated that they plan to use self-ligating brackets and Invisalign™ after graduation. This demonstrates that graduate orthodontic programs are potentially very fertile grounds for stimulating the acceptance of modern orthodontic technologies and thus the future use of bracket systems and techniques by residents when they enter private practice, based on their experiences in the graduate program.

Thirty percent of residents said they plan to include the care of patients with cleft lip and palate and craniofacial anomalies in their practice. This shows altruism from certain graduating orthodontic residents, despite the potentially difficult, long-lasting care and often minimal financial benefit of treating these patients. However, the 70% of residents not planning on treating these patients may be reluctant to do so due to a lack of exposure to these patients during their residency and not necessarily due to a lack of altruism.

Only one Canadian resident indicated an interest in pursuing fellowship training either in Canada or the USA, the assumption being that the fellowship program is in the treatment of patients with cleft lip and palate or craniofacial syndromes. With most craniofacial deformities being either faculty or hospital-based, it is a looming problem that with

retiring full-time faculty with expertise in this area, the future availability of services may be at risk.

5.2 Orthodontic Residents in the US

Reasons for choosing orthodontics

The answers obtained when orthodontic residents in the US were given a list of factors that influenced their decision to choose orthodontics and asked to choose all answers that apply versus to choose the single most important factor were different. When choosing multiple answers, intellectual stimulation/challenge emerged as the most common reason why US residents chose orthodontics as a career, while a passion for orthodontics ranked sixth (Figure 4). However when asked to identify the most important, residents indicated that a passion for orthodontics was the single most important factor (Figure 5).

When given the option to enter multiple influences, six factors obtained more than 60 responses; however when residents were asked to pick a single factor, only three factors emerged as choices (a passion for orthodontics, intellectual stimulation/challenge and workload flexibility and/or predictability).

Another interesting finding was that earning potential ranked low as a single important factor, but was selected with a high frequency when residents were permitted multiple options. For political correctness, residents may be hesitant to indicate earning potential as the most important factor despite the anonymity of the questionnaire, but it certainly emerged as an important overall factor in their decision to become an orthodontist.

Keith and Proffit in the US and Keith in the UK reported that both groups of residents indicated that future job satisfaction was the most common reason for choosing

orthodontics (Keith, 1994; Keith, 1997). These studies however cannot be directly compared because different multiple choice options were offered, although the responses may be related.

In descending importance, US residents indicated that intellectual stimulation/challenge, doctor-patient relationship, working with younger patients, earning potential, workload flexibility and /or predictability and a passion for orthodontics as the most important reasons for pursuing orthodontics. This was similar to Canadian residents whose main factors were intellectual stimulation, a passion for orthodontics, working with younger patients, workload flexibility and/or predictability, earning potential and positive dental school experiences. Therefore, it seems that there is a commonality in the expressed motivations for becoming an orthodontist by orthodontic residents in the UK, Canada and the US.

While the “passion for orthodontics” factor ranked highly, it is difficult to determine how the majority of residents have developed this “passion” prior to even entering dental school. Moreover, one is left to wonder how with limited access to clinical orthodontics in most undergraduate programs, this “passion” for a dental specialty may be developed. Perhaps these individuals may be influenced by their perception of orthodontics as the *prima donna* of dental specialties, experience as a patient and comments of others including general dental practitioners.

An alternate interpretation is that the experience of dental school convinced at least 40% of orthodontic residents that they were “unpassionate” about general dentistry or other specialty areas. It should be apparent that at least most specialty areas in dentistry provide “intellectual stimulation” and this should not be a unique descriptor to

orthodontics. It could be that applicants have a perception that orthodontics functions at a higher intellectual level in comparison to the limited exposure in dental school.

It was found that most US residents decided to become an orthodontist prior to entering dental school (Figure 6). It is unusual for a true “passion for orthodontics” to be manifested prior to dental school. Rather, residents may have been influenced by other confounding factors in life prior to dental school that motivated them to become an orthodontist. Examples of these factors include: orthodontic treatment they received as a child; if they have a parent or family member who is an orthodontist; general preconceived notions about orthodontics as portrayed by the media and public; or the lifestyle and career satisfaction of the orthodontist they see in their community.

The response pattern is inherently problematic as residents say they chose orthodontics because of intellectual stimulation/challenge and a passion for orthodontics and this is coupled with the time that they made their decision being before entering dental school. If residents truly have this intellectual interest and passion for orthodontics, this is not reflected by an interest to pursue academics, teaching and even research. Perhaps a possible solution to the academic crisis may be addressed in changing the selection process in orthodontic residency programs to allow for the selection of candidates without these preconceived notions of orthodontics that are developed prior to dental school. Instead, selection of candidates for admission who develop a true passion while being inspired in dental school, or an intellectual interest in orthodontics after years of practicing general dentistry, may result in more residents with an interest in pursuing academics.

Future Plans after graduation

Residents were asked about their practice plans following graduation and were allowed to select all responses that apply. The most popular option selected was to practice orthodontics as an associate (32.35%), followed by buying into an existing practice (31.18%) (Table 6). Further, when asked what type of practice setting they intend to practice in, 89.05% said private practice, 1.46% said primarily a community setting, 1.46% said primary an academic setting (i.e., teaching hospital or research institute) and 6.57% said a combination of a community and academic setting. It would be expected that at the minimum, the five residents in an extended four year program would express an interest in an academic career as the extended program presumably involves a significant research component leading to the attainment of a doctorate degree. Interestingly, only two residents indicated an interest in full-time academics. Moreover, these two residents may be registered in a two or three year program. Even if it was assumed that these two individuals are two of the five residents in an extended program. This would mean that 60% of residents in extended programs do not plan on pursuing a full-time academic career. Program chairs therefore cannot expect that the acceptance of a resident into an extended length program will guarantee that he or she will subsequently pursue an academic career. Indeed, because orthodontics is the most competitive of all the dental specialties (ADA survey, 2005), these individuals may express an interest in an academic career at the time of their interview for the purpose of being accepted. Either their experiences have discouraged a career in academia or their ultimate true intentions of pursuing private practice once the program is complete became obvious. This notion of residents expressing an interest in teaching at the time of their interview only to have

this sentiment disappear at the time of graduation has previously been expressed in the literature (Ferreira, 2007; Turpin, 2007).

Residents were questioned what percent of time they intend to dedicate to either clinical or didactic research and indicated they plan to dedicate very little time to research. These results confirm the results of previous studies and the notion that orthodontics, like other areas of dentistry, will likely continue to have significant difficulties in the recruitment of full time academics (Larson, 1998; Haden, 2000; Meskin, 2000; Trotman, 2002; Lindauer, 2003; Livingston, 2004; Nunn, 2004; Flores-Mir, 2007; Noble, 2007).

However, 21.17% said they would like to spend 25% of their time on research. This may mean that residents would be interested in a part-time academic career. The survey unfortunately did not ask if residents intend to pursue a part-time academic career.

