Knowledge and Beliefs Regarding Temporomandibular Disorders among Orthodontists

Felipe Borges Porto

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Knowledge and Beliefs Regarding Temporomandibular Disorders Among Orthodontists

Felipe Borges Porto, DDS, MS.

A thesis submitted to the faculty of the Medical University of South Carolina in partial fulfillment of the requirement for the degree of Master of Science in Dentistry at the College of Dental Medicine.

Department of Orthodontics

2017

Approved by:

Theresa Gonzales, Committee Chair

Ricky Harrell

Roland Fulcher
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Acknowledgements

This research is a result of the collaboration from many individuals. First and foremost, I would like to thank my family who has, without hesitation, supported me during this interesting journey, specially my wife, Juliana, who has always motivated and helped me so I could have time and mind strength to complete this task. I also would like to extend a special thank to my mentor, Dr. Theresa Gonzales, who provided me with all the necessary guidance and patience throughout this project. I would also offer my sincere thanks to the other members of my committee, Dr. Rick Harrell and Dr. Roland Fulcher. Their input and guidance were fundamental from start to finish. There are two other extremely important contributors in this project, Lynn West and Abigail Lauer. Lynn’s knowledge and promptness impressed me; she was the one who created and managed the survey into REDCap. Abby is a unique person and an outstanding statistician, she makes all complicated analysis look simple; her knowledge and calmness made me feel comfortable that I had the best team for this project. (Study data were collected and managed using REDCap electronic data capture tools hosted at the Medical University of South Carolina. REDCap is supported by the South Carolina Clinical & Translational Research Institute, with an academic home at the Medical University of South Carolina, through NIH - NCATS Grant Number UL1 TR001450. ) Last but certainly not least, I would not be able to even start this project if I did not have the assistance of my co-residents
(Mark Angeloni, Katie Plunkett, Stephanie Furlong, Justin Wedding, Whitney Buechel, Sam Collins, Jason Latham, Alex Culp, April Parker and Ashley Albrecht.) each and all of them had a very difficult task, to maintain an upbeat atmosphere in the residency room allowing us to forget all the problems and focus on our education and to keep our positive attitude despite the storms.
FELIPE BORGES PORTO. Knowledge and Beliefs Regarding Temporomandibular Disorders Among Orthodontists (Under the direction of THERESA GONZALES)

Objective: This project was undertaken to accomplish two objectives: 1) identify whether there is a discrepancy between orthodontists and “experts in TMD*” related to diagnosis and treatment of TMD patients and 2) influence the manner in which TMD curriculum is taught in orthodontic residency programs in order to better prepare future orthodontic specialists to diagnose and treat (and/or refer) patients with TMD who often seek care from orthodontic providers.

This study will evaluate knowledge and beliefs regarding Temporomandibular Disorders (TMD) among orthodontists when compared to responses from “experts in TMD”; more specifically: A) to determine possible discrepancies related to knowledge and beliefs regarding TMD between these two groups of specialists as it pertains to diagnosis and/or treatment of TMD patients; B) to identify which specific domain (pathophysiologic, chronic pain, psychophysiological, psychiatric disorders) potentially yields the greatest knowledge gap among the specialty cohorts evaluated; C) to ascertain the practicing orthodontic providers’ comfort level in treating TMD patients., and D) to identify the manner in which orthodontists acquired their foundational and treatment knowledge regarding TMD.
It is anticipated that orthodontists who respond to the survey will demonstrate similar knowledge base and beliefs regarding TMD when compared with “experts in TMD”

**Materials and Methods:** A survey invitation was emailed to 8870 orthodontists (including residents in Orthodontics) who, at the time of the survey, were members of the American Association of Orthodontists. Participants were selected at random. The invitational email explained the purpose of the survey, and contained a secure link to an online survey program (REDCap). Participation was voluntary and not financially compensated. Two addition reminder emails were sent to the same groups after one week and one month from the date of the original solicitation. Items were answered on a 6-point scale, which included: *I don't know*, *strongly disagree*, *disagree*, *neutral*, *agree*, and *strongly agree*. A group consensus was attributed when more than 50% of the orthodontists supported one response; the *agree* response combined “strongly agree” and “agree”, and the *disagree* response combined “strongly disagree” and “disagree”. The TMD experts’ responses published on the paper from Porto et al (2016) were used as the reference to evaluate the orthodontists' responses. Comparisons between the responses from the two groups were assessed using z-test.

**Results:** A total of 1545 participants responded the questionnaire. Among the participants 148 were residents, 1132 were private practitioners, and 61 were
fulltime faculty. Almost half of the participants (48.3%) graduated more 20 years ago; 61.6% of the participants do not think they received enough training in TMD during their orthodontic residency. Twenty percent of the participants selected that they acquired most of the TMD knowledge at the dental school, 34.8% selected orthodontic residency, and 37.3% selected Continuing Education course. Sixty two percent of participants indicated they feel comfortable diagnosing TMD patients, but 50.2% do not feel comfortable treating patients with TMD. Among the orthodontists the pathophysiology domain was the specified domain with the highest degree of uncertainty. There was no significant difference between the two groups’ responses in less than one third of the questions.

**Conclusions:** It is clear that the orthodontic residencies in the United States need to improve methods of teaching TMD concepts. Despite the fact most orthodontists feel comfortable diagnosing TMD patients, less than half feel comfortable treating those patients, and the difference in responses with the TMD expert group was significant in 71.05% of the questions.

*academicians who provide TMD courses/continuing education and are board certified by the American Academy of Orofacial Pain*
Introduction

The American Academy of Orofacial Pain (AAOP) defined Temporomandibular Disorder (TMD) as a “collective term that embraces a number of clinical problems that involve the masticatory muscles, the TMJ, and the associated structures”\(^1\). As the definition states, TMD does not involve only a single clinical problem, but many; its etiology has been vociferously debated since the first publications\(^2\)-\(^8\). Due to the variety of factors involved in TMDs, it is not surprising to see a wide range of treatment modalities being suggested for TMD patients\(^9\)-\(^15\).

