oral

MDPI

Communication

Self-Reported Mandibular Impairment and Cervical Pain Comorbidity in Undergraduate Dental Students

Luciana Paula Benício Arcas [1], Letícia Messias Marques Pinto [1], Ana Laura Sebben Fornari Moromizato [1], Jean Soares Miranda [2], João Paulo Mendes Tribst [3,*] and Marina Amaral [1]

[1] Department of Dentistry, University of Taubaté, Rua dos Operários, 9, Taubaté 12020-340, SP, Brazil
[2] Department of Dentistry, Federal University of Juiz de Fora (UFJF)—Campus Governador Valadares—Rua São Paulo, 745—Centro, Governador Valadares 35010-180, MG, Brazil
[3] Department of Oral Regenerative Medicine, Academic Centre for Dentistry Amsterdam (ACTA), University of Amsterdam and Vrije Universiteit Amsterdam, 1081 LA Amsterdam, The Netherlands
* Correspondence: j.p.mendes.tribst@acta.nl

Abstract: The aim of this study was to evaluate the frequency of co-existence of self-reported mandibular functional impairment and cervical pain in the same individuals. Participants answered a validated Mandibular Functional Impairment Questionnaire (MFIQ) and also indicated in a schematic map the region of cervical pain when it was reported. The frequency of cervical pain in participants with or without mandibular functional was compared with Chi-squared test. The final evaluated population consisted of 80 participants, 28 men (35%) and 52 women (65%), with ages ranging between 18 and 55 years (median = 20). It was found that 43.75% (n = 35) reported cervical pain, 15% of participants reported some degree of mandibular impairment, and 11.25% presented the comorbidity. In conclusion, participants with mandibular impairment presented significantly more frequent cervical pain than participants without mandibular impairment.

Keywords: dental students; diagnostic criteria for temporomandibular joint disorder; headaches; perceived stress scale; temporomandibular joint disorders

Citation: Arcas, L.P.B.; Pinto, L.M.M.; Moromizato, A.L.S.F.; Miranda, J.S.; Tribst, J.P.M.; Amaral, M. Self-Reported Mandibular Impairment and Cervical Pain Comorbidity in Undergraduate Dental Students. *Oral* **2022**, *2*, 286–292. https://doi.org/10.3390/oral2040027

Academic Editors: Giuseppe Minervini and Michele D'Attilio

Received: 7 September 2022
Accepted: 4 November 2022
Published: 9 November 2022

1. Introduction

The heterogeneous group of conditions that affect the temporomandibular joints, masticatory muscles, or associated structures are called temporomandibular disorders (TMDs) [1,2]. Most cases of TMDs are characterized by mild level and self-limiting disorders that do not need any treatment. However, TMDs are the second highest cause of musculoskeletal body pain and the second highest cause of orofacial pain [3].

Besides the pain, TMDs can cause reduction in mandibular function, reduction in bite force, limitations in mouth opening, and some clicks or crackles in the temporomandibular joint (TMJ) [4]. Neck pain can also be associated with some painful cases [5], but although it is already known that manual therapy at upper cervical spine may lead to a decrease in orofacial pain after 5 weeks of treatment [6,7], the association between TDMs and cervical pain still lacks consistent scientific evidence.

Interaction between the cervical region and anatomical structures associated with TMDs occurs through the proximity of anatomical structures and through the neurological pathway. The various orofacial components involved in TMDs are linked to the cervical region through the TMJ muscles and ligament connections [8]. In addition, the cervical region and TMJ are both innervated by the trigeminal nerve, and the nociceptive stimulation from both converge to the same place in the central nervous system, enabling cervical pain to modulate TMD-related pain and vice versa [9].

Assessment methods have been developed in order to assess the impact of TMDs on quality of life, as well as to allow standardization in research and the identification

of patients in need of treatment in clinical and epidemiological studies. The Mandibular Function Impairment Questionnaire (MFIQ) is one of the most used instruments for these evaluations. This questionnaire allows, from reliable scores, for the classification of individuals in relation to the severity of the functional limitations in patients with TDMs [10,11].

Therefore, the aim of this study was to evaluate the frequency of existence of self-reported mandibular functional impairment and the presence of cervical pain in the same individuals, which were undergraduate dentistry students. The null hypothesis was that there would be no association between the evaluated factors.

