GRADUATION PROJECT

Degree in Dentistry

PREVALENCE AND IMPACT OF TEMPOROMANDIBULAR JOINT DISORDERS AMONG MUSICIANS.

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RESUMEN

Introducción: Los trastornos temporomandibulares (TMD) son afecciones musculoesqueléticas comunes que afectan a la articulación temporomandibular y se observan con frecuencia entre los músicos debido a las exigencias físicas de su práctica musical. A pesar del creciente número de publicaciones sobre este tema, existe una falta de claridad en cuanto a la prevalencia, los factores de riesgo e impactos específicos de este grupo. Esta revisión tiene como objetivo abordar esta laguna sintetizando las investigaciones existentes sobre el tema; **Objetivos**: El objetivo principal es evaluar la prevalencia de los TMD entre los músicos y compararla con la población general. Los objetivos secundarios incluyen la identificación de los factores de riesgo asociados a los TMD en los músicos, como el tipo de instrumento, la duración de la práctica y el estrés psicológico; **Material y métodos**: Se realizó una revisión sistemática de la literatura utilizando bases de datos como MedLine. Se tuvieron en cuenta los estudios publicados entre 2015 y 2025, centrándose en los estudios observacionales e intervencionistas que evaluaban el TMD en músicos. Las palabras clave incluían «trastornos temporomandibulares», «músicos», «impacto» y «prevalencia»; **Resultados**: La revisión incluyó 11 estudios que cumplían los criterios de inclusión. Los resultados mostraron que los músicos presentan una prevalencia significativamente mayor de TMD en comparación con los no músicos. Se identificaron los riesgos específicos de cada instrumento (por ejemplo, instrumentos de viento frente a instrumentos de cuerda) y factores psicológicos como el estrés como principales contribuyentes al desarrollo de la TMD. La mayoría de los estudios han puesto de relieve que los músicos padecen síntomas crónicos, con dolor y limitaciones funcionales que afectan a su rendimiento profesional; **Conclusiones**: Los músicos corren un mayor riesgo de desarrollar trastornos temporomandibulares (TMD) debido a factores laborales, entre los que se incluyen la biomecánica específica de cada instrumento y la práctica prolongada. Las estrategias preventivas, como el entrenamiento postural y el manejo del estrés, son esenciales para reducir el riesgo de TMD entre los músicos. Se necesitan más investigaciones para analizar los resultados a largo plazo y las intervenciones eficaces para esta población.

PALABRAS CLAVE

Trastornos temporomandibulares, disfunciones de la ATM, músicos, instrumentistas, vocalistas, prevalencia, impacto.

ABSTRACT

Introduction: Temporomandibular disorders (TMD) are common musculoskeletal conditions affecting the temporomandibular joint, commonly observed among musicians due to the physical demands of their musical practice. Despite the growing body of literature on this issue, there is a lack of clarity regarding the prevalence, risk factors and impacts specific to this group. This review aims to address this gap by synthesizing existing research on the subject; **Objectives**: The primary objective is to evaluate the prevalence of TMD among musicians and compare it with the general population. Secondary objectives include identifying the risk factors associated with TMD in musicians, such as instrument type, practice duration, and psychological stress; **Material and Methods:** A systematic literature review was conducted using databases such as MedLine. Studies published between 2015 and 2025 were considered, focusing on observational and interventional studies that assessed TMD in musicians. Keywords included "temporomandibular disorders," "musicians," "impact," and "prevalence. »; **Results**: The review included 11 studies that met the inclusion criteria. The results showed that musicians exhibit a significantly higher prevalence of TMD compared to non-musicians. Instrument-specific risks (e.g., wind vs. string instruments) and psychological factors such as stress were identified as major contributors to the development of TMD. Most studies highlighted that musicians experience chronic symptoms, with pain and functional limitations affecting their professional performance; **Conclusions**: Musicians are at higher risk of developing TMD due to occupational factors, including instrument-specific biomechanics and prolonged practice. Preventive strategies, including posture training and stress management, are essential to reduce the risk of TMD among musicians. Further research is required to explore long-term outcomes and effective interventions for this population.

KEYWORDS

Temporomandibular disorders, TMJ dysfunctions, musicians, instrumentalists, vocalists, prevalence, impact.

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1. INTRODUCTION

1.1. Structure and function of the Temporomandibular Joint (TMJ)

1.1.1. Anatomy of the Temporomandibular Joint

The temporomandibular joint (TMJ) is a complex joint, formed by the articulation between the mandible and the temporal bone of the skull. It functions as a hinge and gliding joint and is capable of movements such as opening/closing, protrusion, retraction, and lateral movements, which are essential for tasks like chewing, speaking, and swallowing. The joint is unique in that it allows both rotational and translational movements, critical for human oral function. The structure of the TMJ includes a condyle, articular disc, and joint capsule, with surrounding muscles, such as the masseter, temporalis, and pterygoid muscles [1,2,3].

1.1.2. Functional Anatomy of TMJ

The muscular attachments and ligamentous structures around the TMJ contribute significantly to the stability and range of motion of the joint. These anatomical components work together to coordinate the functions of mastication, speech, and swallowing. The articular disc plays a vital role in ensuring smooth joint movement and in reducing the friction between the condyle and the temporal bone [4,5]. According to the *Précis d'anatomie clinique de la tête et du cou* of Netter, the disc's role is crucial for minimizing joint damage during repetitive movements associated with activities like chewing and speaking [1].

1.2. Biomechanics of the Temporomandibular Joint (TMJ)

1.2.1. Joint Movements and Muscle Coordination

The biomechanics of the TMJ involve the coordinated action of several anatomical structures, including the mandibular head, the temporal bone, the articular disc, and the muscles of mastication. The mandibular head is the moving part of the joint and articulates with the articular surface of the temporal bone. During mouth opening, the mandibular head moves forward and downward, with the masseter and temporalis muscles controlling the force required to open the mouth. Protrusion, or the forward movement of the jaw, involves the condyle moving forward, sliding over the surface of the temporal bone, with the pterygoid muscles facilitating this motion [6,7].

1.2.2. Articular Disc and Ligament Function

The articular disc is positioned between the mandibular head and the temporal bone, acting as a cushion to absorb forces during chewing. It is held in place by the joint capsule and ligaments, which help stabilize the joint during complex movements such as lateral

excursions and retrusion. These structures are vital for the proper functioning of the TMJ, ensuring smooth, coordinated movement and preventing excessive strain on the joint during everyday activities [2,8].

1.2.3. Biomechanics of TMD Development

The biomechanics of the TMJ play a crucial role in the development of temporomandibular disorders (TMD). Postural imbalances and muscle fatigue from repetitive jaw use, prolonged practice sessions, and asymmetrical head/neck positions during musical activities can exacerbate muscle tension and overload the TMJ. This interaction between biomechanical strain and muscle activity is a key factor in the development of TMD symptoms [9,10].

1.3. Definition and classification of Temporomandibular Disorders (TMD)

1.3.1. General overview of TMD

Temporomandibular disorders (TMD) are characterized by conditions affecting the TMJ, including pain, joint sounds, and restricted movement of the mandible. Approximately 5-12% of the general population experience TMD symptoms, which can significantly affect quality of life. The most common complaints are jaw pain, clicking or popping sounds, and muscle fatigue. These disorders can severely impact daily functions such as eating, speaking, and swallowing [11,12].

Prevalence estimates for TMD vary across studies, with women and individuals aged 20-40 years showing higher rates. The risk factors for TMD include postural issues, jaw misalignments, stress, and parafunctional behaviors such as bruxism and jaw clenching [12].