If residents do indeed pursue orthodontics because of a passion for orthodontics and intellectual stimulation/challenge, then why aren't more residents choosing to pursue an academic career and dedicating more time to research? One possibility is that dental and orthodontic educators need to be more successful in converting this expressed "passion and intellectual stimulation/challenge" into an interest for teaching and research.

Alternatively, could it be that these residents do not truly have this passion and intellectual stimulation/challenge for orthodontics, and are instead motivated to become an orthodontist due to other factors such as earning potential and lifestyle?

Yet another distinct possibility is that current guidelines for program directors in orthodontics to be certified by the American Board of Orthodontics places too heavy a focus on clinical orthodontics. This requirement may prevent the hiring of program directors based on higher doctorate degrees, research, teaching ability and scholarly

activity. This may subsequently translate into a clinically focused program which may result in breeding a generation of orthodontists lacking an interest in research and scholarly activity.

The investigation by Keith and Proffit found that only 6% of US residents planned to teach. Bruner found only 3% of residents had plans for academia and 4% considered either academia or something else (Keith, 1994; Bruner, 2005). Keith found that only 7% of UK residents had an interest in academia after graduation while in Canada. It was found that only two of forty-four Canadian residents were interested in academics (Keith, 1994). In the study by Bruner, 40% of residents reported that they would be interested in full-time academics if the salaries at universities would improve. Flores-Mir summarized possible solutions to this crisis which include more training stipends (Till, 1975; Flores-Mir, 2007), increased flexibility to move through academic ranks, recruitment of immigrants to academia (Till, 1975; Tuncay, 2001), supplementation of salaries through intramural and extramural practice (Kula, 2000; Tuncay, 2001), the use of government funds to subsidize students' education with the requirement that the student enters academics (Johnson, 1998; Tuncay, 2001), and requesting funds from graduates to supplement faculty salaries. Another important recruitment strategy is for faculty to provide mentorship to dental students to become involved in student life and research and attempt to inspire them early in their careers to contemplate an academic career (Noble, 2007). Inherent in this mentorship is for faculties of dentistry to develop an enriched and positive dental school experience. Other solutions include funds to sponsor residents during their training and instituting research grants and programs for dental students to obtain additional degrees to help stimulate and nourish an interest in research. Based on

the results of the current study, orthodontic educators may want to consider a different cohort of applicants who have or may be inspired to develop a genuine interest in research and teaching during dental school as the current pools of orthodontic residents are not filling the gaps in the dramatic shortage of academics.

It may be worthwhile to consider the recruitment of students with backgrounds in education or research as they may truly hold teaching and research as their first passion. Another alternate may be to generate an interest in teaching and research during dental school by summer research projects or through creation of research projects leading to a bachelors of science degrees in dentistry. Students who express interest in these programs may be groomed for careers as dental educators and researchers. However, most students engaged in student research may do so to enhance their opportunity for admission to graduate programs (or due to the fact that they get an additional degree and funding during their summer vacations at universities).

Most residents plan to practice in an urban or suburban setting (75.91%). Only 13.14% plan to practice in a rural setting and 2.92% in an inner city. Similar trends in were found in Canada. This evidence suggests that the profession in the US and Canada may need to take measures to ensure that there is access and availability of care in rural and under-serviced areas. Orthodontic programs may need to accept students from rural and underserviced settings who plan on returning to these communities. Orthodontic specialty programs may need to develop outreach programs in these areas and send residents to provide the needed orthodontic services as the social obligation inherent in dental colleges and graduate programs to address access to care issues. In doing this, residents may be more likely to continue providing care to these under-serviced areas

after graduation. The long-term solution may be to instil in residents a sense that as health care professionals they have a social responsibility for ensuring access of care to all individuals (Noble, 2005).

The majority of residents said that they plan to work full-time which was defined as more than three days per week. There was no significant difference found between gender and age variables. This may be due to the increased debt residents develop upon graduation. The study found that the average debt was \$165,226. This is an increase of more than \$30,000 from the amount of debt in 2002 of \$132,000 as reported by Lindauer and others (Lindauer, 2003). This is less than the average total debt for dental graduates reported at \$200,339 by the American Dental Association in 2006 (ADA survey centre, 2006). It was also previously reported that the average debt of Canadian dental student's is \$24,000 to \$26,000 per year (Matthew, 2006; Matthew, 2006; Walton, 2006; Walton, 2006; Turpin, 2007). This debt has been implicated as a reason why residents fail to pursue academic careers (Turpin, 2007). Help in alleviating this debt may facilitate more residents to pursue academic careers. Further, this high debt may suggest why such a high number of residents indicated that they plan to work as associates after graduation instead of buying into a practice or starting one from scratch. A solution may be to obtain a commitment by residents to deliver care to underserved areas in exchange for debt-relief or reduced tuition. However, cash-strapped universities may find it challenging to act as funding institutions for students.

Interestingly, residents do not seem to expect to make an income level adequate to both reducing this debt and sustaining a reasonable lifestyle until five years after graduation. Residents indicated that they expect to make on average only \$137,570 (range \$10,000 to

\$250,000) in their first year with some residents believing they will make a salary as low as \$60,000. If orthodontic residents are willing to accept salaries as low as \$60,000, why are these individuals not becoming academics? If educational institutions or the government can provide a means to supplement the cost of a resident education with the requirement that he or she teach following graduation, more residents may be willing to accept an academic salary knowing they will graduate without debt. However, residents may be motivated to become involved in teaching dental students after graduation as potential future referral sources, or to impress their patients. Also, the residents who anticipated an initial low income level may be starting a new practice without referral sources, student debt reduction and any patients. These residents may have a medium-term financial plan in place to allow their practice to build and mature. Another possibility is that residents underestimated their projected income for political correctness.

The majority of residents indicated that they intend to work full time (more than three days per week). No significant difference demonstrated between gender and the decision to work full-time or part time. These results were similar to those found in the survey of Canadian residents indicating that female orthodontic residents, like their males counterparts, plan to practice full-time.

Future Practice Plans

In assessing the responses to questions in the present study, it is of interest to note the percent of respondents who indicated that they would use a specific technology. While these responses are insightful to project future orthodontics practice, the negative, maybe or unsure responses should not be ignored.

The response to questions about the future use of technology by orthodontic residents in the US is illustrated in Table 7. Similar to the Canadian study, most respondents plan to use self-ligating brackets and Invisalign™ and very few were adverse to use either. Both self-ligating brackets and Invisalign™ are heavily marketed to residents by orthodontic companies which may be a factor influencing resident responses. Orthodontic companies make self-ligating available to residents as a donation or at a reduced rate, whereas Invisalign™ provides each orthodontic residency program a number of free cases. Residents therefore have the ability to assess these technologies and compare them to more traditional techniques. Based on their answers, residents appear to be inclined to use self-ligating brackets (63.04%) and Invisalign™ (84.06%) while only 4.35% and 2.9% of respondents indicated they would not use these technologies.