2. Materials and Methods

This study was approved and conducted in accordance with the Institutional Ethics Committee (protocol # 2.191.788).

2.1. Participants Selection

One hundred undergraduate dental students (the total number of students from the same school/course is around 370) volunteered to answer the questionnaire, and signed an informed consent form. Exclusion criteria were age (under 18 years old), presence of neuro-psychomotor involvement, history of facial or cranium cervical trauma, presence of facial and/or cranium cervical deformities, previous diagnosis of cervical disc hernia, and/or individuals undergoing orthodontic treatment.

2.2. Questionnaire Application

The validated and translated Portuguese version [10] of the Mandibular Functional Impairment Questionnaire (MFIQ) was applied. This measuring instrument consists of 17 questions arranged in two dimensions (D1: Functional Capacity; D2: Feeding). The average of the points assigned to each question allows of the classification of individuals according to the TMD severity. The limitation degree was rated from 0 to 4 (0, for no limitation, to 4, when the volunteer reported extreme limitation or impossibility of moving without assistance) [10].

The degree of mandibular impairment was calculated by the equation based on the C-index: $C = S/(n \times 4)$, where n is the number of items answered and S is the sum of limitation degree attributed to each of the questionnaire items. Table 1 shows the classification of mandibular impairment according to the C-index. The severity of mandibular functional impairment was classified as low (0 and 1), moderate (2 and 3), or severe (4 and 5) (Table 1).

Table 1. Level of functional jaw impairment.

Range of Variation of the C-Index	Rules	Degree of Functional Impairment
$C \leq 0.3$	All answers with limitation degree < 2	0
$C \leq 0.3$	At least one answer with limitation degree ≥ 2	1
$0.3 < C \leq 0.6$	All answers with limitation degree > 2 and < 3	2
$0.3 < C \leq 0.6$	At least one answer with limitation degree ≥ 3	3
$C > 0.6$	All answers with limitation degree > 3 and < 4	4
$C > 0.6$	All answers with limitation degree = 4	5

Figure 1 (adapted from Dwyer et al. 1990 [12]) illustrates the scheme in which the volunteers pointed out one or more regions in which they felt pain during the previous 2 weeks.

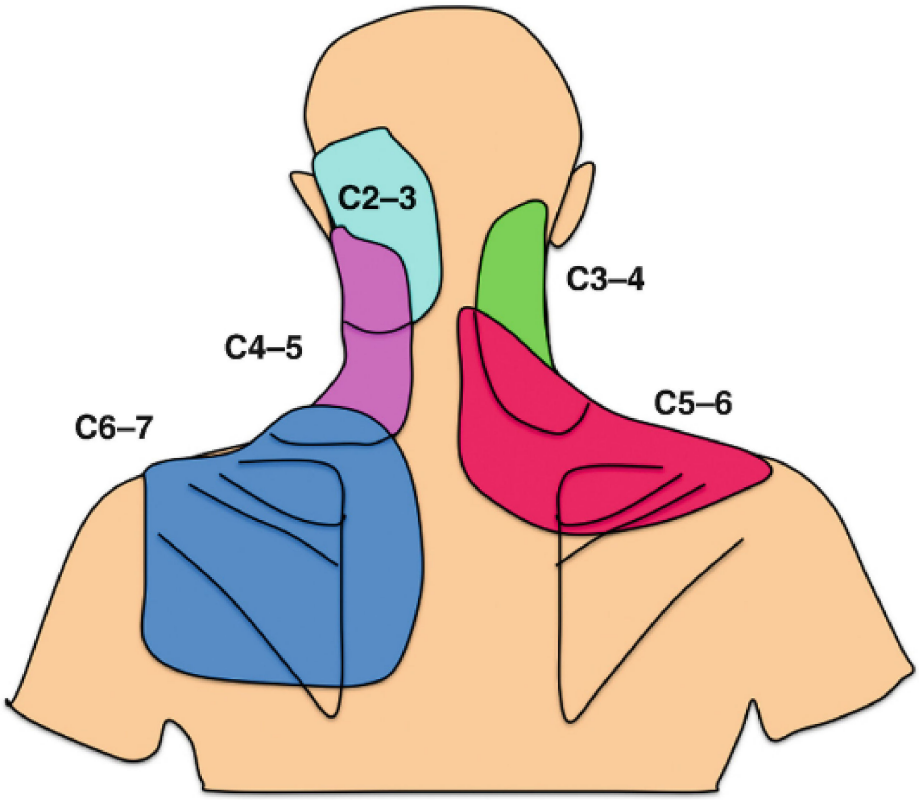

Figure 1. Illustration in which the volunteers pointed to the region of their pain (adapted from Dwyer et al. 1990 [12]).