However, one determinant of treatment for TMD that is often overlooked is the practitioner’s background knowledge and beliefs about the syndrome itself\(^16\)-\(^18\). One reason for the large variation in knowledge about TMD is that orofacial pain is often not considered a dental specialty, and therefore many dental schools in the U.S. do not have a specific orofacial pain (and/or TMD) discipline. Instead, any teaching about orofacial pain is usually divided up piecemeal among several disciplines such as oral surgery, prosthodontics, and orthodontics. Furthermore, patients experiencing TMD often seek care with their general dentists, but they are also frequently referred to orthodontists. Therefore, as an attempt to better diagnose and treat (and/or refer) the patients with TMD who often seek care among orthodontists, it is important to first understand the knowledge and belief regarding TMD among these specialists.
**Review of Literature**

Historically the relationship between TMD and dentistry is relatively recent. At least two major time points catalyzed the interest from the dental professionals regarding the diagnosis and treatment of patients with TMD: a) In 1918 Prentiss suggested that the TMJ problems were a consequence of extractions of teeth, since it would lead to upward movement of the condyle due to the musculature, causing therefore compression of the meniscus, which would finally result in atrophy; b) Similarly, in 1934 Costen stated that TMJ problems were due to nerve impingement from overclosure of bites, lack of posterior teeth and malocclusion. Dr. Costen further opined that dentists should start managing those patients.

However, was not until late 1980’s that the orthodontic community increased its attention towards the TMD field, following a lawsuit that considered orthodontic treatment as being the proximate cause of a patient’s pain. Following that event, multiple research agendas were undertaken to better understand the relationship between orthodontics and TMD. The discussion involving orthodontics and TMD usually focuses on the occlusal condition. Among several publications that investigated the relationship between occlusion and TMD, it is possible to find extensive literature to support both options: there are studies that support a direct relationship between occlusion and TMD, but many others studies defend the opposite.
Nonetheless, occlusion is not the only possible etiologic factor associated with TMD; Okeson identifies four other factors that can be involved with TMD: trauma, deep pain input, parafunctional activity, and emotional stress\textsuperscript{32}.

Before discussing the role of each of those five factors, it is important to define TMD; Temporomandibular disorders (TMDs) are defined as disorders that have their origin in the musculoskeletal structures of the masticatory system, which involve disorders associated with masticatory muscles, and/or temporomandibular joint, and/or associated structures \textsuperscript{33}. According to Rieder at al\textsuperscript{34}, the prevalence of patients who presented/reported at least one sign or symptom of TMD range from 33\% to 50\%. However, the number of patients with TMD who need professional treatment hovers consistently around 10\%\textsuperscript{35}. Therefore, it is important that dentists become familiar with proper diagnosis and management of TMD patients.

In order to correctly diagnose TMD patients and to formulate the best treatment plan, it is necessary to recognize and understand the five etiologic factors mentioned above (occlusal condition, trauma, deep pain input, parafunctional activity, and emotional stress).

Occlusal Condition – Occlusal condition as an etiologic factor for TMD has been an area of contentious discussions and on-going debate. There are at least two important points to be considered when investigating the relationship between occlusion and TMD: a) whether or not the occlusal condition is due to an acute
change; and b) lack of orthopedic stability associated with loading of the masticatory system\textsuperscript{36}. An acute change in the occlusion condition can lead to at least three possible scenarios: the patient may adapt to the acute change in the occlusion; or the patient may develop TMD (mild to severe) which can resolve once the acute change in the occlusion is corrected; or the patient may develop a significant muscular TMD that persists even after eliminating the acute change in the occlusion\textsuperscript{36}. A masticatory system that is orthopedically stable is present when the teeth are in their maximal intercuspal position while the TMJ is also stable\textsuperscript{36}. Loading to an orthopedically stable and healthy joint does not lead to intracapsular problems. When the stable occlusal condition does not coincide with the stable joint position, the system is considered orthopedically unstable\textsuperscript{36}. Orthopedic instability combined with loading can result in changes in the joint structures, increasing the risk of intracapsular disorders\textsuperscript{32}.

Trauma – trauma can be divided in microtrauma and macrotrauma. An example of macrotrauma is a single blow to the face, which seems to be more related to the development of intracapsular disorders\textsuperscript{36}, but if the intracapsular disorder persists, it can lead to a secondary muscle disorder\textsuperscript{32}. Microtrauma is a repetitive loading to the joint (such as oral parafunction) which associated with orthopedic instability can lead to a risk factor for TMD\textsuperscript{36}. 
Emotional stress – studies already demonstrated that emotional stress could increase the EMG activities on masticatory muscles\textsuperscript{37} which is considered a normal effect, but if the stress persists the muscle may fatigue and the patient may experience pain\textsuperscript{36}. Continuous emotional stress can upregulate the autonomic nervous system\textsuperscript{38} which can trigger the central nervous system to maintain the pain condition, therefore compromising the proposed treatment\textsuperscript{36}.

Deep pain input - "deep pain input refers to any source of neural impulses that originate in the deep structures and lead to a pain experience. This excludes the skin and oral mucosa"\textsuperscript{36}. An example is a cervical nerve (C1-C4) pain that can refer pain to the face, which could trigger a secondary masticatory muscle pain\textsuperscript{36}, and directing the treatment only to the masticatory muscle will not eliminate the problem.

Parafunctioanl Activities - It is important to understand that many people put their teeth together when sleeping; it usually occurs when the patient shifts from a deep stage of sleep to a light stage. Among those, many do not experience pain upon awakening, and therefore need no treatment for their clenching/bruxing activity. Nocturnal parafunction that elicits pain upon awakening needs attention, at least to protect teeth from dental wear. In contrast, people generally do not contact their teeth while awake, unless when chewing or swallowing. Thus it is important to appreciate that daytime clenching may lead to muscle pain and muscle fatigue\textsuperscript{36}.
It is fundamental to appreciate these five factors mentioned above are not the sole determinant of whether or not someone will develop TMD. Research has already identified other aspects involved in adaptability, such as an individual’s biology, previous experiences, genetics, somatoform co-morbid disorders and psychological conditions.

Due to the multifactorial etiology of TMD and the controversial studies in this field, researchers and clinicians often do not agree about TMD etiology, diagnosis and treatment. Despite the recent advances in science related to the etiology, diagnosis, and treatment of TMD, often clinicians rely on their own beliefs when diagnosing and treating TMD patients. Oftentimes these beliefs were formed based on outdated knowledge that has not been subjected to rigorous review and does not meet the evidence based practice standards.

The first step to better educate those who diagnose and treat (and/or refer) TMD patients is to learn about their knowledge and beliefs in this field. Many studies have investigated the knowledge and beliefs regarding TMD among dentists, and many studies have investigated the influence of orthodontic treatment on TMD. A recent systematic review concluded that there is no evidence for a cause-effect relationship between orthodontic treatment and temporomandibular
disorders, or that such treatment might improve or prevent them\textsuperscript{21}. Another systematic review (Cochrane) investigated the effectiveness of orthodontic intervention in reducing symptoms in patients with TMD, and to determine if active orthodontic intervention leads to TMD. After identifying 284 studies, none met the inclusion criteria for this review. The authors concluded that there is no sufficient data on which to base clinical practice on the relationship of active orthodontic intervention and TMD\textsuperscript{24}.

