



Cite as: CHMIELA, Mateusz, LACHOWSKA, Ewelina Maria, BARTKIEWICZ, Patrycja Anna, BARAN, Wojciech Przemysław, JANISZEWSKI, Cyprian Mariusz and RATAJCZYK, Oskar. Beta-blockers in Musicians: Mechanisms, Clinical Evidence, Prevalence, and Ethical Parallels with Anti-Doping Regulation in Precision Sports – A Narrative Review. *Quality in Sport*. 2026;65:73762. <https://doi.org/10.12775/QS.2026.65.73762>

ARTICLE TIMELINE

Received: 28.06.2026. Revised: 22.07.2026. Accepted: 22.07.2026. Published: 22.07.2026.

The journal has been awarded 20 points in the parametric evaluation by the Polish Ministry of Higher Education and Science (Annex to the announcement of 05.01.2024, No. 32553). Unique Journal Identifier: 201398. Scientific disciplines assigned: Economics and finance (Field of social sciences); Management and Quality Sciences (Field of social sciences).

Punkty Ministerialne z 2019 – aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 Lp. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398. Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych). © The Authors 2026.

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Beta-blockers in Musicians: Mechanisms, Clinical Evidence, Prevalence, and Ethical Parallels with Anti-Doping Regulation in Precision Sports – A Narrative Review

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Abstract

Background: Music Performance Anxiety is a frequent problem among musicians. Beta-blockers, especially propranolol, are used by some performers to reduce somatic symptoms of stage fright.

Aim: This narrative review aimed to analyse the mechanisms, clinical evidence, prevalence, safety and ethical implications of beta-blocker use among musicians, including parallels with anti-doping regulation in precision sports.

Material and methods: A targeted literature search was conducted using PubMed, Google Scholar, JSTOR and ResearchGate. Clinical studies, surveys, reviews, regulatory documents

and bioethical analyses concerning beta-blockers, Music Performance Anxiety, stage fright and performance enhancement were included.

Results: Beta-blockers may reduce peripheral manifestations of sympathetic arousal and may be useful in selected performance situations. However, the available evidence remains limited by small samples, older study designs and heterogeneous outcome measures. Survey data indicate that beta-blocker use occurs among musicians, particularly in auditions and other high-pressure performances. Their use also raises safety concerns and ethical questions about the boundary between therapy, symptom control and performance enhancement.

Conclusions: The available evidence suggests that beta-blockers may have a limited role in selected musicians, mainly as a short-term option for reducing somatic symptoms of stage fright. They should not be seen as a routine or complete treatment for Music Performance Anxiety. Their use, particularly before auditions and other high-pressure situations, raises questions about safety, medical supervision and fairness. The parallel with precision sports, where beta-blockers are formally regulated, further highlights the ethical complexity of their use in music. Therefore, beta-blocker use in musicians should be approached cautiously, with clear education and individual medical assessment.

Key words: beta-blockers; propranolol; Music Performance Anxiety; stage fright; musicians; performance; anti-doping

1. Introduction

Performance anxiety has been described across multiple performance situations involving evaluation, including sport and stage-related activities such as music, theatre, dance and public speaking [1]. In musicians, performance anxiety is most often discussed as Music Performance Anxiety (MPA). Kenny defined MPA as the experience of marked and persistent anxious apprehension related to musical performance, arising through underlying biological and/or psychological vulnerabilities and/or specific anxiety-conditioning experiences [2]. MPA has been reported across a wide range of musician populations, including children and adolescents, undergraduate students, amateur musicians and professional performers. Its

manifestations may negatively affect performance quality, contribute to the avoidance of practice or public performance and, in severe cases, lead individuals to withdraw from musical activities altogether [3,4].

Music Performance Anxiety is not listed as a separate diagnostic disorder in the DSM-5-TR. When performance-related fear reaches the threshold of a mental disorder, it may fall within social anxiety disorder, particularly with the “performance only” specifier, which applies when fear is restricted to speaking or performing in public [5]. Kenny describes it as a performance-related form of anxiety rather than a separate diagnostic category [2]. In the literature, the terminology is not fully consistent, and terms such as “Music Performance Anxiety”, “performance anxiety” and “stage fright” are sometimes used in overlapping ways [6]. In this review, MPA is understood mainly as anxiety related to musical performance.

The somatic symptoms of MPA are commonly described as manifestations of sympathetic “fight-or-flight” arousal and may include increased heart rate, sweating, tremor, muscle tension, dry mouth, nausea, frequent urination and shallow breathing. In musical performance, these symptoms may become problematic because their impact depends on instrument-specific technical demands, such as hand stability, digital dexterity, breath control and vocal or instrumental precision [3,4].

Because beta-adrenergic receptor antagonists reduce peripheral manifestations of sympathetic arousal, they have attracted interest in performance-related anxiety. Propranolol is a non-selective beta-blocker commonly discussed in the literature on anxiety and stage fright [7,8]. In selected sports, beta-blockers are prohibited by the World Anti-Doping Agency [9]. This is ethically relevant to music because beta-blockers may reduce physical manifestations of anxiety, such as tremor and heightened physiological arousal, which can influence performance in evaluated settings [10]. Although music is not governed by anti-doping rules, auditions and competitions also involve performance under pressure. This review therefore considers beta-blocker use in musicians as both a clinical and ethical issue.