A descriptive analysis was performed considering the data collected, and the frequency of cervical pain in participants with or without mandibular functional was compared with Chi-squared test.

3. Results

Of the 100 volunteers who answered the questionnaire, 4 had history of facial trauma, one had a diagnosis of cervical hernia, 14 were undergoing orthodontic treatment, and one was under 18 years old. These participants were excluded, and the final sample consisted of 80 participants, 28 men (35%) and 52 women (65%), with ages ranging between 18 and 55 years (median = 20).

Considering the population of the study, 43.75% (n = 35) reported cervical pain, reporting one or more sites of pain: C2-3 (3 records); C3-4 (2 records); C4-5 (12 records); C5-6 (24 records); C6-7 (10 records). Additionally, 15% of participants (n = 12, 10 women and 2 men) reported mandibular impairment (degree 1, n = 8; degree 2, n = 4). Comorbidity was presented by 11.25% (n = 9) of the participants (degree 1, n = 6; degree 2, n = 3), with 1 reporting pain in C2-3; 2 reporting pain in C3-4; 3 reporting pain in C4-5; 7 reporting pain in C5-6; and 4 reporting pain in C6-7. The cervical region with the most records of self-reported pain was C5-6 (corresponding to trapezius muscle), for the total population (n = 24, 30%) and for the population with self-reported mandibular impairment (n = 7, 58.33%).

Data (Figure 2) showed that participants with mandibular impairment (n = 12) presented significantly more cervical pain (n = 9, 70%) than participants without mandibular impairment (n = 68, 3 with cervical pain—4.41%) (p-value < 0.001).

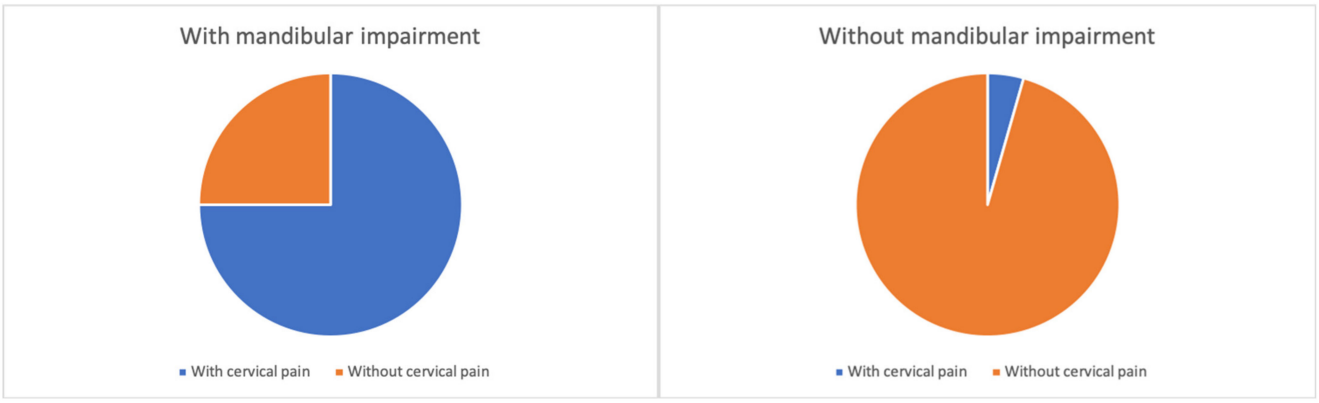

Figure 2. Graphs showing the data distribution according to the presence of mandibular impairment.

4. Discussion

This study evaluated the association of mandibular functional impairment and cervical pain in dentistry students. Notably, 15% of the volunteers reported some degree of mandibular impairment, and 43.75% reported cervical pain, with the latter condition representing quite a relevant health issue for dental students [13]. However, although dentists with long records of service show different levels of pain and discomfort in their necks, there is no evidence regarding whether younger dentists report neck pain before the onset of an abnormal condition in this region, including forward head posture [14].