Even though the recent literature indicates the lack of scientific evidence to support orthodontic therapy to treat TMD, or that orthodontic therapy can cause TMD\textsuperscript{22,42}, it seems that some orthodontists are still deploying orthodontic intervention as an option to manage TMD\textsuperscript{43,44}. Moreover, some orthodontists believe that orthodontic therapy could in fact cause TMD\textsuperscript{44}.

A study from Yang and Kiyak\textsuperscript{43} investigated orthodontists’ perspectives on the best time to initiate treatment, factors that preclude early treatment, and experiences with compliance or adherence problems among their younger patients. Among 129 orthodontists, around 30% believed that some TMD requires treatment in the permanent dentition state, but 44% would refer those patients to a specialist.

Coelho and Caracas\textsuperscript{44} investigated the perception of the relationship between TMD and orthodontic treatment among Brazilian orthodontists. Among the 173 who
answered the questionnaire, 76 orthodontists believed orthodontic treatment can lead to TMD.

Among those papers that investigated the perception of orthodontists regarding the influence of orthodontic therapy in TMD, none investigated the foundational knowledge and beliefs of orthodontists regarding the pathophysiology, chronic pain, psychophysiology and psychiatric domains related to TMD. Therefore, the aim of this study will be to evaluate knowledge and beliefs regarding temporomandibular disorders among orthodontists when compared to responses from “experts in TMD”; more specifically: A) to determine possible discrepancies related to knowledge and beliefs regarding TMD between these two groups of specialists as it pertain to diagnosis and/or treatment of TMD patients; B) to identify which specific domain (pathophysiologic, chronic pain, psychophysiological, psychiatric disorders) potentially yields the greatest knowledge gap among the specialty cohorts evaluated; C) to ascertain the practicing orthodontic providers comfort level in treating TMD patients, and D) to identify the manner in which individual orthodontists acquired their foundational and treatment knowledge regarding TMD.
Materials and Methods

This study was approved by the Medical University of South Carolina’s Institutional Review Board.

1) Temporomandibular survey

The temporomandibular survey consisted of 2 sections: a) general information; and b) knowledge and beliefs regarding TMD.

a) General Information

The first section contained 10 general information questions about each participant, such as where they acquired most of their TMD training and whether or not they feel comfortable diagnosing and treating TMD patients.

b) Knowledge and Beliefs regarding TMD

Knowledge and beliefs were assessed using a 38-item questionnaire used by Porto et al, which was adapted from a survey used by LeResche et al. The questionnaire consists of questions surveying four domains: pathophysiology (15 items), chronic pain (10 items), psychophysiology (9 items), and psychiatric disorders (4 items). Each item consists of a statement to which respondents are asked to indicate their agreement on a 6-point scale (I don’t know, strongly disagree, disagree, neutral, agree, and strongly agree).
2) Survey Administration

2.1 - Subjects:

The survey was administered to random samples of orthodontists in the United States who were members of the American Association of Orthodontists at the time of the study. The orthodontists participated voluntarily, and received no financial compensation.

2.2 - Recruitment:

A total of 8870 random orthodontists who were current members of the American Academy of Orthodontists and registered in one of the states or the District of Columbia were solicited via e-mail and requested to complete the survey online, via a secure link to an online survey program (REDCap). The survey was sent to AAO members of all U.S. states and District of Columbia. Randomization was performed as follows: lists with all members divided per state were printed, then one or more pages were removed from each state's list which had more than 100 members. The members listed on the removed pages were not invited to complete the survey. The invitation explained that the purpose of the study was to evaluate current knowledge and beliefs about diagnosis and treatment of TMD. It stressed that the completion of the survey was entirely voluntary, and that responses would not be identifiable. No personal identification was requested. One reminder e-mail was sent one week after the initial solicitation to the same group initially included.
Another reminder e-mail was sent one month after the initial solicitation, if less than 100% participation was observed. The estimated time for the orthodontists to complete the survey was 9 minutes.

Participants who were not orthodontist or residents in orthodontics were excluded from the analysis of the second section of the survey, as well as the participants who indicated they are AAO members outside the U.S.

3) Survey analysis
The section about knowledge and beliefs regarding TMD consisted of 38 questions answered on a 6-point scale. A group consensus was attributed when more than 50% of the orthodontists supported one response; the agree response combined “strongly agree” and “agree”, and the disagree response combined “strongly disagree” and “disagree”. The TMD experts’ responses published in the paper of Porto et al were used as the reference to evaluate the orthodontists’ responses.

4) Data analysis
The data obtained from the survey software (REDCap) was exported to an excel file and then analyzed using z-test. In order to draw comparisons with responses from the TMD experts, the percent agreement for each question among the TMD experts group was compared to the percent agreement for each question among the
orthodontist group using a two-proportion z-test for each question, and even though the groups may have selected the same option as their response, if the comparison presented p-value<0.05, the difference was considered statistically significant. Participants who were neither orthodontist nor residents in orthodontics, as well as the participants who indicated they are members outside the U.S, were excluded from the analysis of the second section of the questionnaire (knowledge and beliefs regarding TMD).

5) Confidentiality

No identifiers were requested from the participants. No IP address was recorded. The answers were hosted on a secure database at the Medical University of South Carolina.
**Results**

Out of the 8870 emails sent, 727 emails returned as “undeliverable address”. Forty-six orthodontists who responded to the invitational email explained that they were retired and did not feel comfortable participating. A total of 1545 participants answered the questionnaire.

Table I shows the demographic distribution of 1545 participants included in the analysis. Six participants did not fill out this question, five participants were neither orthodontists nor residents in orthodontics, and 11 were AAO members outside the U.S. Among the participants who answered this question, 9.7% were residents in an orthodontic program. The majority of the participants were private practitioners.
Table I. Demographic data indicating distribution among the orthodontist group

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Numbers of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year Ortho resident</td>
<td>61</td>
</tr>
<tr>
<td>2nd year Ortho resident</td>
<td>60</td>
</tr>
<tr>
<td>3rd year Ortho resident</td>
<td>27</td>
</tr>
<tr>
<td>Private practitioner in Orthodontics</td>
<td>1132</td>
</tr>
<tr>
<td>Full time faculty in Ortho</td>
<td>61</td>
</tr>
<tr>
<td>Retired orthodontist</td>
<td>154</td>
</tr>
<tr>
<td>Resident/Private practitioner/faculty OUTSIDE U.S.</td>
<td>11</td>
</tr>
<tr>
<td>Other</td>
<td>33</td>
</tr>
</tbody>
</table>

Among those who answered “other”, one did not indicate his status, 2 indicated being staff members, and 2 indicated to be “fellows”, the others were either part time faculty members or orthodontists in the military service.

