

Medical Science

To Cite:

Lachowska EM, Bartkiewicz PA, Baran WP, Janiszewski CM, Jędrasek TW, Korman A, Al-Batool W. Prevalence and associated risk factors of neck pain among musicians: a systematic review. *Medical Science* 2026; 30: e118ms3882
doi:

Authors' Affiliation:

¹Provincial Specialist Hospital, Wrocław, Poland

²Zielona Góra Philharmonic, Zielona Góra, Poland

³Karol Szymanowski Primary and Secondary Music School, Wrocław, Poland

*Corresponding author:

Ewelina Maria Lachowska

Provincial Specialist Hospital, Wrocław, Poland,

E-mail address: e.lachowska99@gmail.com

Peer-Review History

Received: 12 February 2026

Reviewed & Revised: 01/March/2026 to 18/June/2026

Accepted: 27 June 2026

Published: 07 July 2026

Peer-review Method

External peer-review was done through double-blind method.

Medical Science

pISSN 2321–7359; eISSN 2321–7367



© The Author(s) 2026. Open Access. This article is licensed under a [Creative Commons Attribution License 4.0 \(CC BY 4.0\)](http://creativecommons.org/licenses/by/4.0/), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

Prevalence and associated risk factors of neck pain among musicians: a systematic review

Ewelina Maria Lachowska^{1*}, Patrycja Anna Bartkiewicz¹, Wojciech Przemysław Baran¹, Cyprian Mariusz Janiszewski^{2,3}, Tomasz Wiktor Jędrasek¹, Adrian Korman¹, Wafa Al-Batool¹

ABSTRACT

Background: Playing-Related Musculoskeletal Disorders (PRMDs) are very common among musicians due to the repetitive nature of their movements and positions. Despite syntheses of evidence showing that neck pain is the most affected area of the musculoskeletal system among musicians, neck pain itself has not been separately addressed in reviews of evidence. **Aim:** This systematic review aimed to synthesize the available evidence regarding the prevalence of neck pain and its associated risk factors among musicians. **Methods:** PubMed and Scopus databases were searched for studies on neck pain among musicians, published between January 2016 and January 2026. After article evaluation, we included 14 cross-sectional studies, extracted data, and summarized the findings. **Results:** The prevalence of neck pain among the general population of musicians ranged from 14.3% to 77.2%. However, the included cross-sectional studies differed in terms of musical experience, pain duration, and definitions of neck pain. Female sex was the most consistently reported risk factor associated with neck pain. Other factors that seemed to increase the risk were: playing frequently during the week, being overweight, and being a student. **Conclusions:** Existing literature indicates that neck pain is a common musculoskeletal complaint among musicians. Interpretation is limited by the small number of studies, heterogeneous definitions of neck pain, varying timeframes, populations, and assessment tools. There is a need for further well-designed studies.

Keywords: neck pain; cervical pain; musicians; prevalence; risk factors; musculoskeletal disorders

1. INTRODUCTION

Neck pain is a common health problem worldwide and is a factor associated with years lived with disability (YLD) (Hoy et al., 2014). Musculoskeletal disorders can lead to chronic pain that limits daily functioning and reduces the ability to work (Zaza, 1998). Playing-related musculoskeletal disorders (PRMDs) are common among musicians due to repetitive movements or prolonged static positions (Cardoso et al., 2019). One of the most frequently reported areas of musculoskeletal pain among musicians is the cervical spine. This has been observed both in general

groups of musicians and in specific subgroups specializing in particular instruments (Zaza, 1998; Silva et al., 2015; Rodríguez-Gude et al., 2022; Corrêa et al., 2018).

Despite the growing number of studies on PRMDs, they mostly focus on general musculoskeletal complaints rather than on neck pain specifically. As a result, the epidemiology of neck pain and its associated risk factors among musicians remains unclear. Therefore, the aim of this article was to collect and describe the available evidence on the prevalence of neck pain and its associated risk factors among musicians.