An overwhelming number of US residents (92.03%) said they plan to use TADs in their practices and most were prepared to place these devices themselves (92.03%). Residents may have indicated a desire to place TADs themselves because they are not far removed from dental school or general dental practice and may feel comfortable with the administration of local anaesthesia and performing surgery. However, it may therefore be prudent for the orthodontic profession to engage in a discourse with other dental providers about the placement of TADs. This increased tendency of future orthodontists to place TADs may result in a “turf war” with periodontists, oral surgeons and general dentists. These groups may feel that the orthodontist is encroaching on procedures they should undertake and that the placement of TADs is beyond the scope of practice of the orthodontist. Numerous hands-on continuing education courses have been made available to educate orthodontists in the placement of TADs and many orthodontic

programs are teaching residents to place TADs themselves. This sentiment is supported by the profession at large. For instance, a group of orthodontists who met at the 2004 AAO meeting in Orlando indicated that it is the orthodontist who has the best knowledge on placement of TADs (Mah, 2005).

Most respondents (92.75%) indicated that they plan to use digital imaging programs. Almost half of the respondents (45.65%) plan to use indirect bonding while 28.26% indicated they would use cone-beam computerized tomography. Only 10.87% of residents plan to use lingual orthodontics following graduation. These responses suggest that orthodontic residents are prepared to incorporate technological advances in their practices. Needless to say, orthodontic residents are a fertile group for the marketing efforts of orthodontic supply companies.

Unlike experienced orthodontists, residents do not have preconceived notions of how things have previously been undertaken and do not need to re-learn a technique that may already be efficiently and effectively working. For example, residents have the ability to begin their orthodontic careers starting and finishing cases using self-ligating brackets. By contrast, experienced practitioners using conventional bracket wire ligation may find it frustrating to add inventory (self-ligating brackets) while maintaining conventional inventory. In addition, experienced practitioners will need to spend additional time adapting to a different way of obtaining what they may feel is a similar result. Each new generation of orthodontic residents will be educated with the most current theoretical and technological advances. Keeping abreast with current developments in the profession however may be a continuing challenge for more veteran practitioners.

The majority of residents do not seem to favour lingual orthodontics. Perhaps this is because they are unlikely to receive an extensive amount of education on this technique in their orthodontic training program and from continuing education courses. They are therefore unfamiliar with the philosophy and mechanics involved and as a result report that they will not use this technique. Lingual orthodontics is more practiced and popular outside of North America, particularly in Europe. In the future, residents may be attracted to take hands-on continuing education courses that teach lingual orthodontics. Almost half of residents indicated that they plan on using indirect bonding and most said they will use self-ligating brackets. Integrating indirect bonding and self-ligating brackets into orthodontics might enhance the attractiveness of the lingual technique. With the advent and innovation of customized slots and archwires, constant developments in the indirect bonding approach, increased familiarity of residents with self-ligating brackets, and demand of adult patients for more esthetic and invisible alternative orthodontic care, the lingual orthodontic technique has the potential to gain popularity in the future. This objective may only be realized with enhanced design marketed with the opportunity for orthodontic residents to try it in their graduate program with continuing education courses made available to them and also to more veteran orthodontists.

Two-Phase Treatment

The results of this study indicate that most orthodontic residents in the US are planning to use two-phase treatment and also functional appliances when they graduate. This is in contrast to the evidence from the recent randomized controlled clinical trials that

conclude that there is no difference between using functional appliances versus a control in Class II orthodontic growing patients (Wheeler, 2002; O'Brien, 2003; Tulloch, 2004; Dolce, 2007). Residents likely are familiar with these studies and have been able to critically review them in the didactic component of their orthodontic program and therefore identify the deficiencies in that it is a collapsed sample, that individual differences are more significant than group differences and the lack of an untreated control sample (Derendeliler, 2006). Another more cynical interpretation in favour of why orthodontic residents indicated that they are planning to use two-phased treatment and functional appliances after graduation is that these approaches are seen as an excellent practice builder (Bowman, 1998). This means that the orthodontist would perform treatment on a patient early, not for the clinical benefit to the patient, but to impress the patient with the practice and have them remain a patient until the time that they require full fixed comprehensive orthodontic treatment.

Orthodontic residents indicated that 3M/Unitek was the company they most likely plan to purchase orthodontic brackets from followed by GAC and then American Orthodontics. They indicated that the most important reason for this was that they used the brackets as residents and liked it. The quality of the bracket, customer service and ease of use were other important factors (Figure 8). Cost and popularity were significantly less important from the respondents' perspective. This is important information for orthodontic companies with regard to marketing. Clearly, residents want the ability to assess brackets from different manufacturers during their residency program so they can make an informed decision on what product they plan to purchase and use after graduation. Manufacturers would therefore benefit from having their products readily available to

orthodontic residents in their program. Residents would be able to assess these products for quality, ease of use and customer service. Further, if orthodontic residents are likely to use self-ligating brackets, residents would benefit by being taught by an instructor experienced and proficient in the use of that particular self-ligating bracket.

Assessment of length of program

The same number of residents indicated that it should be a requirement that programs have a Master of Science degree as those who said it should not. Most Canadian residents indicated it should be a requirement however Canadian residents may be biased as all Canadian programs have a mandatory Master of Science component for graduation. Most Canadian residents indicated that all graduate orthodontic programs be 36 months in length to obtain licensure to practice orthodontics in Canada. The same question was posed to US residents and they felt that the extended 36 month long program should not be required for licensure in the US. These responses reflect the current program length in the respective countries. All Canadian programs are 35 or 36 months long while many US programs are 24 to 30 months in length. It is therefore likely that bias exists in the respondents' answers regarding program length.

Recently, there has been debate in the literature over the appropriate length of a graduate orthodontic program. Cangliosi has supported the notion of a minimum 36 month long orthodontic program (Cangliosi, 2007). A three year program would allow for: the opportunity to expand clinical didactic material; enhanced experience in diagnosis and treatment planning; more experience with the finishing stages of treatment; fewer patient transfers; and allow residents to start and finish the same patient and then follow the

patient through months of retention. In addition, extending the length of the program would also allow residents the opportunity to complete a comprehensive research project which may stimulate more researchers in the profession while advancing knowledge to the profession. It has also been suggested that a three year program allows for an increased capacity for critical analysis and objective evaluation of new scientific technological advancements (Sinclair, 1984). Moskowitz indicated that an extended length program results in more seasoned, skilled and critically thinking orthodontic residents (Moskowitz, 2003). He further asserts that a three year program would allow residents to be able to present cases for board certification and that this would increase the number of residents seeking board certification (Moskowitz, 2003). Moskowitz has also stated that graduates from a two year program are at an unfair disadvantage to becoming board certified upon graduation due to their inability to finish their cases (Moskowitz, 2007). Currently, the European standard is that all orthodontic graduate programs be three years in length.