Fifteen percent of the participants graduated from an orthodontic program less than 5 years ago, 9.2% between 5 and 10 years ago, 17.6% between 10 and 20 years ago, and 48.3% more than 20 years ago.

Among the participants, almost 35% indicated that they got most of their knowledge in TMD from an orthodontic residency. "CE courses” was the most selected option, and 3.8% indicated the question to be not applicable for them.
Figure 1. Where the participant obtained most of the knowledge in TMD
When the participants were asked what was the preferred treatment modality to treat the most common TMD problems, 64.2% selected modalities related with occlusion (figure 2).

**Figure 2.** Preferred treatment modality to treat the most common TMD problems.
Figure 3 shows the perception of the participant’s success rate treating TMD patients. Eight participants did not answer to this question.

![Success rate treating TMD patients](image)

**Figure 3.** Perception of success rate treating TMD patients
The majority of the participants informed that they do not think they received enough training in TMD during their orthodontic residency. Even though almost 62% of the participants feel comfortable diagnosing TMD patients, more then half do not feel comfortable treating TMD patients, and only 4.7% stated feeling comfortable performing diagnostic injections to confirm their working diagnosis (Table II).

**Table II.** Other questions present on the general information section of the survey.

<table>
<thead>
<tr>
<th>Question</th>
<th>YES (%)</th>
<th>No (%)</th>
<th>N/A (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think you received enough training in TMD during the orthodontic residency?</td>
<td>35.7</td>
<td>61.6</td>
<td>2.7</td>
</tr>
<tr>
<td>Do you feel comfortable diagnosing TMD patients?</td>
<td>61.9</td>
<td>36.6</td>
<td>1.5</td>
</tr>
<tr>
<td>Do you feel comfortable performing diagnostic injections to confirm your working diagnosis?</td>
<td>4.7</td>
<td>90.5</td>
<td>4.7</td>
</tr>
<tr>
<td>Do you record pain levels using ordinal pain scales (1-10) for your TMD patients?</td>
<td>37.3</td>
<td>57.9</td>
<td>4.8</td>
</tr>
<tr>
<td>Do you feel comfortable treating patients with TMD?</td>
<td>46.6</td>
<td>50.2</td>
<td>3.2</td>
</tr>
</tbody>
</table>
In the second section of the survey, the participants’ knowledge and beliefs regarding TMD was evaluated based on 4 different domains: pathophysiology domain, chronic pain domain, psychophysiology domain, and psychiatric disorders domain.

Among the 38 questions in the second section of the survey, half of the questions received more than 15% “neutral” responses, and 14 questions received more than 15% “I don’t know” responses.

The pathophysiology domain had the highest number of questions (86.7%) that received more than 15% “neutral” or “I don’t know” responses. The domain with the lowest incidence of “neutral” or “I don’t know” responses that were above 15% was the psychophysiology domain (22.22%). Pathophysiology domain was also the domain with the highest percentage of questions (40%) without consensus.

The question with the highest agreement among the orthodontists was: “All individuals with clicking TMJs require treatment”. Ninety six percent of the orthodontists disagreed with that statement.
<table>
<thead>
<tr>
<th>Item</th>
<th>Agree and strongly agree %</th>
<th>Disagree and strongly disagree %</th>
<th>I don’t know %</th>
<th>Neutral %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occlusal equilibration is a useful early treatment for TMD</td>
<td>22.83</td>
<td>50.39</td>
<td>6.32</td>
<td>20.46</td>
</tr>
<tr>
<td>Orthodontic treatment can prevent the onset of TMD</td>
<td>16.63</td>
<td>59.76</td>
<td>2.89</td>
<td>20.71</td>
</tr>
<tr>
<td>Arthroscopic surgery is almost completely effective in repositioning the disk in patients with internal derangements</td>
<td>5.20</td>
<td>58.13</td>
<td>22.78</td>
<td>13.89</td>
</tr>
<tr>
<td>Orthodontic therapy is the best treatment to resolve TMD in a patient with a skeletal malocclusion</td>
<td>9.81</td>
<td>67.54</td>
<td>4.94</td>
<td>17.71</td>
</tr>
<tr>
<td>TMD caused by trauma is much more difficult to treat and has a far worse prognosis than other types of TMD</td>
<td>33.07</td>
<td>31.49</td>
<td>20.62</td>
<td>14.82</td>
</tr>
<tr>
<td>Panoramic film is a reasonable method to evaluate the bony structures of the TMJ</td>
<td>16.08</td>
<td>66.71</td>
<td>0.99</td>
<td>16.22</td>
</tr>
<tr>
<td>When bony changes are seen on a panoramic film, a tomogram is mandatory in order to define the treatment plan</td>
<td>45.68</td>
<td>26.14</td>
<td>9.77</td>
<td>18.42</td>
</tr>
<tr>
<td>The presence of arthritic changes on tomograms, along with crepitus in the joint indicates the need for treatment</td>
<td>19.56</td>
<td>48.51</td>
<td>12.23</td>
<td>19.70</td>
</tr>
<tr>
<td>The position of the condyle in</td>
<td>11.31</td>
<td>53.84</td>
<td>18.72</td>
<td>16.14</td>
</tr>
</tbody>
</table>
the fossa as seen on tomogram is a very accurate indicator of internal derangement