1.3.2. Risk factors for TMD

Several factors contribute to the development of TMD, including mechanical and psychological aspects. Common risk factors include jaw misalignments, poor posture, and repetitive jaw movements, such as during extended computer use, speaking, chewing gum, nail-biting, or prolonged smartphone use [12,13]. Psychological stress and emotional factors, such as performance anxiety or chronic stress, are also strongly linked to TMD symptoms, often exacerbating muscle tension and leading to parafunctional habits such as bruxism [11,13].

1.4. Prevalence and risk factors

1.4.1. General prevalence

Temporomandibular disorders (TMD) are common, affecting approximately 5-12% of the general population. These disorders are often characterized by pain, joint sounds, and restricted

mandibular movement, which can significantly impact an individual's quality of life. The prevalence of TMD symptoms varies across studies, with some showing higher rates in women and individuals aged 20-40 years [2,12].

The most commonly reported symptoms include jaw pain, clicking or popping sounds, and muscle fatigue, which can affect essential functions such as eating, speaking, and swallowing. Postural misalignments, jaw dysfunction, stress, and parafunctional behaviors, such as bruxism (teeth grinding) or jaw clenching, are recognized as key risk factors in the general population [1].

While psychosocial stress, genetic predisposition, and biomechanical factors are thought to contribute to the onset of TMD, the exact etiology remains unclear. Further studies are necessary to fully understand how these factors interact and influence the development of TMD [9].

1.4.2. TMD in non-musicians

In individuals who do not engage in high-demand activities like playing musical instruments, TMD is still prevalent, with various studies reporting similar risk factors. Non-musicians with TMD often exhibit parafunctional habits, such as teeth grinding (bruxism), nail-biting, and chewing gum, which are known to contribute to muscle fatigue and joint strain [8,14]. These behaviors can lead to a range of symptoms, including pain in the jaw, popping or clicking sounds, and reduced jaw mobility.

Moreover, postural issues, such as neck and jaw misalignments, are also common among individuals who spend long hours sitting, particularly in office environments or during activities that involve repetitive jaw movements. Neck strain, combined with the static posture of individuals using computers or smartphones for extended periods, can increase the likelihood of developing TMD symptoms [8,15].

1.4.3. Musicians' susceptibility to TMD

Musicians may face increased risks for developing TMD due to specific biomechanical and psychological demands. While they are not automatically classified as high-risk, the repetitive jaw use, asymmetrical postures, and long hours of practice may contribute to musculoskeletal strain and joint overload, potentially leading to TMD symptoms.

For wind instrument players, the constant pressure exerted by the mouthpiece leads to excessive muscular contraction in the perioral region, placing strain on the TMJ. Similarly, string musicians, particularly violinists, often hold their instruments in asymmetrical postures, which leads to muscle imbalances around the neck and jaw. Additionally, psychological stress, performance anxiety, and pressure to perform at a high level may exacerbate the strain on

the TMJ, with musicians engaging in bruxism and jaw clenching during performances or rehearsals [10,12,13].

Despite the potential for TMD in musicians, further research is required to definitively establish whether musicians are indeed at higher risk than non-musicians [14].

1.5. Psychological and behavioral factors

1.5.1. Stress and parafunctions

Stress is a significant factor in the development and exacerbation of temporomandibular disorders (TMD). Psychological stress can lead to parafunctional habits, such as bruxism (teeth grinding) and jaw clenching, which contribute to muscle tension and joint strain [14]. These habits are commonly observed in individuals who experience high levels of stress, particularly in professions or activities that require high performance or long periods of concentration [3].

Studies have shown that individuals in high-stress professions, such as healthcare, law enforcement, and the performing arts, are very likely to develop TMD symptoms due to stress-induced behaviors. Healthcare workers, for instance, report higher rates of jaw clenching and teeth grinding, especially in intensive care settings where emotional and physical demands are particularly high [7]. Similarly, performing artists (musicians, dancers, actors) often experience performance anxiety, which can exacerbate stress levels and lead to bruxism and muscle tension in the jaw [4].

1.5.2. Practice duration and workload

In addition, practice duration and intensity are crucial: long rehearsals without rest, or poor ergonomic awareness, can contribute to chronic overuse of the TMJ [4]. This union of physical load, stress, and behavioral factors confirms that TMD among musicians is a biopsychosocial disorder, requiring both clinical and psychological understanding [7].

Even in less obviously stressful environments, such as office work, individuals can experience TMD symptoms due to psychosocial stress from long working hours, tight deadlines, and poor posture. A study by van Selms et al. (2020) found that individuals who work long hours sitting in front of a computer screen, often maintaining poor posture, are more prone to developing TMD symptoms, including jaw pain and clicking sounds [11].

These parafunctional habits increase the load on the TMJ, leading to muscle fatigue and joint inflammation, which may eventually result in TMD

1.6. Impact and clinical relevance

1.6.1. Impact on performance and quality of life

The impact of temporomandibular disorders (TMD) on individuals extends beyond local pain, affecting daily activities and overall quality of life. In the general population, TMD often results in functional limitations, such as restricted mouth opening, difficulty chewing, swallowing, and even speaking, which can significantly impair daily tasks. Chronic orofacial pain, along with muscle fatigue, reduces work productivity, concentration, and general well-being. This may also lead to emotional distress, including anxiety and sleep disturbances [9]. In severe or chronic cases, these symptoms may lead to long-term dysfunction and affect the individual's overall quality of life [10].

For musicians, the impact of TMD is more pronounced due to the physical demands of their profession. Functional limitations, such as restricted mouth opening, affect wind instrument players' ability to maintain embouchure and produce sound. Similarly, cervical discomfort and muscle fatigue can interfere with the ability to maintain breathing, articulation, and sound quality during performances. Persistent pain can limit practice time, affect concentration, and compromise technical precision, directly impacting the musician's ability to perform at a high level. In severe cases, TMD symptoms may threaten the musician's professional continuity, forcing them to limit or stop performing. Moreover, chronic pain is associated with anxiety, sleep disturbances, and reduced quality of life, illustrating the far-reaching consequences of this disorder on a musician's personal and professional life [4,7,10].

1.6.2. Preventive and clinical implications

The findings on TMD's impact on quality of life underscore the importance of addressing this disorder not only as an occupational issue but also as a public health concern. In the general population, early recognition and management of TMD are essential to prevent long-term dysfunction and reduce the disorder's burden. Healthcare professionals, such as dentists, physiotherapists, and general healthcare providers, should be trained to recognize early signs of TMD, including jaw pain, clicking sounds, and muscle fatigue, so that preventive measures can be implemented [5,9].

Preventive strategies include education about posture, relaxation techniques, and the importance of taking regular rest breaks from activities that strain the jaw, such as prolonged computer use or mobile phone usage. Physiotherapy aimed at improving jaw and cervical posture, along with stress management programs, can help reduce parafunctional habits like bruxism and jaw clenching [7,14]. Additionally, ergonomic interventions and the use

of supportive devices, such as night guards or bite splints, are often recommended to help manage symptoms and prevent further joint damage [4,10].

For musicians, preventive measures are particularly important due to the high physical demands of their profession. Early identification of musculoskeletal strain, especially related to instrument posture, is crucial. Musicians should be encouraged to incorporate regular ergonomic adjustments and rest periods into their practice routines to prevent overloading the TMJ. Musicians' health programs, which include training in relaxation techniques and postural exercises, can mitigate the risk of TMD [2,11]. Regular screening for TMD symptoms, especially in musicians, can help detect early issues and prevent long-term musculoskeletal damage, ensuring the longevity of their careers [7,10].

1.7. Purpose of the present study

Moreover, few investigations directly compare musicians with non-musicians using standardized diagnostic criteria [11,16]. As a result, the true magnitude of the difference between musicians and the general population remains unclear. Addressing this knowledge gap through a comparative approach will help clarify whether the increased prevalence observed is due to occupational exposure or other predisposing factors and will contribute to improving prevention strategies.