Lindauer however argues that extending the length of an orthodontic program would result in an immediate decrease in the number of orthodontists graduating, an increase in resident debt and would result in a financial hardship for orthodontic programs (Lindauer, 2008). Two year programs may not have the room, faculty and finances to extend themselves by one year. Lindauer says that there is no scientific evidence that demonstrates that graduates from an extended program have superior skills or more orthodontic knowledge (Lindauer, 2008). Perhaps orthodontic residents from two and three year programs should be evaluated by their clinical skills and knowledge upon

graduation and compared, to determine if there true reason to extend the length of orthodontic programs to three years.

Resident Assessment of the American Board of Orthodontics

Most orthodontic residents indicated that they are planning to write the American Board of Orthodontics (ABO) examination. It is interesting however that only 18.12% of residents believe ABO certification should be mandatory for licensure. The ABO is an organization sponsored by the American Association of Orthodontists (AAO). The American Dental Association recognizes it as the only group that can certify orthodontists and they indicate that they are responsible for performing examinations to evaluate the knowledge and skills of practicing orthodontists in the orthodontic specialties pursuit of clinical excellence (Riolo, 2005). It is the opinion of the ABO that every educationally qualified orthodontist should demonstrate their clinical competence by completing ABO certification upon graduation and maintain this certification by subsequent re-examination (Riolo, 2005). However, the percent of AAO members who are certified by the ABO has historically been low ranging from the mid-teens to high 20's (Riolo, 2005). The ABO has recently gone to great lengths to increase the number of orthodontists who are ABO certified by providing an easier mechanism for orthodontists to become certified and recertified (Cangliosi, 2004; Riolo, 2004; Owens, 2005; Riolo, 2005). They provided a "Gateway offer" to practicing orthodontists and three graduating orthodontic classes between March 1, 2005 and July 1, 2007. This allowed the orthodontist to receive an ABO certificate for five years if he or she passed the ABO written examination (Part II) and required them to recertify and complete the

clinical component of the examination (Part III) by this time. The ABO assessed a fee of \$1880 for the five year certificate with an annual fee of \$125 to maintain the certificate. The ABO has also tried to facilitate the certification process for orthodontic residents by allowing them to use cases treated during their residency. This may be a formidable task for residents graduating from a program 24-30 months in length. Further, the ABO is the clinical component of the examination. What is interesting, however, is that despite all the attempts of the ABO to facilitate obtaining certification and increasing the number of members, they continue to exclude all non-North American trained orthodontists from the process.

The ABO plays a role in the accreditation process of orthodontic programs and also measures the clinical competency of academic orthodontic program directors and the efficacy of graduate orthodontic programs (Owens, 2005). The ABO therefore may have a strong influence on graduate program directors and chairs of orthodontic residency programs who may feel pressured to encourage their residents to write the ABO examination. It therefore may not be a coincidence that the ABO is recruiting orthodontic residents and is facilitating the process to become ABO certified. This group of future orthodontists may not be plagued with the same sentiments about the ABO that discouraged their predecessors from becoming certified. Indeed, most orthodontic residents indicated that they plan to become ABO certified but they may be motivated to do so because of the wishes of their program chair or director. It would be interesting to assess how many of these follow through with this following graduation and complete the clinical component once they are in private practice.

The goal of the ABO is to serve as a standard for all orthodontists and their hope is that all educationally qualified orthodontists complete the ABO certification process at the end of their training and maintain certification through periodic re-examination, so orthodontists are continually reassessed throughout their career (Owens, 2005).

However, most US orthodontic residents indicated that ABO certification should not be a requirement for licensure as an orthodontist in the US. Though most residents indicate they will obtain ABO certification, they do not hold the body in such high regard to allow them to dictate whether they should or should not be able to practice orthodontics. This may be due to criticisms and concerns raised about the clinical component of the examination. Ackerman et al described it as “so narrowly focused that an orthodontist might lack up-to-date clinical knowledge, psychomotor and critical thinking skills, diagnostic acumen, patient management ability, and patient-centered ethics, and still pass the examination largely because of mechanically morphing the patient’s teeth into the board’s construct of ideal occlusion” (Ackerman, 2006). Ackerman further questions how the “Gateway program” ensures quality patient care and protects the public from irresponsible behaviour when a resident becomes board certified without having treated a patient on their own, and how a measurement of six of their best treated cases truly measures their entire scope of practice. Ackerman also criticizes the ABO certification process for lacking an evaluation of discernment and caring (Ackerman, 2006). The new requirement forcing accredited orthodontic program directors to be ABO certified or eligible places a much larger focus on clinical aptitude as opposed to academic credentials such as research, publications and teaching and administrative ability. This could be an important factor why US residents graduate with motivations to enter private

practice while pursuing an academic career including research and teaching is not desired. Further, the lack of time available to complete a comprehensive research project in a two-year program coupled with the focus of these programs to successfully complete the ABO examination may prevent the development of residents with an interest in research and teaching.

5.3 Comparison of Orthodontic Residents in Canada versus the US

Reasons for choosing orthodontics

A main reason that orthodontic residents in the US indicated that they chose to enter the profession of orthodontics was because of a “passion for orthodontics” and intellectual stimulation was less of a reason than orthodontic residents in Canada (intellectual stimulation was the most common reasons for orthodontic residents in Canada), and this was found to be statistically significant ($p < 0.001$).

Also, more US orthodontic residents are likely to choose to enter orthodontics prior to dental school, while orthodontic residents in Canada decided to become an orthodontist while in dental school. This difference between Canadian and US orthodontic residents was found to be statistically significant ($p < 0.001$).

Orthodontic residents in the US may have preconceived notions as to what orthodontics is. However, there was a lack of interest in academics from both orthodontic residents in Canada and the US. Therefore the time at which one decides when to become an orthodontist may not have an influence in the development of academics and researchers

in orthodontics. The solution, as discussed, may involve the recruitment of researchers and teachers into dentistry and hope that they develop an interest in orthodontics.

Future Plans after graduation

Similar trends were found that orthodontic programs in both Canada and the US are likely to continue to see a crisis in the lack of orthodontic residents pursuing an academic career. They are likely to continue to resort to hiring foreign orthodontists to fill these gaps or increase the number of orthodontists working part-time. Most residents plan to practice in an urban or suburban setting with few interested in practicing in rural areas. This was found to be statistically greater in Canada versus the US. The orthodontic profession, particularly in Canada, has a responsibility to encourage current orthodontic residents to provide care to these underserved areas. This may involve trying to instil a social responsibility in residents, or providing tuition relief or a salary to those orthodontic residents who commit to practice in these areas for a period of time. This may result in orthodontic residents ultimately staying in these areas. Alternatively, orthodontic programs can increase the acceptance of candidates who intend to practice in these areas, or who are from these areas.

Future Practice Plans

According to the residents, most orthodontic programs in the US and only approximately half in Canada, provide formal training in treatment of patients with cleft lip and palate and craniofacial anomalies. More than half of US residents and almost one third of Canadian residents plan to be involved in the care for these patients after their graduation.