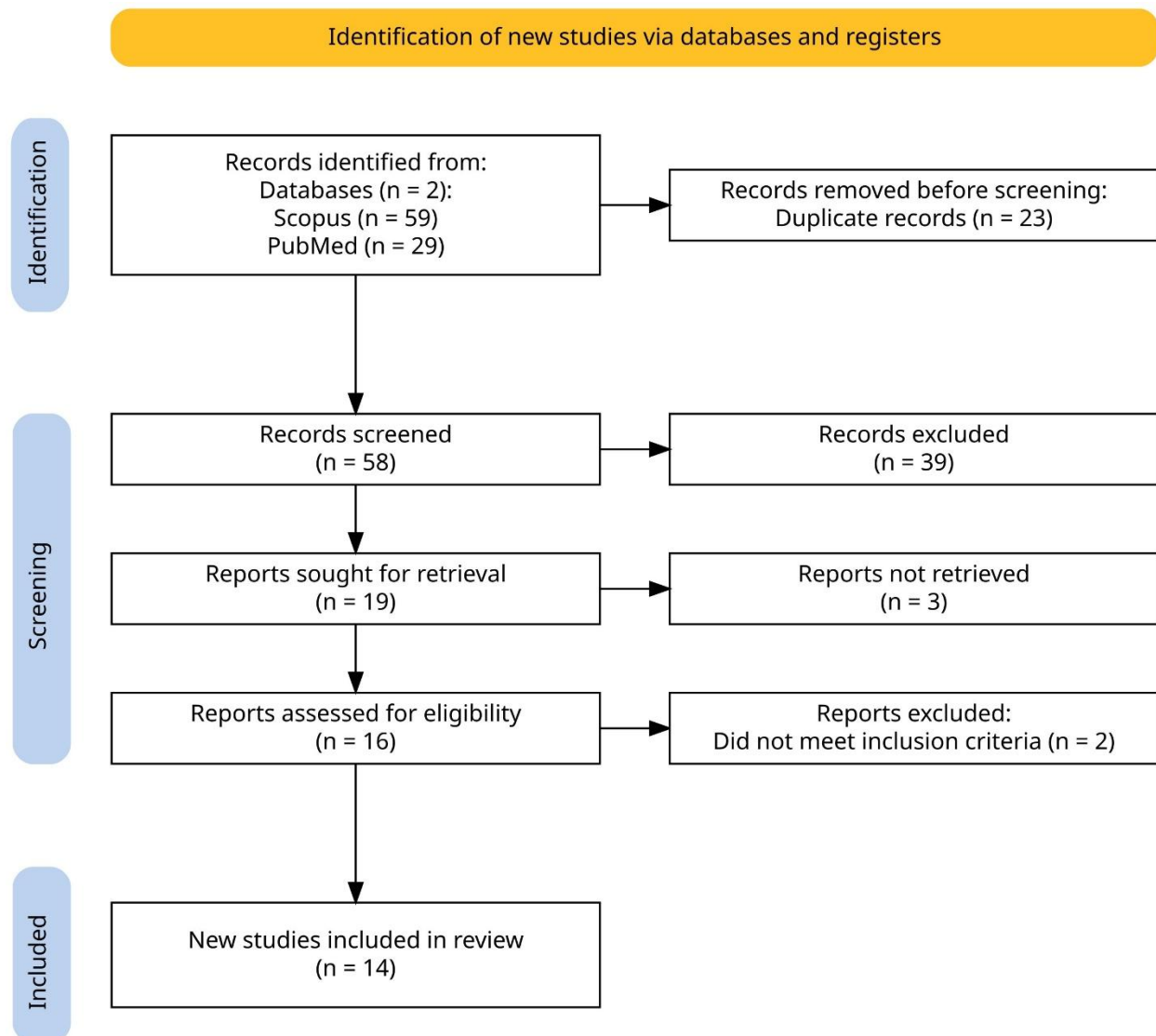


Figure 1. Study selection process.

2. REVIEW METHODS

The research question was structured using the PEO framework (Population, Exposure, Outcome). The population consisted of musicians. The exposure referred to occupational and ergonomic factors associated with playing musical instruments. The outcome was the occurrence and prevalence of neck pain.

We searched PubMed and Scopus to identify studies published between January 2016 and January 2026, with the last search conducted in January 2026. The search strategy combined cervical pain-related terms (“neck”, “cervical”, “pain”) and groups of musicians (“musician”, “instrumentalist”, “orchestra”). We included studies that investigated musicians as the study population, reported the prevalence of neck pain, or examined factors associated with neck pain, and were original research articles. We excluded

studies that didn't report outcomes specifically related to neck pain or that combined neck pain with other musculoskeletal complaints (e.g., neck and shoulder pain).