According to the results, 11.25% participants reported both conditions (mandibular impairment and cervical pain); a high comorbidity of TMDs and cervical pain has also been reported in the literature [15,16]. Comorbidity occurs due to anatomical proximity and due to the fact that nociceptive stimuli in both areas go to the same trigeminal nerve nucleus, mainly in the C3 and C4 region [9]. Besides that, Visscher et al. (2018) [17] stated that this comorbidity is partly explained by genes that influence both traits. The possibility of neural convergence influence in mandibular limitation of TMDs and cervical pain is evidenced by the fact that patients with TMDs do not present differences in posture in relation to patients without TMDs [18]. However, upper cervical mobilizations and neck motor control and stabilization exercises do not affect mandibular function [7]. On the other hand, lower resistance of the neck extensor muscles, superior and global hypomobility of the neck, and a worse level of self-reported cervical disability were observed in patients with TMDs [18].

Another possibility of the relationship between the coexistence of cervical pain and mandibular impairment is that patients with other sites of body pain were 3.6 times more likely to also present temporomandibular pain, and the more pain sites in other parts that are affected, the greater the chance of also finding a painful TMD [19]. Peripheral and central sensitization may explain this association [20], because the central sensitization is resultant of neuroplastic changes in the central nervous system, resulting in a reduction in pain threshold, irrespective of the location of pain in the body. Nociceptive stimuli are also facilitated by amplification of receptive fields [21,22]. It is known that the management of symptomatic TMDs improves cervical dysfunctions [23] and that the neck pain treatment improves the conditions of the patients with chronic TMJ, as they influence each other [24].

Patients with TMDs have a tendency toward kyphosis (hypolordotic cervical malalignment) regardless of neck pain; however, TMD-related variables are not correlated with cervical alignment [15]. In the present study, there was no difference regarding cervical pain and/or mandibular limitation between graduation periods. Since students have more hours of clinical activity after the fourth period/semester, in this observational epidemiological study, dental students' clinical activity posture did not increase the incidence of neck pain or TMDs. Long-term postural changes in the head and neck region may be associated with musculoskeletal disorders [25–27], but it seems not to include mandibular limitation and TMDs.

The prevalence of individuals with mandibular functional limitation in the present study (15%) is similar to some previous studies, which presented a prevalence of 16.2% [19] or rates varying from 7.3% to 30.4% [28]. Additionally, the high incidence of mandibular limitation found in women (10 of 12 volunteers with mandibular limitation) is also confirmed in the literature [29]. Temporomandibular disorders affect about 3 times more women than men [1]. In addition, women report more pain, with more intensity and longer duration than men [30]. A possible explanation for this is the variation in estrogen levels that occurs in women, especially in the reproductive stage, which causes a decrease in the pain threshold [31,32].

The relevance of the present study is based in the fact that the presence of comorbidities associated with TMDs can increase the pain, disabilities, and chronification risk [33]. Although this present study illustrates that those who have mandibular limitation probably have cervical pain, mainly in the trapezius muscle [34], it is also noted that the opposite was less frequent.

Sleep quality, global psychological and somatic symptoms, stress, behavior, and environment [35–37] may also play an important role in factors evaluated, potentially causing both of the conditions (mandibular impairment and cervical pain), which were not investigated in the present study. As per limitations, this is a study with observational and transversal characteristic, with a very specific population. Thus, it is not possible to infer a causal relationship or apply the results to general population. Additionally, stress and other emotional and psychosocial aspects were not considered—these factors can also influence the painful experience related to TMDs, as a clinical evaluation, for diagnosis of TMDs.

5. Conclusions

Within the limitations of the present study, it was concluded that the presence of cervical pain was more frequent in participants with self-report of mandibular functional impairment compared to participants without mandibular functional impairment.