This is considerably less than the number of residents who receive training. Chi-squared analysis found a significant difference between Canadian and US residents, with more US residents saying “Yes” ($p=0.045$). Orthodontic residents in the US may therefore be more altruistic and display more an interest in treating these complex cases than orthodontic residents in Canada.

Indeed, orthodontic programs need to have formal didactic and clinical training programs in the treatment of patients with craniofacial anomalies and cleft lip and palate. In programs where these courses exist, there is a need for improvement such as multidisciplinary seminars and courses, hospital rotations and specialized craniofacial clinics.

This may stimulate all residents to become eager and proficient participants in the care of these patients after graduation despite the challenges in treatment complexity, increased length of treatment and low financial benefits.

Orthodontic programs also need to convey to their residents the personal rewards and fulfillment in developing a long-standing relationship by treating patients with craniofacial anomalies and cleft lip and palate and the joy of being a member of a craniofacial team of diverse specialists.

To further ensure the future provision of care for patients with craniofacial anomalies and cleft lip and palate, orthodontic programs also have a responsibility to accept students who express a genuine interest in the treatment of this population. If these measures are not instituted, there may be access to care issues for patients with cleft lip and palate and craniofacial anomalies and this may be more prevalent in Canada.

A significant number of orthodontic residents in Canada and the US said they will use self-ligating brackets and Invisalign™ after they graduate. Comparing Canadian and US orthodontic residents, Canadian residents are more likely to use self-ligating brackets and Invisalign™, with statistical significance ($p < 0.0349$ and $p < 0.0497$ respectively). This suggests that orthodontic residents in Canada will more readily use technological advances than US orthodontic residents. This could be a result of Canadian orthodontic residents being more technologically savvy, or it could be that orthodontic programs in Canada allow their residents to try new innovations in the field of orthodontics. Also, the representatives of manufacturers may be promoting technological advances more so in Canada than the US. Canada has a history of developing self-ligating brackets, with the advent and popularization of the SPEED™ bracket at the University of Toronto by Dr. Herb Hanson (Hanson, 1980) and the extensive teaching of its use at the University to their orthodontic residents. Because of its roots in Canada, Canadian orthodontic programs may therefore be more amenable to allowing their residents to try self-ligating brackets and newer technologies.

5.4 Study Limitations

The limitation of the current study is that it does not include residents who are training in accredited orthodontic programs in foreign countries and who will subsequently return to Canada or the US and practice orthodontics following graduation. There are numerous residents who are Canadian and are training in the US that plan to return to Canada and vice versa. These residents may have slightly skewed the comparative data. The

limitation of the US survey was the low number of resident emails obtained from a very large overall pool of residents. However, every effort was made to obtain resident emails from all 65 accredited graduate orthodontic programs in the US and the sample that was ultimately obtained was large enough to make generalizations. Further, these residents are not geographically located in one region of the US but evenly distributed evenly throughout the country. Orthodontic residents who participated in the questionnaire were represented from 37 accredited orthodontic programs of the 65 accredited orthodontic programs in the US.

Another limitation of the study was the inability to group the data to allow for further descriptive statistical analysis and comparisons. However, residents were assured anonymity in the study and it was emphasized to them throughout the administration of the study that it would be completely anonymous. If this was not the case, and the respondents were not assured anonymity, then grouping the data may compromise the honesty of the answers that were given in this survey and in future surveys to be administered. The risk of not obtaining an honest answer to any one of the questions that were asked, due to lack of anonymity in the survey, or even due to residents having a slight feeling of losing anonymity when responding to the questions that were asked, was more important than the results that could have been obtained had there been an opportunity to group data. This was the main reason for choosing not to group the data together.

6.0 CONCLUSIONS

6.1 SURVEY OF ORTHODONTIC RESIDENTS IN CANADA

The appeal of intellectual stimulation is the most common motivating factor for Canadian dental students to choose to specialize in orthodontics. Most Canadian orthodontic residents will choose to use modern techniques such as self-ligating brackets and Invisalign™, following graduation in clinical practice.

Canadian orthodontic programs will likely find an exacerbation of the shortage of clinically-based orthodontic researchers and full-time academics in the future and should consider implementing measures to prevent this continued shortage. Most orthodontic residents intend to enter urban or suburban private practice settings after graduation and rural areas are at an increasing risk of being under-serviced. There may therefore be access to care issues that arise in rural or underserved areas in Canada. Professional organizations, governments and Universities may want to implement preventive measure to prevent an access to care issue in Canadian orthodontics.

Canadian orthodontic residents believe that shortened 24 to 30 month orthodontic residency programs do not adequately prepare them for an orthodontic career and favour longer 35 to 36 month programs with a research-based or Master's of Science component, though all Canadian orthodontic programs are 35 or 36 months in length and they may embody an inherent bias when answering this question.

6.2 SURVEY OF ORTHODONTIC RESIDENTS IN THE US

A passion for orthodontics is the most important reason for orthodontic resident in the US to choose orthodontics as a career and intellectual stimulation/challenge is also an important factor in their consideration.

There will continue to be a shortage in orthodontic residents pursuing academia as a career and most indicate that they plan to enter private practice with very few dedicating time to research.

For many respondents, the decision to become an orthodontist was made prior to entering dental school. These orthodontic residents may have a preconceived notion about orthodontic practice, from treatment they have previously received, parents or family members in the dental profession, or the society's portrayal of the orthodontic profession. This may be a contributing factor to why so few orthodontic residents are planning academic and research careers. A possible solution to the academic crisis may therefore be for orthodontic programs to change their selection process to select those candidates who develop a true passion for research in orthodontics while they are dental school or to select general dentists who develop an interest for orthodontics after spending a certain amount of time in private practice.

Orthodontic residents in the US are graduating with a considerable amount of debt and plan to work in urban areas. Similar to Canada, there will likely continue to be access to care issues in the US. A solution to increasing the number of orthodontists serving underserved areas may be to institute programs of debt relief or reduced tuition if these residents offer a commitment to serve these areas.

Orthodontic residents in the US are interested in using newer technological advances in orthodontics. Self-ligating brackets, TADs, Invisalign®, indirect bonding, digital imaging and functional appliances are expected to grow in popularity. Although residents indicated that they do not plan to use lingual orthodontics, if designed and marketed effectively, it has the potential to increase in popularity. US orthodontic residents prefer a 24-30 month long program and most will become ABO certified however they don't feel ABO certification should be mandatory for licensure.

7.0 FUTURE DIRECTIONS

The questionnaire that was administered to orthodontic residents in the US (Appendix 8.9) has been translated to the Turkish language and is being administered to all orthodontic residents in Turkey. We would welcome administration of the questionnaire to any country throughout the world. It would be interesting to administer the questionnaire again in Canada and the US and to compare responses and if any changes are present.