Figure 1 presents the study selection process as a flow diagram based on PRISMA guidelines. We included 14 cross-sectional studies. Data from the included studies were: author and year of publication, country, study population, sample size, mean age of participants, type of instrument played, reported prevalence of neck pain, timeframe of symptom assessment, assessment tools, study design, and reported factors associated with neck pain among musicians.

3. RESULTS & DISCUSSION

Quality assessment

We assessed the quality of the included studies with the Joanna Briggs Institute (JBI) checklist. The majority of the included studies were characterized by a moderate level of quality. Additional information relating to the results can be found within the supplementary material.

Characteristics of included studies

Table 1 summarizes the main characteristics of the included studies.

Table 1. Characteristics of the included studies

Study	Country	Study population	N	Age (years)	Instrument type	Assessment tool
Rodríguez-Gude et al., 2025	Spain	Music conservatory students and teachers	552	26.8 ± 10.6	Mixed instruments	Self-designed questionnaire with body diagram (Google Forms)
Badino et al., 2025	Italy	Clarinet students from Italian conservatories	100	21 (median)	Clarinet	Self-designed questionnaire + NRS pain scale + body diagrams
Yang & Mibu, 2025	China	Participants with prior experience in professional piano training	205	22.1 ± 4.2	Piano	Self-designed questionnaire
Cygańska et al., 2024	Poland	Professional orchestra musicians	182	37.2 ± 9.6	Mixed instruments	MPIIQM-P validated questionnaire
Coelho et al., 2024	Brazil	Professional musicians with ≥1 year of experience	98	33.0 ± 8.0	Mixed instruments	Self-designed online questionnaire
Boj, 2023	Croatia	Secondary music school students and general high school controls	50	18	Mixed instruments	Self-designed questionnaire + VAS
Gómez-Rodríguez et al., 2020	Spain	Musicians aged ≥16 years (Madrid, snowball sampling)	213	26 (median)	Mixed instruments	Validated questionnaire (NDI + others)
Woldendorp et al., 2018	Netherlands	Professional and conservatory student double bassists and bass guitarists	141	~35	Bass instruments	Self-constructed web-based questionnaire + NRS + BSI + SF-36 item + ISBS items
Cruder et al., 2018	Switzerland / UK	Music conservatory students and young professional musicians	158	22.4 ± 3.6	Mixed instruments	Digital pain drawings + QuickDASH
Viljamaa et al., 2017	Finland	Professional symphony orchestra musicians	361	45 ± 10	Mixed instruments	Validated national health survey questionnaire (MSK symptoms) + study-specific questions.
Gasenzer et al., 2017	Germany	Professional orchestra musicians	740	46.4 ± 9.5	Orchestral instruments	Online questionnaire based on German Pain Questionnaire (DSF) + von Korff scale

Rodríguez-Romero et al., 2016	Spain	Music conservatory students	206	23.5 ± 4.1	Mixed instruments	Nordic Musculoskeletal Questionnaire (NMQ-E); VAS; Neck Disability Index (NDI); DASH; SF-36
Lonsdale & Ong, 2016	Malaysia	University instrumental music students	98	21.9	Mixed instruments	Self-report online questionnaire
Berque et al., 2016	UK	Professional orchestra musicians	101	47.7 ± 10.4	Orchestral instruments	Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians (MPIIQM)

Abbreviations: NRS – Numeric Rating Scale; VAS - Visual Analogue Scale; NMQ - Nordic Musculoskeletal Questionnaire; NDI - Neck Disability Index; MPIIQM - Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians

Prevalence of neck pain

Thirteen of the fourteen included studies reported the prevalence of neck pain. The reported prevalence varied across studies depending on the timeframe, outcome definitions, and study populations. Table 2 summarizes the results.