Understanding and managing these disorders effectively will ultimately allow musicians to preserve both their health and their art throughout their careers.

2. OBJECTIVES

Objectives of the study:

- To determine to what extent the temporomandibular joint disorders are more prevalent among musicians than in the general population.
- To define what are the main physical and psychological factors contributing to TMD development and impact on musician’s performance.

3. MATERIAL AND METHODS

3.1. PICO question

P (PATIENT)	I (INTERVENTION)	C (COMPARISON)	O (OUTCOME)
Musicians (wind instrument players, string players, vocalists)	Assessment of TMD symptoms	General population (non-musicians)	Prevalence of TMD symptoms and impact on life and musicians' performance

PICO question: In musicians (P), how does the assessment of TMD symptoms (I) compared to the general population (C) affect the prevalence of TMD symptoms and impact on life and musicians' performance (O)?

3.2. Search Strategy

A review of the literature was conducted to gather relevant studies on the prevalence and impact of temporomandibular joint disorders (TMD) in musicians. The literature search aimed to identify articles published in the past decade that focused on TMD in musicians, instrumentalists, and vocalists, as well as general studies on TMD that might offer insight into the risk factors and impact of these disorders on musicians.

To achieve this, a search was performed using Medline as academic databases. The search was structured using specific keywords and Boolean operators to capture all relevant articles.

The search terms included:

- TMD OR temporomandibular disorders OR temporomandibular joint disorders OR temporomandibular dysfunction OR temporomandibular joint OR TMJ
- AND musicians OR instrumentalists OR vocalists OR music
- AND prevalence OR impact

These keywords were selected to ensure a broad yet targeted search, capturing studies on both the prevalence and impact of TMD in musicians, as well as comparative studies that might include non-musicians.

3.3. Inclusion and Exclusion Criteria

The following inclusion and exclusion criteria were applied to select the most relevant studies:

- Inclusion Criteria:
  - Studies published in English or Spanish or French between 2015 and 2025.
  - Studies focusing on the comparison of musicians, vocalists, instrumentalists, or performing artists with the general population.
  - Studies addressing the prevalence, impact, and risk factors of TMD in musicians.

- Articles that provided data on functional impairment and quality of life related to TMD in musicians.

- Exclusion Criteria:
  - Studies not involving musicians or related populations (e.g., general population studies not comparing musicians).
  - Peer-reviewed journal articles, systematic reviews, meta-analyses, and clinical studies.
  - Articles with insufficient methodological rigor (e.g., studies lacking clear diagnostic criteria for TMD).
  - Editorials, opinion papers, and conference abstracts.
  - Studies focusing on non-musical occupations without relevance to the study of musicians.

3.4. Data Sources and Databases

The search was conducted exclusively through the library of the Medline filter to narrow the results. Only articles sourced from Medline, a key database for medical and dental literature, were included, with a particular focus on cross-sectional studies related to temporomandibular disorders (TMD).

In addition to the database search, the reference lists of selected studies were manually reviewed. Only articles comparing musicians to the general population (non-musicians) were included in the final selection, ensuring a relevant and focused set of studies for the thesis.

3.5. Screening and Selection Process

The article selection process was carried out in several stages to ensure the inclusion of the most relevant studies for this thesis.

1. **Initial Search**: To refine the results, the search was filtered by publication date (2015-2025), language (French, English, and Spanish), and by keywords related to the musical fields, resulting in a more focused pool of articles.
2. **Title Screening**: Only those articles that included relevant search terms in their titles were retained.
3. **Full-Text Review**: The next step involved reviewing only those articles available in full text and which had been peer-reviewed. This helped further ensure the quality of the sources.
4. **Manual Selection**: In the final stage, I manually selected articles that specifically compared musicians to the general population. This step ensured that only studies

directly related to the research focus were included, resulting in a final selection of relevant articles for analysis.

3.6. Data Analysis

The data collected from the selected studies were organized thematically to identify patterns in the findings. The following aspects were analyzed:

- Prevalence of TMD in musicians compared to the general population.
- Risk factors for TMD specific to musicians, such as instrument type, posture, and duration of practice.
- Impact on performance: how TMD affects musicians' ability to perform, including any functional limitations and quality of life issues.
- Treatment approaches: the effectiveness of different management strategies for TMD in musicians.

A qualitative synthesis was performed to summarize the findings, and a narrative review was written to present an overview of the current state of research on TMD in musicians.

3.7. Limitations of the Literature Review

The literature review has some limitations, including:

- Language bias: Only English, French and Spanish articles were included, potentially excluding relevant studies published in other languages.
- Publication bias: Studies with significant findings are more likely to be published, which may skew the overall representation of the impact and prevalence of TMD in musicians.
- Heterogeneity of studies: The studies varied in their sample size, methodology, and diagnostic criteria for TMD, which may limit the ability to directly compare results across studies.

4. RESULTS

4.1. Selection of studies

The literature search conducted in the Medline database initially identified 325,000 articles using the predefined keywords related to temporomandibular disorders and musicians. After applying filters for publication year (2015–2025) and language (English, French and Spanish), the number of results was reduced to 2,513 articles.

During the title screening stage, studies that did not clearly relate to temporomandibular disorders or musical activity were excluded. This step reduced the number of potentially relevant articles to 151 studies.

A full-text review was then performed on articles available in full text. After this stage, 88 studies remained for further evaluation.

Finally, a manual selection was carried out to retain only studies specifically investigating temporomandibular disorders in musicians or comparing musicians with other populations. After applying the predefined inclusion and exclusion criteria, 11 articles were included in the final qualitative synthesis.

The article selection process is summarized using a PRISMA-type flow diagram.