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9.0 APPENDICES

9.1 University of Manitoba Health Research Ethics Board (HREB) Approval

Canada survey



BANNATYNE CAMPUS
Research Ethics Boards

P126-770 Bannatyne Avenue
Winnipeg, Manitoba
Canada R3E 0W3
Tel: (204) 789-3255
Fax: (204) 789-3414

APPROVAL FORM

Principal Investigator: Dr. J. Noble

Protocol Reference Number: H2006:209

Date of Approval: October 20, 2006

Date of Expiry: October 20, 2007

Protocol Title: "Survey of Orthodontic Residents in Canada"

The following is/are approved for use:

- Proposal submitted October 5, 2006
- Survey submitted October 5, 2006

The above underwent expedited review and was **approved as submitted** on October 20, 2006 by Dr. John Arnett, Ph.D., C. Psych., Health Research Ethics Board, Bannatyne Campus, University of Manitoba on behalf of the committee per your letter dated October 20, 2006. The Research Ethics Board is organized and operates according to Health Canada/ICH Good Clinical Practices, Tri-Council Policy Statement, and the applicable laws and regulations of Manitoba. The membership of this Research Ethics Board complies with the membership requirements for Research Ethics Boards defined in Division 5 of the *Food and Drug Regulations*.

This approval is valid for one year only. A study status report must be submitted annually and must accompany your request for re-approval. Any significant changes of the protocol and informed consent form should be reported to the Chair for consideration in advance of implementation of such changes. The REB must be notified regarding discontinuation or study closure.

This approval is for the ethics of human use only. For the logistics of performing the study, approval should be sought from the relevant institution, if required.

Sincerely yours,

John Arnett, Ph.D., C. Psych.
Chair, Health Research Ethics Board
Bannatyne Campus

Please quote the above protocol reference number on all correspondence.

Inquiries should be directed to REB Secretary

Telephone: (204) 789-3883 / Fax: (204) 789-3414

9.2 University of Manitoba Health Research Ethics Board (HREB) Approval US survey



BANNATYNE CAMPUS Research Ethics Boards

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APPROVAL FORM

Principal Investigator: Dr. J. Noble

Protocol Reference Number: H2006:209
Date of Approval: March 22, 2007

Protocol Title: "Survey of Orthodontic Residents in Canada"

The following is/are approved for use:

- Protocol Amendment submitted March 21, 2007
- U.S. Dental Resident Survey

The above was approved by Dr. John Arnett, Ph.D., C. Psych, Chair, Health Research Ethics Board, Bannatyne Campus, University of Manitoba on behalf of the committee per your letter received March 22, 2007. The Research Ethics Board is organized and operates according to Health Canada/ICH Good Clinical Practices, Tri-Council Policy Statement, and the applicable laws and regulations of Manitoba. The membership of this Research Ethics Board complies with the membership requirements for Research Ethics Boards defined in Division 5 of the *Food and Drug Regulations*.

A study status report must be submitted annually and must accompany your request for re-approval. Any significant changes of the protocol and informed consent form should be reported to the Chair for consideration in advance of implementation of such changes. The REB must be notified regarding discontinuation or study closure.

This approval is for the ethics of human use only. For the logistics of performing the study, approval must be sought from the relevant institution, if required.

Sincerely yours,

John Arnett, Ph.D. C. Psych.
Chair, Health Research Ethics Board
Bannatyne Campus

Please quote the above protocol reference number on all correspondence.

Inquiries should be directed to the REB Secretary **Telephone:** (204) 789-3255 / **Fax:** (204) 789-3414

9.3 Email sent to program department heads in Canada.

Hello, my name is Dr. James Noble and I am interested in collecting information on the demographics of orthodontic residents in Canada, their reasons for choosing orthodontics as a career, their future directions and an evaluation of their program. Attached to this email is the survey. With your permission, I would like to email your orthodontic residents and request for them to fill out this survey on a website. The results of the survey are anonymous; we are not collecting any personal information. We have obtained ethics approval to conduct this study from the University of Manitoba Research Ethics Board. If you have any problem with us conducting this survey, kindly let me know. If you can provide the email addresses of your residents, I would appreciate it. Many thanks for your cooperation.

Sincerely,

James Noble

University of Manitoba Graduate Orthodontic Resident

9.4 Email sent to Canadian Orthodontic Residents

Hello, we are conducting a study to learn more about the demographics of orthodontic residents in Canada, their reasons for choosing orthodontics as a career, their future directions and an evaluation of their program. If you can kindly take ten minutes of your time and complete the survey at the following website it would be greatly appreciated. Please note that no personal information is being collected from you, the results of the survey are completely anonymous as it will not be possible to track from where the results were obtained once you submit it on-line. We have obtained ethics approval to conduct this study from the University of Manitoba Research Ethics Board. If you have any questions, please let us know. Many thanks for your time.

Sincerely,

James Noble

University of Manitoba Graduate Orthodontic Resident

9.5 Email sent to US Orthodontic program chairs and director

Hello, my name is Dr. James Noble and I am an orthodontic resident at the University of Manitoba. I am interested in collecting information on the demographics of orthodontic residents in United States, their reasons for choosing orthodontics as a career, their future directions and an evaluation of their program. Attached to this email is the survey I have designed. With your permission, I would like to email your orthodontic residents and request for them to complete this survey on-line. Please let me know if you have any concerns or if provide any feedback about the survey that you may have. The results are completely anonymous; we are not collecting any personal information and will not be able to track who completed each survey. We have obtained ethics approval to conduct this study from the University of Manitoba Research Ethics Committee. The results of the survey are intended to be submitted for publication in the AJODFO. A similar survey has been successfully completed by orthodontic residents in Canada and has yielded some very interesting results. If you have any problem with us conducting this survey, kindly let me know. Also, Can you kindly send me the email addresses of all your residents? Many thanks for your cooperation.

Sincerely,

James Noble

University of Manitoba Graduate Orthodontic Resident

9.6 Email sent to Orthodontic residents in the US

Hello, we are conducting a study to learn more about the demographics of orthodontic residents in Canada, their reasons for choosing orthodontics as a career, their future directions and an evaluation of their program. If you can kindly take ten minutes of your time and complete the survey at the following website it would be greatly appreciated. Please note that no personal information is being collected from you, the results of the survey are completely anonymous as it will not be possible to track from where the results were obtained once you submit it on-line. We have obtained ethics approval to conduct this study from the University of Manitoba Research Ethics Board. If you have any questions, please let us know. Many thanks for your time.

Sincerely,

James Noble

University of Manitoba Graduate Orthodontic Resident

9.7 Questionnaire of Orthodontic Residents in Canada

Survey of Orthodontic Residents in Canada

Note: All responses will remain anonymous

Demographics

1. What is your gender?

M

F

2. What is your age?

<25,

25-29,

30-34,

35-39,

>40

3. What is your current level of training in your program?

1st year

2nd year

3rd year

4. How many years were you qualified as a dentist before beginning your orthodontic residency? Please check

1

2

3

4

>4

5. i) What city and country were you born in?

ii) What city and country did you complete high school?