<p>| Mandibular repositioning splints are more effective than maxillary repositioning splints | 10.07  | 47.48  | 23.64  | 18.81  |
| Splint therapy is only effective when the splint is used more than 16 hours/day. | 27.32  | 40.85  | 17.31  | 14.52  |
| Nocturnal bruxism is caused by occlusal interference. | 8.28   | 71.24  | 3.91   | 16.57  |
| Ice packs and/or heat packs and passive muscle stretching are good early treatments for TMD. | 74.75  | 5.63   | 5.70   | 13.92  |
| All individuals with clicking TMJs require treatment. | 1.79   | 96.22  | 0.46   | 1.52   |
| Balancing interference are commonly related to TMD | 34.51  | 31.06  | 11.75  | 22.69  |</p>
<table>
<thead>
<tr>
<th>Item</th>
<th>Agree and strongly agree %</th>
<th>Disagree and strongly disagree %</th>
<th>I don't know %</th>
<th>Neutral %</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRN narcotics (&quot;as needed&quot; for pain) are a treatment of choice when TMD pain is severe.</td>
<td>17.04</td>
<td>55.33</td>
<td>10.92</td>
<td>16.71</td>
</tr>
<tr>
<td>Antidepressants are never indicated in the management of TMD.</td>
<td>6.39</td>
<td>60.12</td>
<td>18.24</td>
<td>15.25</td>
</tr>
<tr>
<td>An extensive history of previous treatment failures in a TMD patient is usually an indication for surgery.</td>
<td>13.91</td>
<td>55.69</td>
<td>12.31</td>
<td>18.1</td>
</tr>
<tr>
<td>Chronic pain is a behavioral, as well as a physical problem.</td>
<td>63.38</td>
<td>9.25</td>
<td>10.65</td>
<td>16.71</td>
</tr>
<tr>
<td>Although some TMD patients have psychological problems, these problems are usually unrelated to their pain.</td>
<td>4.87</td>
<td>70.80</td>
<td>10.07</td>
<td>14.27</td>
</tr>
<tr>
<td>Poor quality of sleep is a major factor in the development of TMD.</td>
<td>32.15</td>
<td>18.35</td>
<td>21.41</td>
<td>28.09</td>
</tr>
<tr>
<td>Difficulty with sleep is a common finding in chronic pain.</td>
<td>72.18</td>
<td>2.40</td>
<td>13.68</td>
<td>11.74</td>
</tr>
<tr>
<td>Some patients use pain as an excuse to avoid unpleasant chores.</td>
<td>40.96</td>
<td>9.74</td>
<td>21.41</td>
<td>27.89</td>
</tr>
<tr>
<td>Behavior modification treatments are appropriate for patients with chronic TMD pain.</td>
<td>69.43</td>
<td>2.60</td>
<td>11.55</td>
<td>16.42</td>
</tr>
<tr>
<td>Chronic TMD patients should be advised to rest and limit their work and social activities when they are experiencing pain.</td>
<td>24.45</td>
<td>34.13</td>
<td>15.23</td>
<td>26.19</td>
</tr>
<tr>
<td>Item</td>
<td>Agree and strongly agree %</td>
<td>Disagree and strongly disagree %</td>
<td>I don’t know %</td>
<td>Neutral %</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------------</td>
<td>----------------</td>
<td>-----------</td>
</tr>
<tr>
<td>The mechanisms of acute and chronic pain are the same.</td>
<td>2.54</td>
<td>82.57</td>
<td>10.22</td>
<td>4.68</td>
</tr>
<tr>
<td>Biofeedback can be useful for treating TMD.</td>
<td>64.86</td>
<td>1.20</td>
<td>21.11</td>
<td>12.83</td>
</tr>
<tr>
<td>Oral parafunction habits are often significant in the development of TMD.</td>
<td>70.99</td>
<td>7.49</td>
<td>7.22</td>
<td>14.30</td>
</tr>
<tr>
<td>Patients with TMD who clench/brux do so either during the day or at night, but not both.</td>
<td>2.81</td>
<td>78.56</td>
<td>12.22</td>
<td>6.41</td>
</tr>
<tr>
<td>Stress management is indicated for many TMD patients.</td>
<td>89.85</td>
<td>1.27</td>
<td>2.07</td>
<td>6.81</td>
</tr>
<tr>
<td>Stress is a major factor in the development of TMD.</td>
<td>78.29</td>
<td>4.21</td>
<td>3.87</td>
<td>13.63</td>
</tr>
<tr>
<td>Tension and stress increase jaw muscle EMG levels in susceptible patients.</td>
<td>79.56</td>
<td>0.53</td>
<td>14.30</td>
<td>5.61</td>
</tr>
<tr>
<td>Progressive muscle relaxation is not an effective treatment for TMD.</td>
<td>4.21</td>
<td>60.96</td>
<td>20.32</td>
<td>14.51</td>
</tr>
<tr>
<td>Information on the daily pattern of the TMD symptoms can be helpful for identifying contributing factors.</td>
<td>91.71</td>
<td>0.87</td>
<td>3.74</td>
<td>3.68</td>
</tr>
</tbody>
</table>
### Table VI. Psychiatric Disorders Domain – Ortho group only

<table>
<thead>
<tr>
<th>Item</th>
<th>Agree and strongly agree %</th>
<th>Disagree and strongly disagree %</th>
<th>I don’t know %</th>
<th>Neutral %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical depression is rare in chronic TMD patients.</td>
<td>2.07</td>
<td>65.22</td>
<td>22.68</td>
<td>10.03</td>
</tr>
<tr>
<td>Depressed mood is fairly common in chronic TMD patients.</td>
<td>70.12</td>
<td>2.27</td>
<td>15.84</td>
<td>11.76</td>
</tr>
<tr>
<td>Anxiety disorders are more common in TMD patients than in the population at large.</td>
<td>49.73</td>
<td>4.14</td>
<td>30.08</td>
<td>16.04</td>
</tr>
<tr>
<td>Depression can be an important etiologic factor in chronic pain.</td>
<td>73.46</td>
<td>2.41</td>
<td>14.44</td>
<td>9.69</td>
</tr>
</tbody>
</table>

Out of the 38 questions of the second section, 10 questions did not reach consensus level among the orthodontists group. For the ortho group, consensus in each question was attributed when more than 50% of the respondents supported one option (see material and methods). Comparison between the two groups (orthodontists group, and TMD expert group) indicated only 10 questions in which the difference between the two groups’ responses was not statistically significant. In another question, which was about the effect of a poor quality of sleep in the development of TMD, no consensus was achieved in either group.
Table VII. Pathophysiology Domain – Ortho and TMD groups