Table 2. Prevalence of neck pain among musicians

Study	Outcome	Timeframe	Prevalence
Rodríguez-Gude et al., 2025	neck pain	not specified	57.2%
Badino et al., 2025	posterior neck pain	non-musical activities	45%
Badino et al., 2025	lateral neck pain	non-musical activities	19%
Badino et al., 2025	anterior neck pain	non-musical activities	6%
Badino et al., 2025	posterior neck pain	performance-related	29%
Badino et al., 2025	lateral neck pain	performance-related	14%
Badino et al., 2025	anterior neck pain	performance-related	5%
Yang & Mibu, 2025	neck symptoms (pain, numbness or stiffness)	during piano playing	30.7%
Cygańska et al., 2024	neck pain (among musicians with PRMD)	past 7 days	22.4%
Coelho et al., 2024	neck pain	not specified	14.3%
Gómez-Rodríguez et al., 2020	neck pain	12 months	73.7%
Woldendorp, 2018	neck complaints	last 3 months	29.8%
Cruder et al., 2018	neck pain (frontal)	last week	27.9% (women); 17.0% (men)
Cruder et al., 2018	neck pain (dorsal)	last week	47.7% (women); 10.9% (men)
Viljamaa et al., 2017	neck pain	last 30 days	69% (women); 52% (men)
Viljamaa et al., 2017	neck pain	>30 days in past year	36% (women); 17% (men)
Gasenzer et al., 2017	neck pain (among musicians reporting pain)	>3 months	64.1%
Rodríguez-Romero et al., 2016	neck pain/discomfort	lifetime	77.2%
Rodríguez-Romero et al., 2016	neck pain/discomfort	12 months	64.6%
Rodríguez-Romero et al., 2016	neck pain/discomfort	last month	48.5%
Rodríguez-Romero et al., 2016	neck pain/discomfort	point prevalence	23.8%
Lonsdale & Ong, 2016	neck discomfort/tension/pain	lifetime playing-related symptoms	39.8%
Berque et al., 2016	neck PRMP (among musicians reporting PRMP)	point prevalence	13.9%

*Unless otherwise indicated, prevalence estimates refer to the entire study population of musicians. In some studies, prevalence was reported within specific subgroups of musicians (e.g., musicians with PRMD – playing-related musculoskeletal disorders, or musicians reporting pain).

Prevalence of neck pain according to outcome definition

The prevalence of neck pain (considered alone) ranged from 14.3% to 73.7%. (Rodríguez-Gude et al., 2025; Badino et al., 2025; Coelho et al., 2024; Gómez-Rodríguez et al., 2020; Cruder et al., 2018; Viljamaa et al., 2017). Other studies that combined it with other symptoms

reported the prevalence varying from 29.8 to 77.2% (Yang and Mibu, 2025; Woldendorp et al., 2018; Rodríguez-Romero et al., 2016; Lonsdale and Ong, 2016).

Prevalence of neck pain across different musician populations

Among the 14 included studies, 4 reported prevalence estimates for groups of musicians with PRMDs. Remaining studies evaluated prevalence in heterogeneous populations of musicians (including healthy musicians and those with musculoskeletal complaints). The prevalence of neck pain among people with preexisting musculoskeletal complaints was within a range from 13.9% to 64.1% (Cygańska et al., 2024; Gasenzer et al., 2017; Berque et al., 2016). The prevalence of neck pain ranged from 14.3% to 77.2% in the general musician population.

Prevalence of neck pain and timeframes

The prevalence of neck pain among musicians depends on the time period used to measure the symptoms. Prevalence estimates ranged from 13.9% to 23.8% (Rodríguez-Romero et al., 2016; Berque et al., 2016). The prevalence estimates ranged from 10.9% to 47.7% when symptoms were assessed during the last week (Cygańska et al., 2024; Gómez-Rodríguez et al., 2020; Cruder et al., 2018). Reported prevalence in the last 30 days has ranged from approximately 36% to 69% (Viljamaa et al., 2017; Rodríguez-Romero et al., 2016). The prevalence ranged from 29.8% to 64.1% in studies with longer follow-up periods (3 months or more (Woldendorp et al., 2018; Gasenzer et al., 2017).

Risk factors associated with neck pain

Female sex was the most consistently reported risk factor, with five studies indicating a higher prevalence of neck pain among female musicians. One study did not find a statistically significant association. Table 3 presents other factors.