6. Which degrees did you complete before dental school? Check all that apply.

Diploma	_____	Field	_____
Bachelor's	_____	Field	_____
Master's	_____	Field	_____
Doctoral/PhD/DSc.	_____	Field	_____

Reasons for Choosing Orthodontics

7. What were the main factors influencing your decision to pursue an Orthodontic residency training program? Select all that apply.

intellectual stimulation/challenge
doctor-patient relationship
a passion for orthodontics
working with motivated patients
working with younger patients
enjoyed orthodontics the most in dental school
workload flexibility and/or predictability
influence of a mentor
positive dental school experience
influence of family
prestige
earning potential
research opportunities
teaching opportunities
ability to pursue non-work related interests
availability of training opportunities
other, please describe

8. What was the single most important factor influencing your decision to pursue an Orthodontic residency training program? Select ONE answer only.

intellectual stimulation/challenge
ability to combine surgery and medicine
doctor-patient relationship
a passion for orthodontics
working with motivated patients
working with younger patients
enjoyed orthodontics the most in dental school
workload flexibility and/or predictability
influence of a mentor/ positive elective experience
influence of family
prestige
earning potential
research opportunities
teaching opportunities
ability to pursue non-work related interests
availability of training opportunities
other

9. When did you decide to pursue an Orthodontic training program?

before dental school
after dental school during a dental residency
after dental school during private practice
after a period of time in practice
other

10. Which statement applies to your undergraduate dental curriculum?

No exposure to orthodontics
Too little exposure orthodontics
Just the right amount of exposure to orthodontics
Too much to orthodontics

Future Directions

11. What are your future plans after training?

Start practising comprehensive Orthodontics as an associate

Start practising comprehensive Orthodontics by buying into an existing practice
Start practising comprehensive Orthodontics by starting your practice from scratch
Apply for fellowship training in Canada
Apply for fellowship training in the United States
Apply for fellowship training outside North America
Pursue a graduate degree (MSc, PhD) or work in research
Pursue a full-time research and teaching career
Undecided

12. What city and country do you plan on practicing when you graduate?

13. What type of setting will you most likely practise in?

Private practice
Primarily a community setting
Primarily an academic setting (i.e., teaching hospital or research institute)
A combination of community and academic settings
undecided

14. What type of population do you plan on primarily serving?

Rural
Urban/Suburban
Inner city
Don't know
I don't intend to be involved in direct patient care

15. What type of practice will you work in?

Solo
Group
Don't know
I don't intend to be involved in direct patient care

16. Do you plan on practising part-time (less than 3 business days/week) or full time?

Part-time
Full time
Don't know

17. Approximately how much time will you dedicate to research (basic or clinical)?

0%

25%

50%

75%

100%

Don't know

18. Do you plan to include the treatment of cleft lip and palate and craniofacial anomaly patients in your practice?

Yes

No

Maybe

Unsure

19. Do you plan on using self-ligating brackets in your practice?

Yes

No

Maybe

Unsure

20. Do you plan on using Invisalign® in your practice?

Yes

No

Maybe

Unsure

Evaluation of Program

19. What is your general level of satisfaction with your Orthodontic training program so far? *(please note - your responses are anonymous)*

very dissatisfied

somewhat dissatisfied
neutral
satisfied
very satisfied

20. Does your program have regular formal didactic teaching sessions or dedicated & protected academic time?

No
Yes, but not enough
Yes, just about the right amount
Yes, but too much

21. Does your program offer training in numerous orthodontic treatment philosophies?

Yes
No

22. What do you feel about the amount of clinic-based training in your program?

Too little
Just about right
Too much
unsure

23. What do you feel about the amount of research-based training in your program?

Too little
Just about right
Too much
unsure

24. How many patients do you think you will have completed, from start to finish, by the end of your training program?

<30
30-40
40-50
50-60

60-70
>70

25. How many orthognathic surgery patients do you estimate you will have completed, from start to finish, by the end of your training program? Please indicate a number.

26. How many extraction patients do you think you will have completed, from start to finish, by the end of your training program? Please indicate a number.

27. How many non-extraction patients do you think you will have completed, from start to finish, by the end of your training program? Please indicate a number.

28. Does your training program have dedicated research time?

Yes
No
Unsure

29. Do you think your program should have more dedicated research time?

Yes
No
Unsure

30. Do you feel orthodontic residents should undertake a Masters of Science (research component) during their training program?

Yes
No
Maybe
Unsure

31. How many patients during your training do you estimate that you will have treated in the mixed dentition? Please indicate a number.

32. Does your program contain formal training in treating patients with cleft lip and palate and craniofacial anomalies?

Yes
No
Unsure

33. Does your program include any care for persons who are disabled or underserved?

Yes
No

34. At the end of your training program, do you think you will feel adequately prepared to enter the workforce?

Yes
No
Unsure

35. Do you feel that there is a fair balance of the education and service aspects of your program?

Strongly disagree
Disagree
Neutral
Agree
Strongly agree
Unsure

36. Which statements about the perception of orthodontics by other dental disciplines do you feel is most accurate? Other disciplines have a :

Strongly negative view
Somewhat negative view
Neutral view
Somewhat positive view
Strongly positive view

37. How many adults do you estimate you will treat from start to finish? Please indicate a number.

38. Does your program have a formal interdisciplinary program for treating patients?

Yes
No

39. Which specialties do you collaborate with in your training/ are you learning with?

Oral Surgery
Periodontics
Endodontics
Radiology
Oral Medicine and Pathology
Prosthodontics
Paedodontics

40. In Canada, all programs are 35 to 36 months in length. Do you think the 24 to 30 month USA programs adequately prepare orthodontic residents?

Yes
No

41. Should Canada enforce the 35 month University "Canadian Standard" for licensure?

Yes
No

9.8 Questionnaire of Orthodontic Residents in the US

Survey of Orthodontic Residents in the USA

Note: All responses will remain anonymous

Demographics

1. What is your gender?

M,
F

2. What is your age?

<25,
25-29,
30-34,
35-39,
>40

3. What is your current level of training in your program?

1st year
2nd year
3rd year
4th year

4. How many years were you qualified as a dentist before beginning your orthodontic residency? Please check

1
2
3
4
>4

5. i) What city and country were you born in?

ii) What city and country did you complete high school?