Author Contributions: Conceptualization, M.A.; methodology, L.P.B.A., L.M.M.P., A.L.S.F.M. and M.A.; formal analysis, J.S.M., J.P.M.T. and M.A.; investigation, L.M.M.P. and A.L.S.F.M.; writing—original draft preparation, L.P.B.A., L.M.M.P., A.L.S.F.M. and M.A.; writing—review and editing, J.S.M. and J.P.M.T.; project administration, M.A. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and was approved by the Institutional Review Board.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data available on request of the last author.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Manfredini, D.; Guarda-Nardini, L.; Winocur, E.; Piccotti, F.; Ahlberg, J.; Lobbezoo, F. Research Diagnostic Criteria for Temporomandibular Disorders: A Systematic Review of Axis I Epidemiologic Findings. *Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod.* **2011**, *112*, 453–462. [CrossRef] [PubMed]
2. van Grootel, R.J.; Buchner, R.; Wismeijer, D.; van der Glas, H.W. Towards an Optimal Therapy Strategy for Myogenous TMD, Physiotherapy Compared with Occlusal Splint Therapy in an RCT with Therapy-and-Patient-Specific Treatment Durations. *BMC Musculoskelet. Disord.* **2017**, *18*, 76. [CrossRef] [PubMed]
3. Schiffman, E.; Ohrbach, R.; Truelove, E.; Look, J.; Anderson, G.; Goulet, J.-P.; List, T.; Svensson, P.; Gonzalez, Y.; Lobbezoo, F.; et al. Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) for Clinical and Research Applications: Recommendations of the International RDC/TMD Consortium Network and Orofacial Pain Special Interest Group. *J. Oral Facial Pain Headache* **2014**, *28*, 6–27. [CrossRef] [PubMed]
4. Dworkin, S.F.; Huggins, K.H.; LeResche, L.; Von Korff, M.; Howard, J.; Truelove, E.; Sommers, E. Epidemiology of Signs and Symptoms in Temporomandibular Disorders: Clinical Signs in Cases and Controls. *J. Am. Dent. Assoc.* **1990**, *120*, 273–281. [CrossRef] [PubMed]