Table 3. Factors associated with neck pain among musicians

Risk factor	Study	Measure of association
Female sex	Rodríguez-Gude et al., 2025	higher prevalence (p < 0.001)
	Gómez-Rodríguez et al., 2020	OR 4.19 (95% CI 2.19–8.03)
	Rodríguez-Romero et al., 2016	OR 2.4 (95% CI 1.1–5.2)
	Viljamaa et al., 2017	higher prevalence (p < 0.001)
	Boj, 2023	not significant (p > 0.05)
Playing ≥15 h/week	Gómez-Rodríguez et al., 2020	higher risk (OR 2.60, 95% CI 1.38–4.88)
Difficulties recovering after performances	Viljamaa et al., 2017	higher prevalence (p < 0.01)
Overweight / obesity	Gómez-Rodríguez et al., 2020	higher risk (OR 2.85, 95% CI 1.45–5.63)
Student status	Rodríguez-Gude et al., 2025	higher prevalence among students (p = 0.006)
Instrument family	Rodríguez-Gude et al., 2025	significant differences between instrument groups (p = 0.028)
Elevated arm position	Gómez-Rodríguez et al., 2020	not significant
Regular physical activity	Rodríguez-Romero et al., 2016	lower prevalence (p = 0.03)
Mono- vs Multi-instrumentalism	Woldendorp et al., 2018	not significant (p = 0.271)

Neck pain prevalence among musicians

Neck pain appears to be a common issue among musicians. Reported prevalence among this group ranges from about 14% to 77%. At the same time, differences in the studies’ methods make it difficult to compare results directly or draw clear conclusions. The wide range of reported prevalence may be partly explained by the fact that some studies included broader neck-related symptoms (such as stiffness, discomfort, or numbness), whereas others assessed neck pain alone. In addition, studies with longer timeframes tended to

report higher prevalence estimates, as they are more likely to capture individuals who experienced neck pain at any point during the specified period.

The chosen articles also featured musicians with diverse levels of experience. Rodríguez-Gude et al., (2022) found that students had more neck pain than more experienced musicians. This could mean that the stage of musical training can affect how often symptoms happen. An important aspect is that the studies selected for review were conducted in different geographical regions. This is relevant, as studies of the general population indicate that neck pain prevalence may vary by region.

In particular, according to the GBD 2021 Neck Pain Collaborators (2024), the highest age-standardized point prevalence was reported in North Africa and the Middle East, whereas the lowest was observed in Australasia. Such differences are considered to be related to variations in lifestyle, working conditions, ergonomics, and access to healthcare. In all included studies, pain was self-reported, and the affected body region was identified by participants rather than assessed by a clinician. This may have introduced some error, as participants could misidentify the exact location of pain, especially between the neck and shoulder areas. Cruder et al., (2018) noted this issue and attempted to reduce it by using digital pain drawings, in which participants marked painful areas on a body chart.

Finally, it should also be noted that the studies included musicians playing different instruments. Since each instrument involves specific physical demands, this may have contributed to differences in the reported prevalence of neck pain.

Risk factors

The female sex was the most consistently reported variable associated with neck pain. A significantly higher prevalence was found in female musicians in four studies. This is consistent with the Global Burden of Disease 2021 study, which found that women in the general population have a higher prevalence of neck pain than men. The sex differences observed are likely to be multifactorial and may be due to anatomical differences (e.g., small cervical vertebrae and paraspinal musculature in females) and biological (including genetic) factors affecting pain perception. However, the underlying mechanisms of these differences remain unclear and require further investigation (GBD 2021 Neck Pain Collaborators, 2024).

Greater weekly playing time was associated with a higher prevalence of neck pain (Gómez-Rodríguez et al., 2020), while regular physical activity was associated with a lower prevalence (Rodríguez-Romero et al., 2016). Similar relationships have been previously reported; greater playing time and lower levels of physical activity have been associated with musculoskeletal pain in musicians (Corrêa et al., 2018). However, in a study assessing complaints of the arm, neck, and/or shoulder (CANS), playing time was not significantly associated with symptoms (Kok et al., 2017).

In contrast, several examined factors did not show significant associations with neck pain. For instance, elevated arm position during instrument playing was not significantly related to neck pain. It is consistent with previous findings, which reported no overall association between arm position and CANS, except for a higher prevalence of left shoulder complaints in musicians playing with an elevated left arm (Kok et al., 2017).