6. Which degrees did you complete before dental school? Check all that apply.

Diploma	_____	Field	_____
Bachelor's	_____	Field	_____
Master's	_____	Field	_____
Doctoral/PhD/DSc.	_____	Field	_____

7. How much debt will you have upon graduation from your program?

Reasons for Choosing Orthodontics

8. What were the main factors influencing your decision to pursue an Orthodontic residency training program? Select all that apply.

intellectual stimulation/challenge
doctor-patient relationship
a passion for orthodontics
working with motivated patients
working with younger patients
enjoyed orthodontics the most in dental school
workload flexibility and/or predictability
have had orthodontic work done on my malocclusion
influence of a mentor
positive dental school experience
influence of family
prestige
earning potential
research opportunities
teaching opportunities
ability to pursue non-work related interests
availability of training opportunities
other, please describe

9. What was the single most important factor influencing your decision to pursue an Orthodontic residency training program? Select ONE answer only.

intellectual stimulation/challenge
ability to combine surgery and medicine
doctor-patient relationship

a passion for orthodontics
working with motivated patients
working with younger patients
enjoyed orthodontics the most in dental school
workload flexibility and/or predictability
influence of a mentor/ positive elective experience
influence of family
prestige
earning potential
research opportunities
teaching opportunities
ability to pursue non-work related interests
availability of training opportunities
other

10. When did you decide to pursue an Orthodontic training program?

before dental school
after dental school during a dental residency
after dental school during private practice
after a period of time in practice
other

11. Which statement applies to your undergraduate dental curriculum?

No exposure to orthodontics
Too little exposure orthodontics
Just the right amount of exposure to orthodontics
Too much orthodontics

Future Directions

12. What are your future plans after training?

Start practising comprehensive Orthodontics as an associate
Start practising comprehensive Orthodontics by buying into an existing practice
Start practising comprehensive Orthodontics by starting your practice from scratch
Apply for fellowship training in North America
Apply for fellowship training outside North America
Pursue a graduate degree (MSc, PhD) or work in research
Pursue a full-time research and teaching career

Military
Undecided

13. What city, state and country do you plan on practicing when you graduate?

14. What type of setting will you most likely practise in?

Private practice
Primarily a community setting
Primarily an academic setting (i.e., teaching hospital or research institute)
A combination of community and academic settings
undecided

15. What type of population do you plan on primarily serving?

Rural
Urban/Suburban
Inner city
Don't know
I don't intend to be involved in direct patient care

16. What type of practice will you work in?

Solo
Group
Don't know
I don't intend to be involved in direct patient care

17. Do you plan on practising part-time (less than 3 business days/week) or full time?

Part-time
Full time
Don't know

18. Approximately how much time will you dedicate to research (basic or clinical)?

0%
25%
50%
75%
100%
Don't know

19. Do you plan to include the treatment of cleft lip and palate and craniofacial anomaly patients in your practice?

Yes
No
Maybe
Unsure

20. Do you plan on using self-ligating brackets in your practice?

Yes
No
Maybe
Unsure

21. Do you plan on using Invisalign® in your practice?

Yes
No
Maybe
Unsure

22. Do you plan on using temporary anchorage devices in your practice?

Yes
No
Maybe
Unsure

23. If yes, do you plan on placing these temporary anchorage devices yourself?

Yes
No
Maybe
Unsure

24. Do you plan on using cone-beam computerized tomography in your practice?

Yes
No
Maybe
Unsure

25. Do you plan on using a digital imaging program in your practice?

Yes
No
Maybe

Unsure

26. Do you plan on using indirect bonding in your practice?

Yes

No

Maybe

Unsure

27. Do you plan on using lingual orthodontics in your practice?

Yes

No

Maybe

Unsure

27. Do you plan on performing two-phase treatment in your practice?

Yes

No

Maybe

Unsure

28. Do you plan on using functional appliances in your practice?

Yes

No

Maybe

Unsure

29. From which company do you plan on purchasing orthodontic bracket after graduation?

3M Unitek

GAC

Ormco

American Orthodontics

Rocky Mountain Orthodontics

TP Orthodontics

Cerum Orthodontics

Forestadent

SPEED

30. Why do you plan on purchasing brackets from this company? (select as many as apply)

Customer service
Quality of the bracket
Cost used it as an orthodontic
Ease of use
I used it as an orthodontic resident and I liked it
Popularity
Being used by the practice I plan on entering

31. How much money do you expect to make:

1 year after graduation: _____
5 years after graduation: _____
10 years after graduation: _____

32. Do you plan on receiving ABO certification after graduation?

Yes
No
Maybe
Unsure

33. Should it be mandatory for all orthodontic graduates to receive ABO certification to practice orthodontics in the US?

Yes
No
Maybe
Unsure

Evaluation of Program

34. What is your general level of satisfaction with your Orthodontic training program so far? (*please note - your responses are anonymous*)

very dissatisfied

somewhat dissatisfied
neutral
satisfied
very satisfied

35. Does your program have regular formal didactic teaching sessions or dedicated & protected academic time?

No
Yes, but not enough
Yes, just about the right amount
Yes, but too much

36. Does your program offer training in numerous orthodontic treatment philosophies?

Yes
No

37. What do you feel about the amount of clinic-based training in your program?

Too little
Just about right
Too much
unsure

38. What do you feel about the amount of research-based training in your program?

Too little
Just about right
Too much
unsure

39. How many patients do you think you will have completed, from start to finish, by the end of your training program?

<30
30-40
40-50
50-60
60-70

>70

40. How many orthognathic surgery patients do you estimate you will have completed, from start to finish, by the end of your training program? Please indicate a number.

41. How many extraction patients do you think you will have completed, from start to finish, by the end of your training program? Please indicate a number.

42. How many non-extraction patients do you think you will have completed, from start to finish, by the end of your training program? Please indicate a number.

43. Does your training program have dedicated research time?

Yes

No

Unsure

44. Do you think your program should have more dedicated research time?

Yes

No

Unsure

45. Do you feel orthodontic residents should undertake a Masters of Science (research component) during their training program?

Yes

No

Maybe

Unsure

46. How many patients during your training do you estimate that you will have treated in the mixed dentition? Please indicate a number.

47. Does your program contain formal training in treating patients with cleft lip and palate and craniofacial anomalies?

Yes

No
Unsure

48. Does your program include any care for persons who are disabled or underserved?

Yes
No

49. At the end of your training program, do you think you will feel adequately prepared to enter the workforce?

Yes
No
Unsure

50. Do you feel that there is a fair balance of the education and service aspects of your program?

Strongly disagree
Disagree
Neutral
Agree
Strongly agree
Unsure

51. Which statements about the perception of orthodontics by other dental disciplines do you feel is most accurate? Other disciplines have a :

Strongly negative view
Somewhat negative view
Neutral view
Somewhat positive view
Strongly positive view

52. How many adults do you estimate you will treat from start to finish? Please indicate a number.

53. Does your program have a formal interdisciplinary program for treating patients?

Yes
No

54. Which specialties do you collaborate with in your training/are you learning with?

Oral Surgery
Periodontics
Endodontics
Radiology
Oral Medicine and Pathology
Prosthodontics
Paedodontics

55. Do you think the 24 to 30 month USA programs adequately prepares orthodontic residents?

Yes
No

56. Should there be an enforced the 36 month full-time University "Standard" for licensure?

Yes
No

57. What should be the MINIMUM full-time program length for North American graduate orthodontic program?