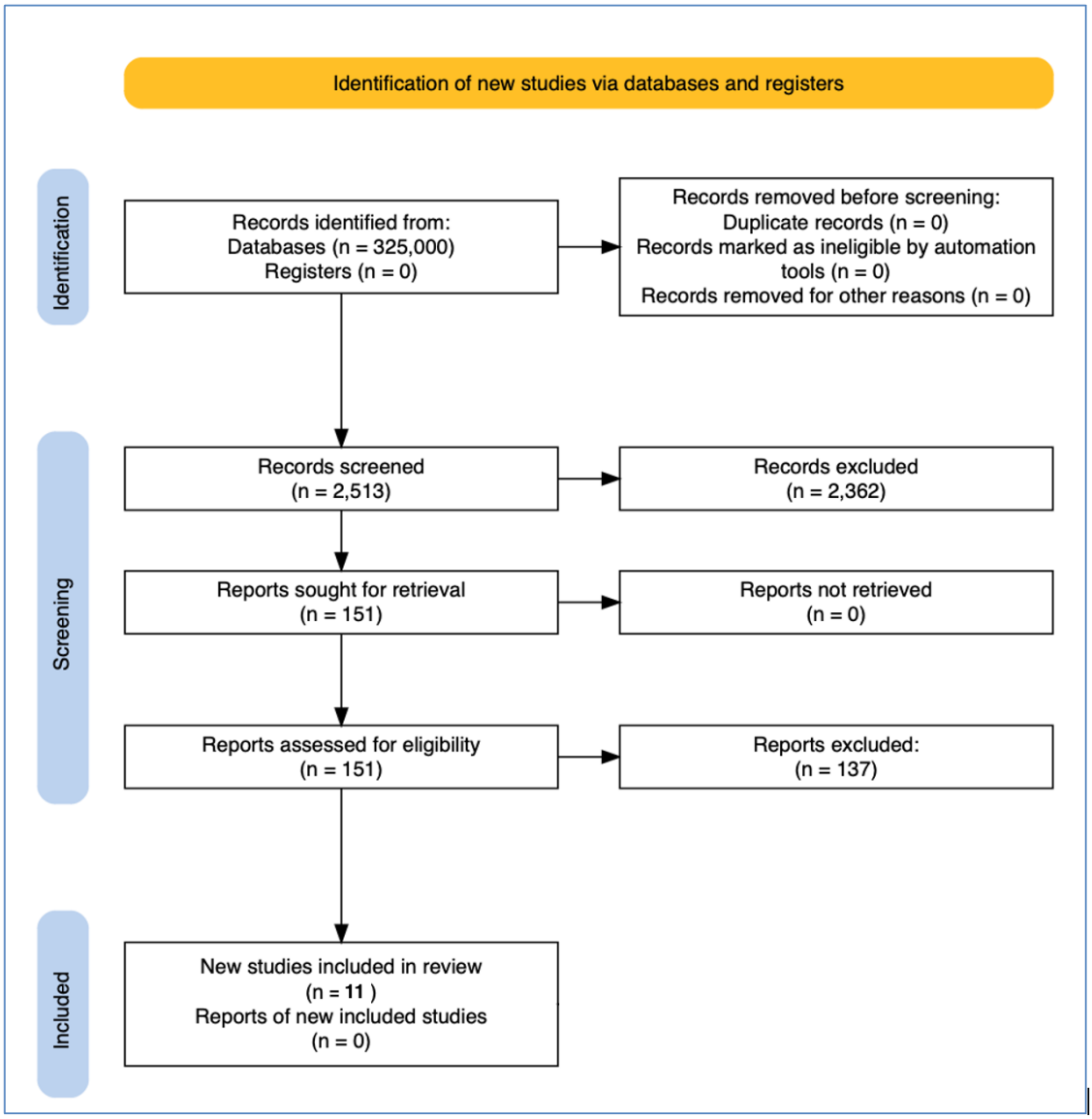


Figure 1. PRISMA flow diagram of the study selection process

4.2. Type of studies included

The included articles presented heterogeneous methodological designs. Among the 10 studies, the following types were identified:

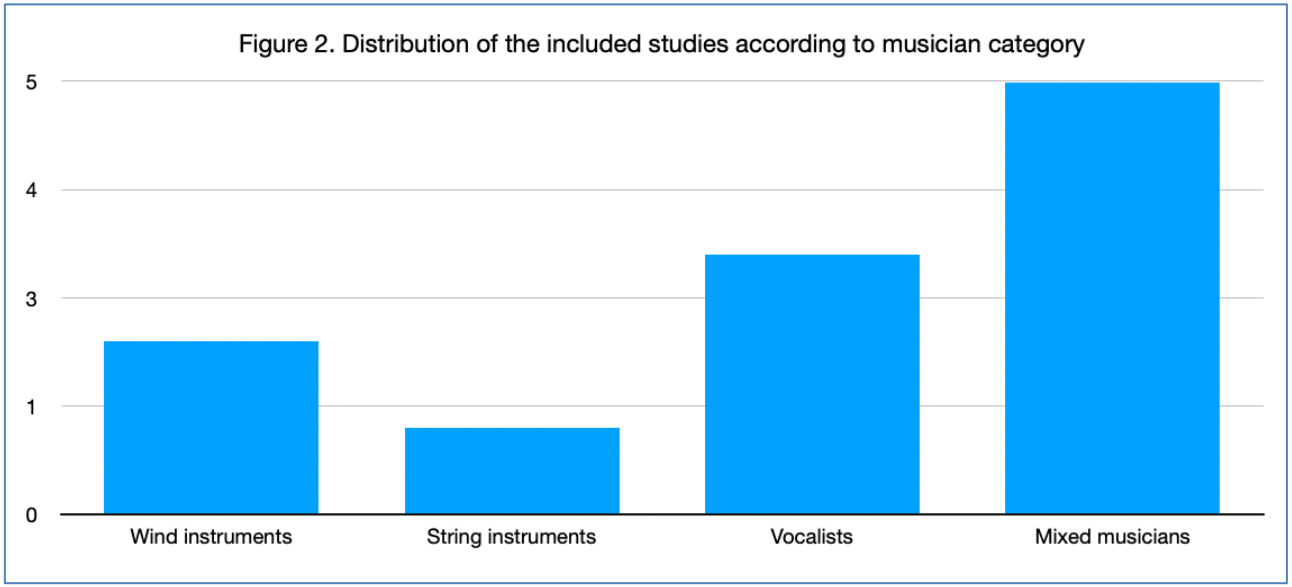
- cross-sectional observational studies [5,6,8,10,11,13,14,15,16]
- clinical observational studies [3]
- one interventional clinical study [12]

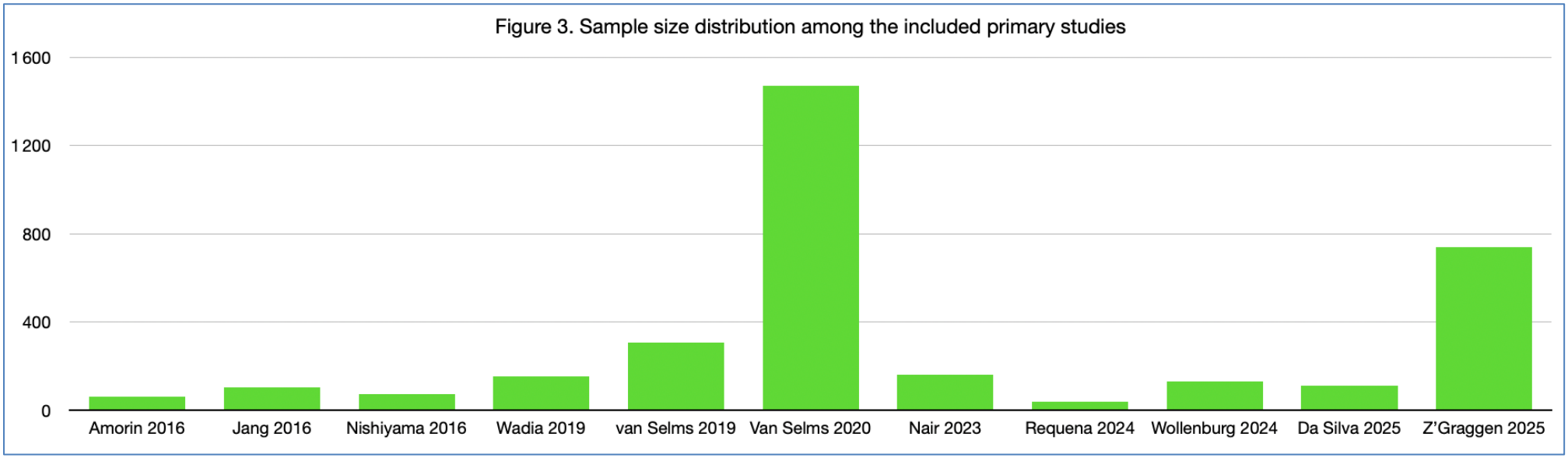
This diversity of study designs reflects the current state of research on temporomandibular disorders among musicians.

4.3. Groups evaluated in the studies

Most studies compared musicians with non-musicians or general population controls to evaluate whether musical activity represents a risk factor for temporomandibular disorders.

Some studies focused specifically on different categories of musicians, including wind instrumentalists, string instrumentalists, and vocalists, to assess the influence of specific musical practices on the development of TMD [5].