<table>
<thead>
<tr>
<th>Item</th>
<th>Orthodontists</th>
<th>TMD experts</th>
<th>z-value&lt;sup&gt;a&lt;/sup&gt;</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occlusal equilibration is a useful early treatment for TMD</td>
<td>50.39% disagree</td>
<td>90.9% disagree</td>
<td>-4.47</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Orthodontic treatment can prevent the onset of TMD</td>
<td>59.76% disagree</td>
<td>93.9% disagree</td>
<td>-3.85</td>
<td>0.0001</td>
</tr>
<tr>
<td>Arthroscopic surgery is almost completely effective in repositioning the disk in patients with internal derangements</td>
<td>58.13% disagree</td>
<td>93.9% disagree</td>
<td>-4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Orthodontic therapy is the best treatment to resolve TMD in a patient with a skeletal malocclusion</td>
<td>67.54% disagree</td>
<td>90.9% disagree</td>
<td>-2.76</td>
<td>0.0058</td>
</tr>
<tr>
<td>TMD caused by trauma is much more difficult to treat and has a far worse prognosis than other types of TMD</td>
<td>No consensus</td>
<td>75.7% disagree</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Panoramic film is a reasonable method to evaluate the bony structures of the TMJ</td>
<td>66.71% disagree</td>
<td>No consensus</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>When bony changes are seen on a panoramic film, a tomogram is mandatory in order to define the treatment plan</td>
<td>No consensus</td>
<td>79.7% disagree</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>The presence of arthritic changes on tomograms, along with crepitus in the joint indicates the need for treatment</td>
<td>No consensus</td>
<td>81.8% disagree</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>The position of the condyle in the fossa as seen on tomogram is a very accurate indicator of internal derangement</td>
<td>53.84% disagree</td>
<td>84.8% disagree</td>
<td>-3.43</td>
<td>0.0006</td>
</tr>
<tr>
<td>Statement</td>
<td>Agreement</td>
<td>Disagreement</td>
<td>t-Value</td>
<td>p-Value</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>---------------</td>
<td>--------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Mandibular repositioning splints are more effective than maxillary repositioning splints</td>
<td>No consensus</td>
<td>87.8% disagree</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Splint therapy is only effective when the splint is used more than 16 hours/day.</td>
<td>No consensus</td>
<td>90.9% disagree</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Nocturnal bruxism is caused by occlusal interference.</td>
<td>71.24% disagree</td>
<td>87.8% disagree</td>
<td>-2.02</td>
<td>0.0434</td>
</tr>
<tr>
<td>Ice packs and/or heat packs and passive muscle stretching are good early treatments for TMD.</td>
<td>74.75% agree</td>
<td>78.7% agree</td>
<td>-0.5</td>
<td>0.6171</td>
</tr>
<tr>
<td>All individuals with clicking TMJs require treatment.</td>
<td>96.22% disagree</td>
<td>90.9% disagree</td>
<td>1.52</td>
<td>0.1285</td>
</tr>
<tr>
<td>Balancing interference are commonly related to TMD</td>
<td>No consensus</td>
<td>81.8% disagree</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

a difference between the two groups’ responses was statistically significant (p<0.05)
### Table VIII. Chronic Pain Domain – Ortho and TMD groups

<table>
<thead>
<tr>
<th>Item</th>
<th>Orthodontists</th>
<th>TMD experts</th>
<th>z-value&lt;sup&gt;a&lt;/sup&gt;</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRN narcotics (&quot;as needed&quot; for pain) are a treatment of choice when TMD pain is severe.</td>
<td>55.33% disagree</td>
<td>90.3% disagree</td>
<td>-4.09</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Antidepressants are never indicated in the management of TMD.</td>
<td>60.12% disagree</td>
<td>93.5% disagree</td>
<td>-3.77</td>
<td>0.0002</td>
</tr>
<tr>
<td>An extensive history of previous treatment failures in a TMD patient is usually an indication for surgery.</td>
<td>55.69% disagree</td>
<td>96.7% disagree</td>
<td>-4.55</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Chronic pain is a behavioral, as well as a physical problem.</td>
<td>63.38% agree</td>
<td>93.5% agree</td>
<td>-3.46</td>
<td>0.0005</td>
</tr>
<tr>
<td>Although some TMD patients have psychological problems, these problems are usually unrelated to their pain.</td>
<td>70.8% disagree</td>
<td>83.8% disagree</td>
<td>-1.58</td>
<td>0.1141</td>
</tr>
<tr>
<td>Poor quality of sleep is a major factor in the development of TMD.</td>
<td>No consensus</td>
<td>No consensus</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Difficulty with sleep is a common finding in chronic pain.</td>
<td>72.18% agree</td>
<td>96.7% agree</td>
<td>-3.03</td>
<td>0.0024</td>
</tr>
<tr>
<td>Some patients use pain as an excuse to avoid unpleasant chores.</td>
<td>No consensus</td>
<td>83.8% agree</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Behavior modification treatments are appropriate for patients with chronic TMD pain.</td>
<td>69.43% agree</td>
<td>87.1% agree</td>
<td>-2.11</td>
<td>0.0349</td>
</tr>
<tr>
<td>Chronic TMD patients should be advised to rest and limit their work and social activities when they are experiencing pain.</td>
<td>No consensus</td>
<td>51.6% disagree</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

<sup>a</sup>difference between the two groups’ responses was statistically significant (p<0.05)
### Table IX. Psychophysiology Domain – Ortho and TMD groups

<table>
<thead>
<tr>
<th>Item</th>
<th>Orthodontists</th>
<th>TMD experts</th>
<th>z-value*</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>The mechanisms of acute and chronic pain are the same.</td>
<td>82.57% disagree</td>
<td>96.7% disagree</td>
<td>-2.07</td>
<td>0.0385</td>
</tr>
<tr>
<td>Biofeedback can be useful for treating TMD.</td>
<td>64.86% agree</td>
<td>87% agree</td>
<td>-2.56</td>
<td>0.0105</td>
</tr>
<tr>
<td>Oral parafunction habits are often significant in the development of TMD.</td>
<td>70.99% agree</td>
<td>74.2% agree</td>
<td>-0.39</td>
<td>0.6965</td>
</tr>
<tr>
<td>Patients with TMD who clench/brux do so either during the day or at night, but not both.</td>
<td>78.56% disagree</td>
<td>90.3% disagree</td>
<td>-1.58</td>
<td>0.1141</td>
</tr>
<tr>
<td>Stress management is indicated for many TMD patients.</td>
<td>89.85% agree</td>
<td>90.3% agree</td>
<td>-0.08</td>
<td>0.9362</td>
</tr>
<tr>
<td>Stress is a major factor in the development of TMD.</td>
<td>78.29% agree</td>
<td>74.1% agree</td>
<td>0.56</td>
<td>0.5755</td>
</tr>
<tr>
<td>Tension and stress increase jaw muscle EMG levels in susceptible patients.</td>
<td>79.56% agree</td>
<td>61.2% agree</td>
<td>2.49</td>
<td>0.0128</td>
</tr>
<tr>
<td>Progressive muscle relaxation is not an effective treatment for TMD.</td>
<td>60.96% disagree</td>
<td>80.6% disagree</td>
<td>-2.22</td>
<td>0.0264</td>
</tr>
<tr>
<td>Information on the daily pattern of the TMD symptoms can be helpful for identifying contributing factors.</td>
<td>91.71% agree</td>
<td>90.3% agree</td>
<td>0.28</td>
<td>0.7795</td>
</tr>
</tbody>
</table>

* Difference between the two groups’ responses was statistically significant (p<0.05)
<table>
<thead>
<tr>
<th>Item</th>
<th>Orthodontists</th>
<th>TMD experts</th>
<th>z-value&lt;sup&gt;a&lt;/sup&gt;</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical depression is rare in chronic TMD patients.</td>
<td>65.22% disagree</td>
<td>80.6% disagree</td>
<td>-1.78</td>
<td>0.0751</td>
</tr>
<tr>
<td>Depressed mood is fairly common in chronic TMD patients.</td>
<td>70.12% agree</td>
<td>93.5% agree</td>
<td>-2.82</td>
<td>0.0047</td>
</tr>
<tr>
<td>Anxiety disorders are more common in TMD patients than in the population at large.</td>
<td>No consensus</td>
<td>74.2% agree</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Depression can be an important etiologic factor in chronic pain.</td>
<td>73.46% agree</td>
<td>74.1% agree</td>
<td>-0.08</td>
<td>0.9362</td>
</tr>
</tbody>
</table>

<sup>a</sup>difference between the two groups’ responses was statistically significant (p<0.05)
**Discussion**

The purpose of this study was to identify whether or not there was a discrepancy between orthodontists and “experts in TMD” related to diagnosis and/or treatment of TMD patients. In the long term, the authors expect to influence the way TMD is taught in orthodontic residency programs in order to better prepare future orthodontic specialists to diagnose and treat (and/or refer) the patients with TMD who often seek care among orthodontists.