5. Benlidayi, I.C.; Guzel, R.; Tatli, U.; Salimov, F.; Keceli, O. The Relationship between Neck Pain and Cervical Alignment in Patients with Temporomandibular Disorders. *Cranio* **2020**, *38*, 174–179. [CrossRef] [PubMed]
6. Calixtre, L.; Grüninger, B.L.D.S.; Haik, M.; Alburquerque-Sendín, F.; Oliveira, A.B. Effects of Cervical Mobilization and Exercise on Pain, Movement and Function in Subjects with Temporomandibular Disorders: A Single Group Pre-Post Test. *J. Appl. Oral Sci.* **2016**, *24*, 188–197. [CrossRef]
7. Calixtre, L.B.; Oliveira, A.B.; De Sena Rosa, L.R.; Armijo-Olivo, S.; Visscher, C.M.; Alburquerque-Sendín, F. Effectiveness of Mobilisation of the Upper Cervical Region and Craniocervical Flexor Training on Orofacial Pain, Mandibular Function and Headache in Women with TMD. A Randomised, Controlled Trial. *J. Oral Rehabil.* **2019**, *46*, 109–119. [CrossRef]
8. La Touche, R.; García, S.M.; García, B.S.; Acosta, A.P.; Juárez, D.A.; Pérez, J.J.F.; Angulo-Díaz-Parreño, S.; Cuenca-Martínez, F.; Paris-Alemany, A.; Suso-Martí, L. Effect of Manual Therapy and Therapeutic Exercise Applied to the Cervical Region on Pain and Pressure Pain Sensitivity in Patients with Temporomandibular Disorders: A Systematic Review and Meta-analysis. *Pain Med.* **2020**, *21*, 2373–2384. [CrossRef]
9. Fougeront, N.; Fleiter, B. Temporomandibular Disorder and Comorbid Neck Pain: Facts and Hypotheses Regarding Pain-Induced and Rehabilitation-Induced Motor Activity Changes. *Can. J. Physiol. Pharmacol.* **2018**, *96*, 1051–1059. [CrossRef]
10. Campos, J.A.D.B.; Carrascosa, A.C.; Maroco, J. Validity and Reliability of the Portuguese Version of Mandibular Function Impairment Questionnaire: Validity and Reliability of the Mfiq. *J. Oral Rehabil.* **2012**, *39*, 377–383. [CrossRef]
11. Xu, L.; Cai, B.; Fang, Z. Translation and Validation of a Chinese Version of the Mandibular Function Impairment Questionnaire. *J. Oral Rehabil.* **2016**, *43*, 608–614. [CrossRef] [PubMed]
12. Mb, A.D.; Aprill, C.; Bogduk, N. Cervical Zygapophyseal Joint Pain Patterns I: A Study in Normal Volunteers. *Spine* **1990**, *15*, 453–457. [CrossRef] [PubMed]
13. Sulimany, A.M. Cervical and Lumbar Pain among Dental Interns in Saudi Arabia: A National Cross-Sectional Study. *J. Contemp. Dent. Pract.* **2021**, *22*, 860–866. [CrossRef] [PubMed]
14. Mostamand, J.; Lotfi, H.; Safi, N. Evaluating the Head Posture of Dentists with No Neck Pain. *J. Bodyw. Mov. Ther.* **2013**, *17*, 430–433. [CrossRef]
15. Almoznino, G.; Zini, A.; Zakuto, A.; Zlutzky, H.; Bekker, S.; Shay, B.; Haviv, Y.; Sharav, Y.; Benoliel, R. Cervical Muscle Tenderness in Temporomandibular Disorders and Its Associations with Diagnosis, Disease-Related Outcomes, and Comorbid Pain Conditions. *J. Oral Facial Pain Headache* **2020**, *34*, 67–76. [CrossRef]
16. Siu, W.-S.; Shih, Y.-F.; Lee, S.-Y.; Hsu, C.-Y.; Wei, M.-J.; Wang, T.-J.; Lin, H.-C.; Lin, Y.-L. Alterations in Kinematics of Temporomandibular Joint Associated with Chronic Neck Pain. *J. Oral Rehabil.* **2022**, *49*, 860–871. [CrossRef]
17. Visscher, C.; Schouten, M.; Ligthart, L.; van Houtem, C.; de Jongh, A.; Boomsma, D. Shared Genetics of Temporomandibular Disorder Pain and Neck Pain: Results of a Twin Study. *J. Oral Facial Pain Headache* **2018**, *32*, 107–112. [CrossRef]
18. De Oliveira-Souza, A.I.S.; Ferro, J.K.D.O.; Barros, M.M.; De Oliveira, D.A. Cervical Musculoskeletal Disorders in Patients with Temporomandibular Dysfunction: A Systematic Review and Meta-Analysis. *J. Bodyw. Mov. Ther.* **2020**, *24*, 84–101. [CrossRef]
19. Braido, G.V.D.V.; Campi, L.B.; Jordani, P.C.; Fernandes, G.; Gonçalves, D.A.D.G. Temporomandibular Disorder, Body Pain and Systemic Diseases: Assessing Their Associations in Adolescents. *J. Appl. Oral Sci.* **2020**, *28*, e20190608. [CrossRef]
20. Chichorro, J.G.; Porreca, F.; Sessle, B. Mechanisms of Craniofacial Pain. *Cephalalgia* **2017**, *37*, 613–626. [CrossRef]
21. Woolf, C.J. Central Sensitization: Implications for the Diagnosis and Treatment of Pain. *Pain* **2011**, *152*, S2–S15. [CrossRef] [PubMed]
22. Kim, M.S.; Kim, J.J.; Kang, K.H.; Kim, M.J.; In, Y. Diagnosis of Central Sensitization and Its Effects on Postoperative Outcomes Following Total Knee Arthroplasty: A Systematic Review and Meta-Analysis. *Diagnostics* **2022**, *12*, 1248. [CrossRef] [PubMed]
23. Kang, J.-H. Effects on Migraine, Neck Pain, and Head and Neck Posture, of Temporomandibular Disorder Treatment: Study of a Retrospective Cohort. *Arch. Oral Biol.* **2020**, *114*, 104718. [CrossRef] [PubMed]
24. Letafatkar, A.; Rabiei, P.; Alamooti, G.; Bertozzi, L.; Farivar, N.; Afshari, M. Effect of Therapeutic Exercise Routine on Pain, Disability, Posture, and Health Status in Dentists with Chronic Neck Pain: A Randomized Controlled Trial. *Int. Arch. Occup. Environ. Health* **2020**, *93*, 281–290. [CrossRef]
25. Selms, M.K.A.; Wiegers, J.W.; Meer, H.A.; Ahlberg, J.; Lobbezoo, F.; Visscher, C.M. Temporomandibular Disorders, Pain in the Neck and Shoulder Area, and Headache among Musicians. *J. Oral Rehabil.* **2020**, *47*, 132–142. [CrossRef]
26. Mahmoud, N.F.; Hassan, K.A.; Abdelmajeed, S.F.; Moustafa, I.M.; Silva, A.G. The Relationship between Forward Head Posture and Neck Pain: A Systematic Review and Meta-Analysis. *Curr. Rev. Musculoskelet. Med.* **2019**, *12*, 562–577. [CrossRef]
27. Sabrish, S.; Gaur, R.; Mahajan, P.; Gupta, S.; Gowda, S.; Mathew, S. Effectiveness of an Educative Ergonomic Plan in Reducing Musculo-Skeletal Disorders among Dental Practitioners. *Braz. Dent. Sci.* **2022**, *25*, e2483. [CrossRef]
28. Christidis, N.; Lindström Ndanshau, E.; Sandberg, A.; Tsilingaridis, G. Prevalence and Treatment Strategies Regarding Temporomandibular Disorders in Children and Adolescents—A Systematic Review. *J. Oral Rehabil.* **2019**, *46*, 291–301. [CrossRef]
29. Paredes, S.; Cantillo, S.; Candido, K.D.; Knezevic, N.N. An Association of Serotonin with Pain Disorders and Its Modulation by Estrogens. *Int. J. Mol. Sci.* **2019**, *20*, 5729. [CrossRef]
30. Lövgren, A.; Häggman-Henrikson, B.; Fjellman-Wiklund, A.; Begic, A.; Landgren, H.; Lundén, V.; Svensson, P.; Österlund, C. The Impact of Gender of the Examiner on Orofacial Pain Perception and Pain Reporting among Healthy Volunteers. *Clin. Oral Investig.* **2022**, *26*, 3033–3040. [CrossRef]