Figure 2. Distribution of the included studies according to musician category
5
4
3
1
0
Wind instruments
String instruments
Vocalists
Mixed musicians


Figure 3. Sample size distribution among the included primary studies
1 600
1 200
800
400
0
Amorin 2016
Jang 2016
Nishiyama 2016
Wadia 2019
van Selms 2019
Van Selms 2020
Nair 2023
Requena 2024
Wollenburg 2024
Da Silva 2025
Z'Graggen 2025

4.4. Summary of included studies (ordered by publication year)

Author	Year	Population	Sample size	Study type	Main findings
Amorim	2016	Violin players	62	Cross-sectional	TMD symptoms were reported by 58% of violinists. High music performance anxiety was strongly associated with TMD symptoms; the most anxious players were about six times more likely to report TMD symptoms than non-musicians.
Jang	2016	Instrumentalists	103	Clinical observational	61.3% reported at least one TMD symptom. Clicking/popping was the most frequent complaint. Woodwind and brass players reported joint sounds more often than lower-string players.
Nishiyama	2016	Wind instrument players	72	Cross-sectional	Wind instrument playing habits were associated with an increased TMD risk, supporting the role of mouthpiece-related load and playing behavior as possible occupational factors.
Wadia	2019	Vocalists	155	Cross-sectional	Vocalists reported TMD-related complaints such as jaw fatigue and temporomandibular symptoms, supporting that singing-related demands may affect the stomatognathic system in some performers. These symptoms being more prevalent in musicians.
van Selms	2019	Vocalists	306	Cross-sectional	After adjustment for confounders, singing itself was not associated with reported TMD pain or TMJ sounds. Female sex, oral behaviors, physical workload, and daily practice were more relevant correlates. Singers show more pronounced symptoms compared to the general population.
van Selms	2020	Musicians	1,470	Cross-sectional	TMD symptoms were associated with neck pain, shoulder pain, and headache, TMD in musicians may be part of a broader pattern of playing-related musculoskeletal complaints.
Nair	2023	Asian vocalists and instrumentalist musicians	159	Cross-sectional	Instrumentalists reported performing-related orofacial pain more than twice as often as vocalists, and persistent pain more often reduced performance. Vocalists reported much more frequent jaw/neck pre-conditioning exercises.
Requena	2024	Wind musicians	40	Interventional study	A cervical treatment approach improved TMD-related outcomes in wind musicians, supporting a functional relationship between cervical and temporomandibular regions in this population. These effects are more pronounced in musicians' population.
Wollenburg	2024	Singers	129	Observational	TMD prevalence was 42% in professional singers, 31% in recreational singers, and 25% in no singers. Professional singers reported more restricted jaw movement, TMJ sounds, and temporomandibular pain than non-singers.
Da Silva	2025	Instrumentalists	110	Cross-sectional	The study investigated associations between TMD and age, time of activity, and instrument type in instrumentalist musicians, supporting that musician-related variables may influence TMD occurrence. String and wind musicians were the most affected, with significant impact on muscle function and facial pain compared to non-musicians.
Z'Graggen	2025	Student & professional musicians	739	Cross-sectional	19.5% screened positive for painful TMD. Positive screens were more common in younger, less experienced, and predominantly female musicians; keyboard players and upper-string players showed higher frequencies.

Table 1. Summary of the included primary studies investigating temporomandibular disorders in musicians

5. DISCUSSION

5.1. Overall interpretation of the findings

The purpose of this literature review was to analyze the relationship between musical practice and temporomandibular disorders (TMD), and to determine prevalence differences between musicians and non-musicians concerning temporomandibular symptoms. Overall, the results of the selected studies suggest that musicians frequently report signs and symptoms compatible with TMD, including orofacial pain, joint sounds, mandibular fatigue, restricted jaw movements, and pain associated with performance [3,5,6,10,11,13,14]. Although the intensity and prevalence of these symptoms vary between studies, the literature tends to support the idea that musical practice may expose performers to specific biomechanical and psychosocial demands that can affect the stomatognathic system [6].

At the same time, the findings should not be interpreted in an overly simplistic way. The relationship between musical practice and TMD is unlikely to be explained by one isolated factor. Rather, it appears to be multifactorial, involving the interaction of mechanical load, posture, repetitive muscle activity, emotional stress, parafunctional habits, and general musculoskeletal overload [11]. This means that musical practice alone may not be the direct cause of TMD in every case, but it may increase the probability of symptom development in susceptible individuals or aggravate pre-existing dysfunction.

Another important point emerging from this review is that musicians should not be considered a homogeneous group. The studies included in this work evaluated instrumentalists, wind players, string players, vocalists, students, and professional performers. The physical requirements of these subgroups differ significantly, which may partly explain the heterogeneity of the results [2,3,10,13,16]. Therefore, the discussion of TMD in musicians must take into account the diversity of musical practice rather than treating all performers as a single category.

5.2. Prevalence of temporomandibular disorders in musicians

One of the most relevant findings in the literature is that musicians often report a substantial frequency of temporomandibular symptoms. Jang et al. observed that a large proportion of instrumentalists reported at least one symptom of TMD, with joint sounds being among the most common complaints [3]. Similarly, Z'Graggen et al. found a notable proportion of positive screenings for painful TMD among both professional and student musicians, indicating that painful temporomandibular symptoms are not limited to a small subgroup of performers [14]. Da Silva et al. also supported the presence of TMD in instrumentalist musicians and explored

possible associations with musician-related variables such as age, instrument, and duration of activity [5].

While TMD is prevalent in 5-12% of the general population, with symptoms like jaw pain and clicking sounds, musicians may face an increased risk due to specific biomechanical and psychological demands. Although the general population shares risk factors such as poor posture and bruxism, musicians are exposed to unique stressors like repetitive movements, asymmetrical postures, and performance anxiety, which may heighten their likelihood of developing TMD symptoms. Thus, while the risk factors are similar, the intensity and specificity of stress in musicians may lead to a higher prevalence of TMD compared to the general population [6].

These findings are consistent with broader syntheses of the literature, which suggest that musicians may present higher rates of temporomandibular symptoms than the general population [4,7]. However, prevalence rates differ considerably from one study to another. This variability may be explained by differences in diagnostic criteria, age range, gender distribution, professional level, and whether the study assessed self-reported symptoms or clinically confirmed TMD [3,5,11,14,16]. In some studies, the focus was specifically on painful TMD, while others included a broader spectrum of functional or articular symptoms. As a result, prevalence values cannot always be directly compared.

Even so, the general trend remains meaningful. Musicians are repeatedly identified as a population exposed to functional strain in the craniofacial region, and several studies suggest that their professional or educational environment may favor the appearance or persistence of temporomandibular symptoms [3,5,11,14]. This has practical importance because even mild TMD symptoms may interfere with musical performance, especially when playing requires precision, endurance, and prolonged control of the jaw and facial musculature.

5.3. Influence of instrument type

The type of instrument played appears to be one of the most important factors when discussing TMD risk in musicians. Wind instrumentalists are often described as a particularly vulnerable group because they repeatedly apply pressure through the mouthpiece while maintaining sustained activation of the lips, cheeks, tongue, and mandibular muscles [12]. Requena et al., focused on treatment rather than prevalence, also highlighted the functional relevance of TMD in wind musicians by showing that a cervical intervention could improve outcomes in this group [12].

String instrumentalists, especially violinists and violists, represent another group of interest. Amorim et al. reported a high frequency of TMD symptoms among violin players and found a

strong association between symptoms and performance anxiety [8]. The violin requires a prolonged asymmetric posture of the head, neck, and mandible, often with continuous stabilization of the instrument between the chin and shoulder. This posture may generate persistent muscular tension in the masticatory and cervical regions, which may help explain the occurrence of temporomandibular symptoms in this subgroup [6,8].