Neck pain–related disability and functional impact

Neck pain is common in the general population - epidemiological studies have estimated that approximately 30–50% of adults experience neck pain within 12 months, with point prevalence estimates of around 4–5% (Hoy et al., 2014). In comparison, the point prevalence of neck pain among musicians in the included studies ranged from 13.9% to 23.8%, suggesting that musicians may be particularly vulnerable to cervical musculoskeletal complaints.

It is also important to point out that two studies found that musicians had disabilities related to neck pain. Rodríguez-Romero et al., (2016) found that approximately 51% of conservatory students exhibited varying levels of neck-related disability, as measured by the Neck Disability Index (NDI), with female students achieving significantly higher NDI scores than male students. Worse mental health was also linked to more neck disability. Gómez-Rodríguez et al., (2020) similarly reported quantifiable disability, as evaluated by the NDI. They also noted that neck pain had practical consequences, as some musicians reported limitations in their usual work activities due to neck symptoms.

Because neck pain is relatively common among musicians and has a considerable global impact, more research is needed to understand its risk factors and develop effective prevention strategies. More consistent studies are also needed, especially regarding how neck pain is defined and which assessment periods are used.

Limitations

Some limitations should be considered when interpreting the current literature review's findings. First of all, the definitions, recall periods, and assessment tools used in the selected studies varied considerably. In addition, the study populations were often insufficiently homogeneous to allow direct comparisons. In studies, neck pain was assessed using questionnaires, which may have led to some degree of misclassification. Furthermore, most of the included studies had a cross-sectional design, which is inherently limited in its ability to establish causality.

4. CONCLUSION

Based on the available cross-sectional studies, several conclusions can be drawn. The prevalence of neck pain among musicians ranged from 14.3% to 77.2%, which appears to be higher than in the general population. Moreover, female musicians are at a higher risk of developing this condition. It can be observed that longer timeframes tend to result in higher prevalence estimates. In addition, neck pain may be associated with some degree of disability and can affect daily functioning and work activities. Overall, the available evidence is limited and heterogeneous, highlighting the need for further well-designed studies using standardized assessment tools to better understand the factors associated with neck pain among musicians.

Acknowledgments

There are no acknowledgments to disclose.

Authors' Contributions

Conceptualization: Ewelina Lachowska, Cyprian Janiszewski, Wojciech Baran, Patrycja Bartkiewicz, Tomasz Jędrasek, Adrian Korman, Wafa Al-Batool;

Methodology: Ewelina Lachowska, Wojciech Baran, Patrycja Bartkiewicz;

Data acquisition: Ewelina Lachowska, Tomasz Jędrasek, Adrian Korman;

Data analysis and interpretation: Wojciech Baran, Ewelina Lachowska, Cyprian Janiszewski;

Drafting of the manuscript: Ewelina Lachowska, Cyprian Janiszewski;

Critical revision of the manuscript: Ewelina Lachowska, Wojciech Baran, Patrycja Bartkiewicz, Tomasz Jędrasek, Adrian Korman, Cyprian Janiszewski, Wafa Al-Batool;

Final paper approved by all authors.

Informed consent

Not applicable.

Ethical approval

Not applicable. This article does not contain any studies with human participants or animals performed by any of the authors.

Funding

This research did not receive any external funding like specific grant from funding agencies in the public, commercial, or nonprofit sectors.

Conflict of interest

The authors declare that they have no conflicts of interest, competing financial interests or personal relationships that could have influenced the work reported in this paper.

Data and materials availability

All data associated with this study will be available based on the reasonable request to corresponding author.