31. Quinelato, V.; Bonato, L.L.; Vieira, A.R.; Granjeiro, J.M.; Tesch, R.; Casado, P.L. Association between Polymorphisms in the Genes of Estrogen Receptors and the Presence of Temporomandibular Disorders and Chronic Arthralgia. *J. Oral Maxillofac. Surg.* **2018**, *76*, 314.e1–314.e9. [CrossRef] [PubMed]
32. Garcia, E.; Godoy-Izquierdo, D.; Godoy, J.F.; Perez, M.; Lopez-Chicheri, I. Gender Differences in Pressure Pain Threshold in a Repeated Measures Assessment. *Psychol. Health Med.* **2007**, *12*, 567–579. [CrossRef] [PubMed]
33. Ohrbach, R.; Fillingim, R.B.; Mulkey, F.; Gonzalez, Y.; Gordon, S.; Gremillion, H.; Lim, P.-F.; Ribeiro-Dasilva, M.; Greenspan, J.D.; Knott, C.; et al. Clinical Findings and Pain Symptoms as Potential Risk Factors for Chronic TMD: Descriptive Data and Empirically Identified Domains from the OPPERA Case-Control Study. *J. Pain* **2011**, *12*, T27–T45. [CrossRef] [PubMed]
34. Lendraitiene, E.; Smilgiene, L.; Petruseviciene, D.; Savickas, R. Changes and Associations between Cervical Range of Motion, Pain, Temporomandibular Joint Range of Motion and Quality of Life in Individuals with Migraine Applying Physiotherapy: A Pilot Study. *Medicina* **2021**, *57*, 630. [CrossRef]
35. Fillingim, R.B.; Ohrbach, R.; Greenspan, J.D.; Knott, C.; Diatchenko, L.; Dubner, R.; Bair, E.; Baraian, C.; Mack, N.; Slade, G.D.; et al. Psychological factors associated with development of TMD: The OPPERA prospective cohort study. *J. Pain* **2013**, *14*, T75–T90. [CrossRef]
36. Bair, E.; Ohrbach, R.; Fillingim, R.B.; Greenspan, J.D.; Dubner, R.; Diatchenko, L.; Helgeson, E.; Knott, C.; Maixner, W.; Slade, G.D. Multivariable modeling of phenotypic risk factors for first-onset TMD: The OPPERA prospective cohort study. *J. Pain* **2013**, *14*, T102–T115. [CrossRef]
37. Roithmann, C.C.; Silva, C.A.G.D.; Pattussi, M.P.; Grossi, M.L. Subjective sleep quality and temporomandibular disorders: Systematic literature review and meta-analysis. *J. Oral Rehabil.* **2021**, *48*, 1380–1394. [CrossRef]