The situation of vocalists is more nuanced. Wadia et al. described temporomandibular symptoms in singers, suggesting that vocal performance may place demands on the jaw and surrounding structures [6]. However, van Selms et al. found that after adjustment for confounding factors, singing itself was not necessarily associated with increased TMD pain or TMJ sounds [16]. More recently, Wollenburg et al. reported differences between professional singers, recreational singers, and non-singers, with professional singers showing more signs and symptoms than controls [13]. Nair et al. also compared vocalists and instrumentalists and found that instrumentalists reported performing-related orofacial pain more frequently than vocalists [10]. Taken together, these studies suggest that vocal activity may be associated with jaw fatigue or functional complaints in some contexts, but the relationship appears less direct and less consistent than for wind or string instrumentalists [6,10,13,16].

5.4. Biomechanical and occupational factors

Beyond instrument category, the occupational demands of musical practice may themselves contribute to TMD. Musicians often practice for several hours per day, repeat highly specialized movements, and maintain constrained body positions over long periods [4,7,9]. These repetitive and prolonged demands may lead to muscular fatigue, overload of the temporomandibular joint, and reduced capacity for tissue recovery. In this context, TMD can be understood as part of a chronic overuse pattern rather than an isolated event [11].

While TMD is common in the general population, musicians may be at a higher risk due to the specific biomechanical and psychological demands of their profession. Like the general population, musicians share risk factors such as poor posture and bruxism. However, the repetitive motions, asymmetrical postures, and performance anxiety faced by musicians may increase the likelihood of developing TMD symptoms. Thus, although the general population and musicians share similar risk factors, the specific demands of musical practice may make musicians more susceptible to TMD [6].

A key element is the repetitive recruitment of the craniofacial musculature. Fine motor control is essential in musical performance, and many instruments require stable jaw positioning, sustained perioral muscle contraction, or repeated mandibular adjustment. Over time, these actions may increase functional stress on the TMJ and on the masticatory muscles [2,3,5]. In

professional settings, the demands are often intensified by rehearsals, concerts, travel, and insufficient recovery periods, all of which may aggravate symptoms.

Another relevant issue is ergonomics. Poor playing posture, inadequate support of the instrument, and insufficient awareness of body mechanics may contribute to musculoskeletal imbalance [6,11]. In musicians, TMD may therefore reflect not only a local dysfunction of the jaw, but also a global occupational problem linked to posture, technique, muscular endurance, and training habits. This perspective is important because it suggests that prevention should not focus only on the jaw itself, but also on the musician's full working environment.

5.5. Psychological and behavioral factors

The literature also supports the importance of psychological and behavioral factors. Musicians are often exposed to stress, perfectionism, competition, public performance pressure, and fear of error. These factors may increase muscle tension, alter pain perception, and promote parafunctional behaviors such as clenching or bruxism [12]. Amorim et al. found a strong association between TMD symptoms and music performance anxiety in violin players, showing that emotional factors may play a major role in symptom presentation [15].

Psychological distress may influence TMD in at least two ways. First, it may increase unconscious muscle activity, especially in the jaw and cervical region. Second, it may amplify the subjective experience of pain, making symptoms more persistent or disabling [15]. Nair et al. discussed coping behaviors, psychological distress, and disability in relation to orofacial pain among young adult musicians, reinforcing the idea that temporomandibular complaints cannot be explained by biomechanics alone [15].

This psychosocial dimension is especially relevant in musicians because pain may threaten not only health, but also identity and performance capacity. A musician experiencing jaw pain may worry about technical decline, loss of control, or interruption of practice, which can in turn increase stress and contribute to a vicious cycle of pain and tension [12,15]. For this reason, a purely mechanical interpretation of TMD in musicians is insufficient; psychological well-being should also be considered in assessment and management.

5.6. Relationship with other musculoskeletal complaints

Several studies suggest that TMD in musicians is often accompanied by other musculoskeletal complaints, particularly in the neck and shoulder regions. This association is not surprising, given the functional interdependence between the jaw, cervical spine, and shoulder

girdle. Postural imbalances or muscular overload in one area can affect adjacent regions and modify mandibular function.

In addition, van Selms et al. (2017) found that temporomandibular symptoms in musicians were often linked with neck pain, shoulder pain, and headaches, indicating that these complaints may represent a broader pattern of playing-related musculoskeletal disorders [2]. Similarly, Requena et al. (2024) demonstrated that cervical treatment had a positive effect on TMD-related outcomes in wind musicians, further supporting the connection between cervical dysfunction and TMD [12].

This relationship has important clinical implications. It suggests that TMD in musicians should not be evaluated in isolation from the rest of the musculoskeletal system. A patient presenting with jaw pain may also have cervical dysfunction, postural overload, or shoulder tension, all of which can contribute to the persistence of TMD symptoms. From a clinical standpoint, this highlights the need for an integrated and multidisciplinary approach to management.

5.7. Clinical relevance and implications for practice

The findings of this review are clinically relevant for dentists, physiotherapists, and professionals involved in performing arts medicine. Dentists should be aware that musicians may represent a patient population with specific occupational risk factors, and that temporomandibular complaints in these patients may be related to performance habits, posture, and instrument-specific demands [3,5,12].

In practical terms, assessment should include questions about the type of instrument played, daily practice duration, onset of symptoms during or after playing, and the presence of associated neck or shoulder pain. In some cases, collaboration with physiotherapists, music teachers, or other specialists may be beneficial, particularly when posture correction or technique modification is needed [11,12].

Preventive measures may also be important. These may include ergonomic education, awareness of parafunctional habits, stress reduction strategies, scheduled rest periods, and early management of mild symptoms before they become chronic [11]. For musicians, prevention is especially important because even moderate TMD symptoms may reduce endurance, affect embouchure or articulation, and compromise professional performance [3,6,10].

5.8. Limitations of the available literature and of the present review

Despite the relevance of the findings, several limitations should be acknowledged. First, many of the included studies were cross-sectional, which limits the ability to establish causality [3,5,10,11,13,14,16]. These studies can identify associations, but they cannot determine whether musical practice directly causes TMD or whether other predisposing factors explain the observed relationship.

Second, the methods used to diagnose TMD were not uniform. Some studies relied mainly on questionnaires or symptom screening, whereas others included clinical examination [3,13,14,16]. This heterogeneity makes comparison more difficult and may partly explain the variability in reported prevalence.

Third, study populations were heterogeneous. Some included students, others professional musicians, and others mixed populations [10,11,14]. Instrument categories were not always defined in the same way, and some studies focused on one specific subgroup such as violinists, vocalists, or wind musicians [2,6,8,14]. These differences limit the generalizability of the results.

The present review also has limitations. The search was restricted to one major database and to articles published in English, French, or Spanish, which may have excluded relevant studies published elsewhere. In addition, some reviews identified in the search could not be kept in the results table because they were not primary studies, although they remained useful for contextual interpretation in the discussion [6].

5.9. Future directions for research

Future research should aim to clarify the causal relationship between musical practice and TMD. Longitudinal studies would be especially useful to determine whether symptoms increase with years of training, changes in repertoire, or intensity of performance. Studies using standardized diagnostic criteria, such as the DC/TMD, would also improve comparability between investigations.

It would also be valuable to compare more precisely different instrument families and levels of expertise, and to investigate protective factors. For example, warm-up routines, posture training, stress management, and specific technical education may help reduce symptom burden, but these aspects remain insufficiently studied [10,12].

Finally, more interventional research is needed. The study by Requena et al. suggests that targeted treatment may improve outcomes in wind musicians with temporomandibular dysfunction [12]. Similar studies evaluating physiotherapy, dental management, ergonomic interventions, and multidisciplinary prevention programs could provide clinically useful data for this population.