REFERENCES

1. Badino L, Garzoglio E, Canfori T, Balestrino M, Vestito L, Trompetto C, Marinelli L. A questionnaire-based study on cranio-cervical-mandibular symptoms in clarinet students. *Explor Neuroprotect Ther* 2025; 5: 1004114.
2. Berque P, Gray H, McFadyen A. Playing-related musculoskeletal problems among professional orchestra musicians in Scotland: a prevalence study using a validated instrument, the Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians (MPIIQM). *Med Probl Perform Art* 2016; 31(2): 78–86.
3. Boj E. The prevalence of neck pain in secondary music school students. *Physiother Croat* 2023; 21: 357–362.
4. Cardoso M, Morgado E, Leonido L. From incidence to strategy: a systematic review in playing-related musculoskeletal disorders. *Motricidade* 2019; 15: 65–70.
5. Coelho PC, Navarro FAM, Nakao RY, Rodrigues LCL, Gonçalves ISF. Epidemiological study of neck and low back pain prevalence in professional musicians. *Coluna/Columna* 2024; 23: e285777.
6. Corrêa LA, dos Santos LT, Paranhos Júnior ENN, Albertini AIM, Parreira PCS, Nogueira LAC. Prevalence and risk factors for musculoskeletal pain in keyboard musicians: a systematic review. *PM&R* 2018; 10: 1341–1354.
7. Cruder C, Falla D, Mangili F, Azzimonti L, Araujo LS, Williamon A, Barbero M. Profiling the location and extent of musicians' pain using digital pain drawings. *Pain Pract* 2018; 17: 761–772.
8. Cygańska AK, Kaczorowski M, Rodzik B. The Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians: assessment of patient-related outcomes among professional orchestra musicians in Poland. *J Clin Med* 2024; 13: 4751.
9. Gasenzer ER, Klumpp MJ, Pieper D, Neugebauer EAM. The prevalence of chronic pain in orchestra musicians. *Dtsch Arztebl Int* 2017; 114: 757–762.
10. GBD 2021 Neck Pain Collaborators. Global, regional, and national burden of neck pain, 1990–2020, and projections to 2050: a systematic analysis of the Global Burden of Disease Study 2021. *Lancet Rheumatol* 2024; 6: e142–e155.
11. Gómez-Rodríguez R, Díaz-Pulido B, Gutiérrez-Ortega C, Sánchez-Sánchez B, Torres-Lacomba M. Prevalence, disability and associated factors of playing-related musculoskeletal pain among musicians: a population-based cross-sectional descriptive study. *Int J Environ Res Public Health* 2020; 17: 3991.
12. Hoy D, March L, Woolf A, Blyth F, Brooks P, Smith E, Vos T, Barendregt J, Bloore J, Murray C, Burstein R, Buchbinder R. The global burden of neck pain: estimates from the Global Burden of Disease 2010 study. *Ann Rheum Dis* 2014; 73: 1309–1315.
13. Kok LM, Huisstede BMA, Douglas TJ, Nelissen RGHH. Association of arm position and playing time with prevalence of complaints of the arm, neck, and/or shoulder (CANS) in amateur musicians: a cross-sectional pilot study among university students. *Med Probl Perform Art* 2017; 32(1): 8–12.
14. Lonsdale C, Ong T. Playing-related health problems among instrumental music students at a university in Malaysia. *Med Probl Perform Art* 2016; 31: 151–159.
15. Rodríguez-Gude C, Taboada-Iglesias Y, Pino-Juste M. Location of musculoskeletal pain in musicians according to gender, academic status and instrument. *Muscles Ligaments Tendons J* 2025; 15: 423–431.
16. Rodríguez-Gude C, Taboada-Iglesias Y, Pino-Juste M. Musculoskeletal pain in musicians: prevalence and risk factors – a systematic review. *Int J Occup Saf Ergon* 2022.
17. Rodríguez-Romero B, Pérez-Valiño C, Ageitos-Alonso B, Pértega-Díaz S. Prevalence and associated factors for musculoskeletal pain and disability among Spanish music conservatory students. *Med Probl Perform Art* 2016; 31: 193–200.
18. Silva AG, Lã FMB, Afreixo V. Pain prevalence in instrumental musicians: a systematic review. *Med Probl Perform Art* 2015; 30: 8–19.
19. Viljamaa M, Toppila E, Uitti J, Pääkkönen R. Musculoskeletal symptoms among Finnish professional orchestra musicians. *Med Probl Perform Art* 2017; 32: 195–200.
20. Woldendorp KH, Boonstra AM, Arendzen JH, Reneman MF. Variation in occupational exposure associated with musculoskeletal complaints: a cross-sectional study among professional bassists. *Int Arch Occup Environ Health* 2018; 91: 215–223.
21. Yang Q, Mibu C. Physical health conditions and occupational risks among piano students and teachers in Chengdu, China: prevalence, awareness, and prevention strategies. *Crit Public Health* 2025; 35.
22. Zaza C. Playing-related musculoskeletal disorders in musicians: a systematic review of incidence and prevalence. *CMAJ* 1998; 158: 1019–1025.