A secondary objective of this study was to evaluate knowledge and beliefs regarding Temporomandibular Disorders (TMD) among orthodontists when compared to responses from “experts in TMD”; more specifically: A) to evaluate possible discrepancies related to knowledge and beliefs regarding TMD between these two groups of specialists as it pertains to diagnosis and/or treatment of TMD patients; B) to identify which specific domain (pathophysiologic, chronic pain, psychophysiological, psychiatric disorders) potentially yields the greatest discrepancy among the specialty cohorts evaluated; C) to ascertain the practicing orthodontic providers comfort level in treating TMD patients., and D) to identify the manner in which individual orthodontists acquired their foundational and treatment knowledge regarding TMD.

Since the survey indicated that the comparison would be drawn between orthodontists and TMD experts, one may argue that residents should be excluded...
from the analysis. However, the questions without consensus were the same when excluding residents from the analysis. Removing the residents’ responses also did not change the questions with statistically significant differences between the two groups.

On 27 out of the 38 questions of the second section, the majority of both groups selected the same options as their responses. However, the difference between the number of participants selecting the same response was not statistically significant on 10 questions.

In the second section of the survey, consensus among the orthodontists was not reached on 10 questions out of the 38 questions. Interestingly, the specified domain with the highest lack of consensus among the orthodontists was the pathophysiology domain. This domain covered diagnosis and some of the most common treatment modalities for TMD. The first question that did not reach consensus was “TMD caused by trauma is much more difficult to treat and has a far worse prognosis than other types of TMD”, 33.07% agreed with that statement, 31.49% disagreed, 20.62% did not know, and 14.82% were neutral. The literature, however, does not fully support that statement. While trauma is one of the factors that can lead to TMD[^32], there is not enough scientific evidence to support the assertion that patients with trauma are more difficult to treat.
The second question without consensus was “when bony changes are seen on a panoramic film, a tomogram is mandatory in order to define the treatment plan”. Most of the orthodontists (45.68%) agreed with that statement. However, a tomogram is not always necessary when evaluating patients with TMJ bony changes observed on a panoramic film. Even though a tomogram reveals more detail of the hard tissue when compared to the panoramic image, there was no statistically significant difference between panoramic imaging and tomograms in diagnosing flattening of the condyle45. When bony changes are observed on a panoramic image, before the clinician requests a more detailed image, he/she should consider whether or not a new image would likely change the diagnosis or treatment plan.

The third question that did not reach consensus among the orthodontists was also related to bony changes: “the presence of arthritic changes on tomograms, along with crepitus in the joint, indicates the need for treatment”. Even though consensus was not achieved, the majority of the respondents (48.51%) disagreed with that statement, which is in line with the response from TMD experts group. In fact, a treatment directed to the TMJ structure for a patient with those characteristics would be necessary only if the patient had significant impaired function, and/or symptomatology.

The next two questions that caused pause among the orthodontists were related to splint therapy. The studies about splint therapy for TMD are equivocal46.
but comparisons between several different types of splints showed no difference among them, and there is no data to support that splints must be used at least 16 hours/day to be effective.

The statement “balancing interferences are commonly related to TMD” also did not obtain consensus among the orthodontists. As mentioned previously, the relationship between occlusion and TMD has been extensively investigated, but yet the literature has not been conclusive. There are studies to support both sides of this debate, therefore not reaching a consensus in this particular question replicates the lack of agreement on the literature.

The statement “poor quality of sleep is a major factor in the development of TMD” also received no consensus, not only among the orthodontists, but also among the TMD experts. The relationship between pain and sleep quality in TMD patients is well documented, but whether TMD is a cause or a result of TMD may have given some respondents pause.

Another question that did not obtain consensus stated that “anxiety disorders are more common in TMD patients than in the population at large”. The orthodontists almost reached consensus on this question, since 49.73% agreed with the statement, but a similar amount of orthodontists responded either “neutral” or “I don’t know”. A recent study conducted by Reissmann reiterates the statement is
true; he concluded that the incidence of anxiety among the TMD patients is higher than among the general population.

It is important to appreciate that 61.6% of the participants feel that they did not have enough TMD training during their orthodontic residencies. The Accreditation Standards for Advanced Specialty Education Programs in Orthodontics and Dentofacial Orthopedics created by the Commission of Dental Accreditation (CODA) states that "A graduate of an advanced specialty education program in orthodontics must be competent to: ... g. Manage patients with functional occlusal and temporomandibular disorders;". This data indicates that the orthodontic residency programs must consider revisiting their curriculum in regard to temporomandibular disorders.

Coincidently, 61.9% of the participants indicated they do not feel comfortable diagnosing TMD patients, and less than half (46.6%) feel comfortable treating patients with TMD. This last question, however, was not found to be clear for all participants; it could be interpreted in different ways: a) one could interpret as if it was asking if he/she would feel comfortable treating an orthodontic patient who happens to have TMD (not necessarily to treat the patient’s TMD) or b) one could interpret as if it was asking if he/she would feel comfortable treating the patient’s TMD. Therefore the numbers collected from this question should be interpreted with some necessary caution.
Almost 65% of the participants indicated that they would treat TMD patients focusing on the occlusion (51.3% selected splint therapy, and 12.9% selected orthodontic/occlusal therapy). Once again, this data demonstrated that the relationship between occlusion and TMD is still controversial. Dr. Jeffrey Okeson\textsuperscript{36} summarized: “While recent data does not support that static relationship of teeth is strongly associated with TMD. Yet to believe that the occlusal conditions could not influence masticatory system function and dysfunction seems rather naïve.”

While more than half of the participants do not feel comfortable treating TMD patients, only 28.6% reported that they “do not treat TMD patients”.