5.10. General conclusion of the discussion

Taken together, the available evidence suggests that musicians may be at increased risk of temporomandibular symptoms, especially when musical practice involves sustained jaw activity, asymmetric posture, repetitive loading, and occupational stress [3,5,8,10,11,14]. However, the relationship is complex and influenced by multiple interacting factors, including instrument type, psychological profile, musculoskeletal comorbidities, and methodological differences between studies [6,13,16].

Therefore, TMD in musicians should be understood as a multifactorial condition requiring an integrated perspective. Greater awareness, earlier identification, and more interdisciplinary care may help improve both health outcomes and professional well-being in this specific population.

6. CONCLUSIONS

The aim of this literature review was:

- to determine to what extent the temporomandibular joint disorders are more prevalent among musicians than in the general population.
- to define what are the main physical and psychological factors contributing to TMD development and impact on musician's performance.

6.1. Prevalence of TMD in Musicians Compared to the General Population

Despite the growing attention given to the relationship between TMD and musical activity, current literature remains heterogeneous and fragmented. Many studies have small sample sizes or focus on a single instrument type, making it difficult to draw generalized conclusions [5,15].

Overall, the findings of the selected studies suggest that musicians may represent a population exposed to increased risk of temporomandibular symptoms, including orofacial pain, joint sounds, and muscular fatigue. Several factors appear to contribute to this increased risk, particularly the biomechanical demands associated with certain instruments, prolonged practice sessions, and repetitive muscular activity involving the stomatognathic system [3,5,10,11].

The type of instrument played also seems to influence the occurrence of temporomandibular symptoms. Wind instrumentalists and string players may experience greater mechanical loading

of the craniofacial structures, while the relationship between singing and temporomandibular disorders appears to be more complex and influenced by multiple factors [2,8,13,16].

6.2. Key Factors Contributing to TMD Development and Its Impact on Musicians

In addition to biomechanical aspects, psychological stress, performance anxiety, and other musculoskeletal complaints may also contribute to the development or persistence of temporomandibular symptoms in musicians. These findings highlight the multifactorial nature of temporomandibular disorders in this population and underline the importance of a multidisciplinary approach to prevention and management [7,9,10,11].

Although TMD is prevalent in the general population, with 5-12% of individuals affected by symptoms such as jaw pain, clicking sounds, and restricted jaw movements, musicians seem to be at higher risk for developing TMD symptoms due to the specific demands of their profession. This suggests that the biomechanical and psychological stressors involved in musical practice may increase the likelihood of symptom development in susceptible individuals, but further research is needed to definitively compare musicians with the general population in terms of TMD prevalence [6,7].

However, the available literature remains heterogeneous, and most studies are cross-sectional, limiting the possibility of establishing causal relationships between musical practice and temporomandibular disorders. Future research should therefore focus on longitudinal studies using standardized diagnostic criteria to better understand the mechanisms involved and to develop effective preventive strategies for musicians [5,7].

This relationship has practical importance because even mild TMD symptoms may interfere with musical performance, especially when playing requires precision, endurance, and prolonged control of the jaw and facial musculature. Musicians are repeatedly identified as a population exposed to functional strain in the craniofacial region, and several studies suggest that their professional or educational environment may favor the appearance or persistence of temporomandibular symptoms [3,5,11,14].

In conclusion, musicians may be considered a population potentially at risk of temporomandibular symptoms due to the combined influence of biomechanical, occupational, and psychological factors. Greater awareness among healthcare professionals and musicians themselves may help improve early detection, prevention, and management of temporomandibular disorders in this specific population.

7. SUSTAINABILITY

Sustainability in healthcare involves promoting long-term strategies that improve health outcomes, prevent disease, and enhance quality of life while reducing the burden on healthcare systems. In the context of temporomandibular disorders (TMD) among musicians, sustainability can be considered from both a social and health perspective.

The results of this literature review highlight the importance of early identification and prevention of temporomandibular disorders in musicians. By improving awareness of the occupational risks associated with musical practice, healthcare professionals can help implement preventive strategies such as ergonomic education, posture correction, and early management of musculoskeletal symptoms. These approaches may contribute to reducing the long-term impact of TMD on musicians' health and professional performance.

From a sustainability perspective, preventing musculoskeletal disorders among musicians supports long-term professional well-being and may reduce healthcare costs associated with chronic pain management. Furthermore, promoting preventive healthcare strategies aligns with the objectives of the United Nations Sustainable Development Goals, particularly SDG 3: Good Health and Well-being, which aims to ensure healthy lives and promote well-being for all individuals.

Therefore, integrating preventive approaches and occupational health awareness in musicians' training may contribute to more sustainable healthcare practices and improved quality of life for this population.

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9. ANNEXES

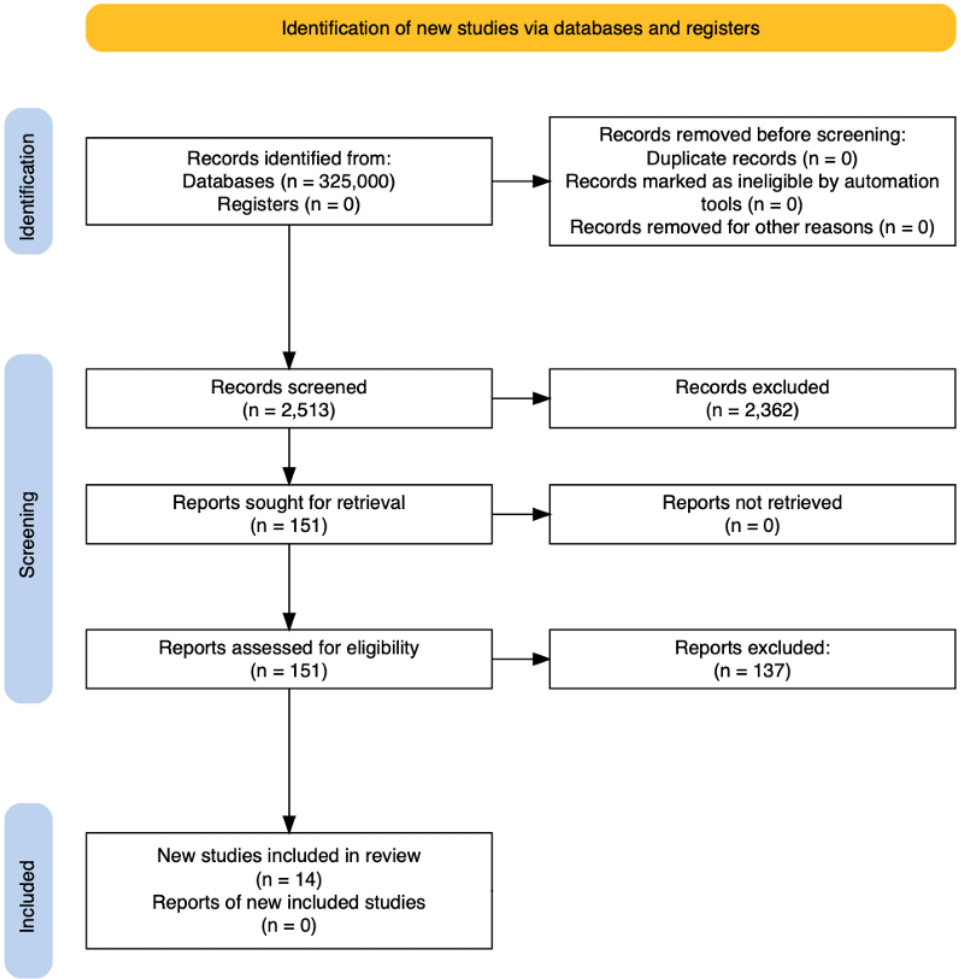
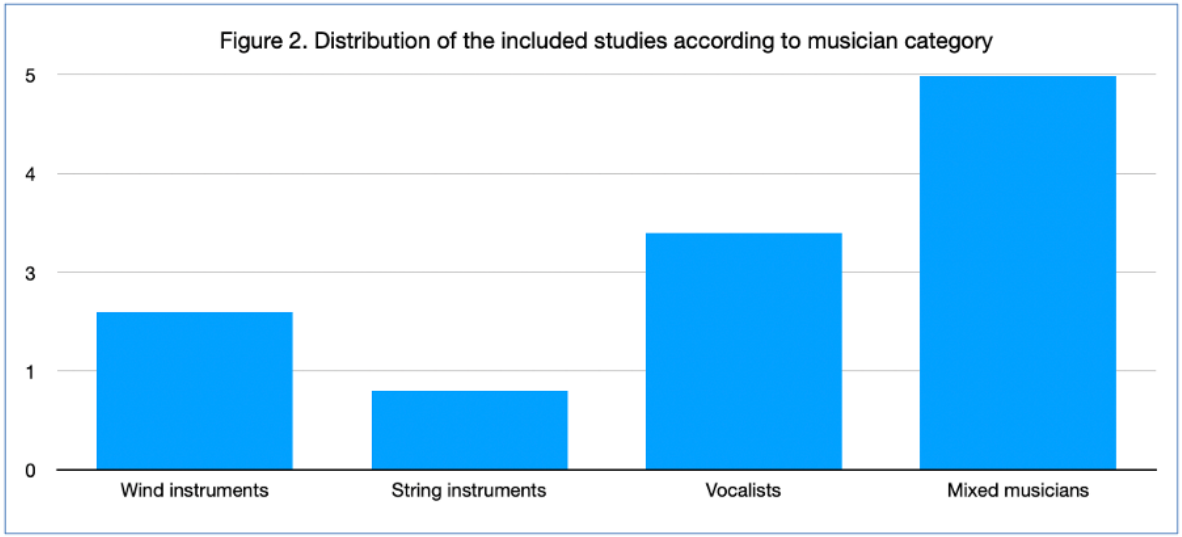
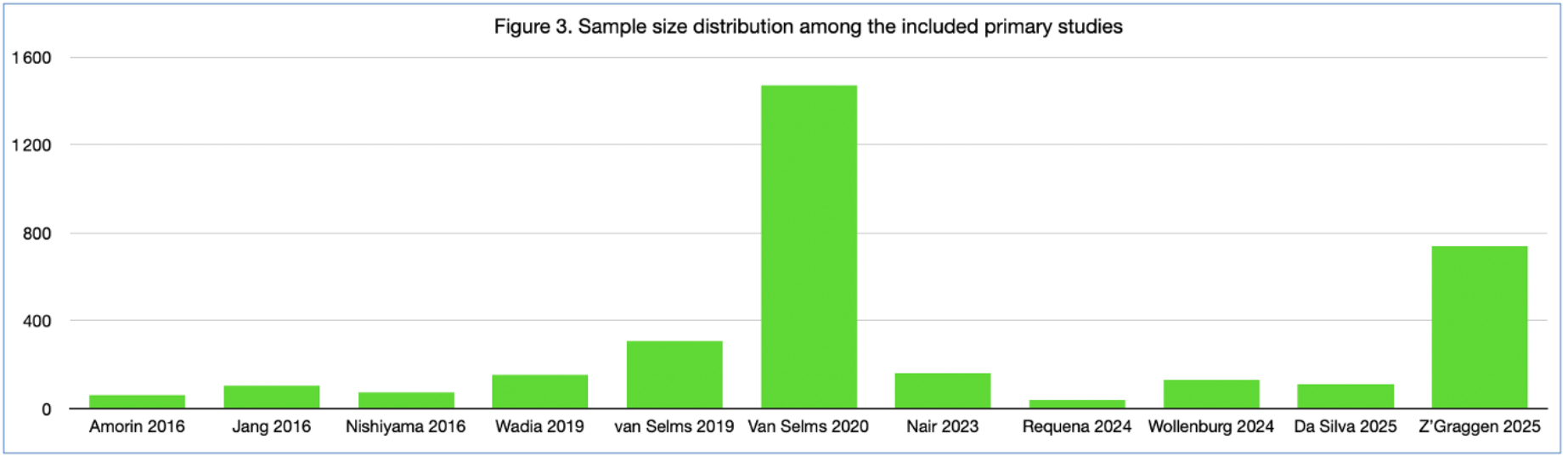


Figure 1. PRISMA flow diagram of the study selection process


Figure 2. Distribution of the included studies according to musician category
5
4
3
1
0
Wind instruments
String instruments
Vocalists
Mixed musicians


Figure 3. Sample size distribution among the included primary studies
1 600
1 200
800
400
0
Amorin 2016
Jang 2016
Nishiyama 2016
Wadia 2019
van Selms 2019
Van Selms 2020
Nair 2023
Requena 2024
Wollenburg 2024
Da Silva 2025
Z'Graggen 2025

Author	Year	Population	Sample size	Study type	Main findings
Amorim	2016	Violin players	62	Cross-sectional	TMD symptoms were reported by 58% of violinists. High music performance anxiety was strongly associated with TMD symptoms; the most anxious players were about six times more likely to report TMD symptoms than non-musicians.
Jang	2016	Instrumentalists	103	Clinical observational	61.3% reported at least one TMD symptom. Clicking/popping was the most frequent complaint. Woodwind and brass players reported joint sounds more often than lower-string players.
Nishiyama	2016	Wind instrument players	72	Cross-sectional	Wind instrument playing habits were associated with an increased TMD risk, supporting the role of mouthpiece-related load and playing behavior as possible occupational factors.
Wadia	2019	Vocalists	155	Cross-sectional	Vocalists reported TMD-related complaints such as jaw fatigue and temporomandibular symptoms, supporting that singing-related demands may affect the stomatognathic system in some performers. These symptoms being more prevalent in musicians.
van Selms	2019	Vocalists	306	Cross-sectional	After adjustment for confounders, singing itself was not associated with reported TMD pain or TMJ sounds. Female sex, oral behaviors, physical workload, and daily practice were more relevant correlates. Singers show more pronounced symptoms compared to the general population.
van Selms	2020	Musicians	1,470	Cross-sectional	TMD symptoms were associated with neck pain, shoulder pain, and headache, TMD in musicians may be part of a broader pattern of playing-related musculoskeletal complaints.
Nair	2023	Asian vocalists and instrumentalist musicians	159	Cross-sectional	Instrumentalists reported performing-related orofacial pain more than twice as often as vocalists, and persistent pain more often reduced performance. Vocalists reported much more frequent jaw/neck pre-conditioning exercises.
Requena	2024	Wind musicians	40	Interventional study	A cervical treatment approach improved TMD-related outcomes in wind musicians, supporting a functional relationship between cervical and temporomandibular regions in this population. These effects are more pronounced in musicians' population.
Wollenburg	2024	Singers	129	Observational	TMD prevalence was 42% in professional singers, 31% in recreational singers, and 25% in no singers. Professional singers reported more restricted jaw movement, TMJ sounds, and temporomandibular pain than non-singers.
Da Silva	2025	Instrumentalists	110	Cross-sectional	The study investigated associations between TMD and age, time of activity, and instrument type in instrumentalist musicians, supporting that musician-related variables may influence TMD occurrence. String and wind musicians were the most affected, with significant impact on muscle function and facial pain compared to non-musicians.
Z'Graggen	2025	Student & professional musicians	739	Cross-sectional	19.5% screened positive for painful TMD. Positive screens were more common in younger, less experienced, and predominantly female musicians; keyboard players and upper-string players showed higher frequencies.

Table 1. Summary of the included primary studies investigating temporomandibular disorders in musicians