Finally, despite the increase of research and new publications about TMD, knowledge and beliefs regarding this topic among orthodontists is still equivocal on most of the items investigated. Therefore, it would seem prudent to incorporate contemporary TMD diagnostic and evidence based treatment algorithms into the curricular structure of the orthodontic residency programs.
Summary and Conclusion

While several studies involving diagnosis and treatment of TMD have been published, no recent study has investigated if these publications have been translated to clinical practice and/or orthodontic training. This study intended to investigate the knowledge and beliefs of orthodontists regarding TMD by drawing a comparison to the group of “TMD experts”.

This study indicated that most of the orthodontists believe not enough training regarding TMD is offered during orthodontic residency programs. Furthermore, most of them do not feel comfortable in diagnosing or treating TMD patients. Yet, less than one third indicated they do not treat TMD patients, which is concerning since this data may suggest that some patients are being treated by professionals who do not feel comfortable doing so.

When comparisons were made between the two groups about their responses related to knowledge and beliefs regarding TMD, the responses even though considered to be a consensus, showed a statistically significant difference on 28 of the 38 questions. This study rejected the null hypothesis that orthodontists’ responses would not be different than the TMD experts’ responses.

In conclusion, it seems evident that orthodontic residencies need to improve the quality and the impact of TMD training in their curriculum. Despite the fact most orthodontists feel comfortable diagnosing TMD patients, less than half feel
comfortable treating those patients, and the difference in responses with the TMD expert group was significant in 71.05% of the questions.
Appendix A - Questionnaire emailed to eligible participants

TEMPOROMANDIBULAR DISORDERS SURVEY

The following is a research study being conducted by Dr. Felipe Porto, 2nd year resident at the Postgraduate Program in Orthodontics-Medical University of South Carolina.

The purpose of the study is to evaluate 'knowledge and beliefs regarding Temporomandibular Disorders (TMD)' among orthodontists.

It should take approximately 9 minutes to complete. You have the option to save your answers and finish later.

If you have any questions, please contact Dr. Felipe Porto (portof@musc.edu) or (859-285-7279).

General Information
Please select the option that better classifies you:

- ( ) A 1st year resident in an Orthodontic program
- ( ) A 2nd year resident in an Orthodontic program
- ( ) A 3rd year resident in an Orthodontic program
- ( ) Private practitioner
- ( ) FULL time faculty
- ( ) Retired
- ( ) Resident/private practitioner/faculty-OUTSIDE U.S.
- ( ) Other

Please specify __________________________

Graduation date (Postgraduate program in Orthodontics)

- ( ) I am an Orthodontics resident
- ( ) less than 5 years ago
- ( ) 5 to 10 years ago
- ( ) 10 to 20 years ago
- ( ) More than 20 years ago
- ( ) N/A

Do you think you received enough training in TMD during the Orthodontic residency?

- ( ) Yes
- ( ) No
- ( ) N/A
Where do you think you got most of your knowledge in TMD from?
( ) Dental School
( ) Orthodontics residency
( ) CE courses
( ) Fellowship/residency in Orofacial Pain/TMD
( ) Other residency
( ) N/A
Please specify ______________________

Do you feel comfortable diagnosing TMD patients?
( ) Yes
( ) No
( ) N/A

Do you feel comfortable performing diagnostic injections to confirm your working diagnosis?
( ) Yes
( ) No
( ) N/A

Do you record pain levels using ordinal pain scales (1-10) for your TMD patients?
( ) Yes
( ) No
( ) N/A

Do you feel comfortable treating patients with TMD?
( ) Yes
( ) No
( ) N/A

What is the treatment modality you prefer to treat the most common TMD problems?
( ) I do not treat TMD patients
( ) Biofeedback
( ) Pharmacological
( ) Splint therapy
( ) Orthodontic/occlusal therapy
( ) None of the above
What is your perception of your success rate treating TMD patients?
( ) < 25%
( ) 25-50%
( ) 50-75%
( ) >75%
( ) N/A

Pathophysiology Domain

Occlusal equilibration is a useful early treatment for TMD.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Orthodontic treatment can prevent the onset of TMD.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Arthroscopic surgery is almost completely effective in repositioning the disk in patients with internal derangements.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Orthodontic therapy is the best treatment to resolve TMD in a patient with skeletal malocclusion.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

TMD caused by trauma is much more difficult to treat and has a far worse prognosis than other types of TMD.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Panoramic film is a reasonable method to evaluate the bony structures of the TMJ.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

When bony changes are seen on a panoramic film, a tomogram is mandatory in order to define the treatment plan.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

The presence of arthritic changes on tomograms, along with crepitus in the joint indicates the need for treatment.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree
The position of the condyle in the fossa as seen on tomograms is a very accurate indicator of internal derangement.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Mandibular repositioning splints are more effective than maxillary splints.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Splint therapy is only effective when the splint is used more than 16 hours/day.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Nocturnal bruxism is caused by occlusal interference.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Ice packs and/or heat packs and passive muscle stretching are good early treatments for TMD.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

All individuals with clicking TMJs require treatment.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Balancing interferences are commonly related to TMD.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

**Chronic Pain Domain**

PRN narcotics ("as needed" for pain) are a treatment of choice when TMD pain is severe.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Antidepressants are never indicated in the management of TMD.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

An extensive history of previous treatment failures in a TMD patient is usually an
indication for surgery.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Chronic pain is a behavioral, as well as a physical problem.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Although some TMD patients have psychological problems, these problems are usually unrelated to their pain.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Poor quality of sleep is a major factor in the development of TMD.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Difficulty with sleep is a common finding in chronic pain.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
Some patients use pain as an excuse to avoid unpleasant chores.

Behavior modification treatments are appropriate for patients with chronic TMD pain.

Chronic TMD patients should be advised to rest and limit their work and social activities when they are experiencing pain.

Psychophysiology

The mechanisms of acute and chronic pain are the same.

Biofeedback can be useful for treating TMD.
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Oral parafunction habits are often significant in the development of TMD.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Patients with TMD who clench/brux do so either during the day or at night, but not both.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Stress management is indicated for many TDM patients.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Stress is a major factor in the development of TMD.
( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree
Tension and stress increase jaw muscle EMG levels in susceptible patients.

( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Progressive muscle relaxation is not an effective treatment for TMD.

( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Information on the daily pattern of the TMD symptoms can be helpful for identifying contributing factors.

( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

**Psychiatric Disorders**

Clinical depression is rare in chronic TMD patients.

( ) I don't know
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Depressed mood is fairly common in chronic TMD patients.
Anxiety disorders are more common in TMD patients than in the population at large.

Depression can be an important etiologic factor in chronic pain.
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