2. Material and methods

This article is a narrative review of the literature on beta-blocker use among musicians, with particular focus on mechanisms of action, clinical evidence, prevalence, safety and ethical parallels with anti-doping regulation in precision sports.

A targeted literature search was conducted using PubMed, Google Scholar, JSTOR and ResearchGate. Additional sources were identified through manual screening of reference lists

from relevant articles and reviews. Search terms included combinations of keywords related to Music Performance Anxiety and stage fright, such as “music performance anxiety”, “stage fright”, “performance anxiety”, “musicians”, “orchestral musicians” and “performing arts”, combined with pharmacological terms such as “beta-blockers”, “beta-adrenergic antagonists”, “propranolol”. Additional searches were performed using terms related to ethics and regulation, including “biomedical enhancement”, “anti-doping”, “WADA” and “beta-blockers in sport”.

The literature search was performed between May and June 2026. Recent literature was prioritised where available; however, older foundational studies were also included when they remained directly relevant to the topic. Eligible sources included original clinical studies, observational surveys, systematic and narrative reviews, book chapters, summaries of product characteristics, regulatory documents and bioethical analyses. Sources were included if they addressed beta-blocker use in musicians, Music Performance Anxiety, stage fright, performance-related anxiety, safety of beta-blockers, patterns of use among performers or ethical and regulatory issues related to performance enhancement.

3. Review of available literature

3.1. General mechanism of action of beta-blockers

Beta-blockers compete with catecholamines for beta-adrenergic receptors, thereby limiting the effects of sympathetic activation . Propranolol is a competitive, non-selective beta-blocker acting on both β_1 - and β_2 -adrenergic receptors, and because of its lipophilicity it can cross the blood–brain barrier [7,8].

In the context of stage fright and Music Performance Anxiety, propranolol is relevant mainly because it may reduce peripheral manifestations of sympathetic arousal, such as tremor, tachycardia, bow shake or sweaty palms [3,7]. This is consistent with reports that musicians use beta-blockers primarily to control physical symptoms that may interfere with performance [4]. However, beta-blockers are not specifically anti-anxiety medications and should therefore be understood as targeting the somatic component of stage fright rather than as a comprehensive treatment for MPA as a whole [3,7].

3.2. Safety of beta-blocker use with particular consideration of musicians

According to the Summary of Product Characteristics for Propranolol WZF, propranolol may cause adverse effects such as sleep disturbances, nightmares, bradycardia, cold or cyanotic extremities and fatigue. Giddens et al. also note that, although beta-blockers are generally considered safe, contraindications and adverse effects such as bronchospastic effects, bradycardia and hypotension do exist [11].

In musicians, not only general adverse effects but also medication-related effects on performance-specific elements, such as controlled tremor, voice and breathing, may be relevant [11,12]. Packer and Packer described a professional violinist in whom daily beta-blocker treatment for hypertension was associated with impairment of vibrato, a form of voluntary tremor important for violin technique. Vibrato impairment was not observed during intermittent beta-blocker use for stage fright, although fatigue and weakness were noted. The authors proposed that, in some cases, beta-blockers may reduce β_2 -mediated sympathetic tone below the level required to produce voluntary tremor, thereby impairing vibrato technique [12].

A separate issue is the potential effect of beta-blockade on voice parameters. Giddens et al. examined the effects of propranolol and laboratory-induced stress on the voice. Among other outcomes, they assessed jitter, which reflects short-term irregularity in vocal fold vibration. Although propranolol reduced sympathetic activation, jitter increased significantly during stress after propranolol administration [11].

The safety of beta-blocker use is particularly important because some musicians use these medications without a prescription or medical supervision. In the study by Fishbein et al., 70% of beta-blocker users were occasional non-prescribed users [13]. Patston and Loughlan emphasise that musicians should understand the consequences of beta-blocker use and should take these medications only under medical supervision [4].

3.3. Clinical evidence on the effectiveness of beta-blockers in reducing stage fright

Szeleszczuk and Frączkowski discussed propranolol in the context of different forms of anxiety and stress, with particular attention to stage fright and post-traumatic stress disorder. The authors noted that propranolol has been described as potentially useful in stage fright, but they also emphasised important methodological limitations in the available evidence. A particular problem is the lack of formal, objective tools for assessing treatment response, as some studies relied on subjective ratings of performance quality or non-standardised outcomes. For this reason, propranolol should be presented as a potential short-term option for reducing somatic symptoms of stage fright, rather than as a treatment with clearly established efficacy across the whole spectrum of Music Performance Anxiety [8].

Early evidence on beta-blockers in musical performance comes from the study by James et al., who evaluated oxprenolol in musicians with stage fright. Beta-blocker administration was associated with improved performance, particularly during the first performance and among musicians who reported greater nervousness. The authors linked this effect to a reduction in excessive sympathetic arousal, which may contribute to symptoms such as tachycardia and tremor. These findings support the view that beta-blockers may help mainly by reducing physical symptoms of stage fright, rather than by exerting a direct sedative effect on the central nervous system [14].

Similar conclusions can be drawn from the study by Brantigan et al., which examined the effects of beta-blockade and beta-stimulation on stage fright. The researchers described stage fright as a state related to the “fight-or-flight” response, including symptoms such as tachycardia, tremor, sweating, tight breathing and nausea. In their study, beta-blockade reduced physical impediments to performance, whereas beta-stimulation increased symptoms of stage fright. Performance quality, as judged by music critics, was better after beta-blockade, which the authors linked to the reduction of peripheral adrenergic symptoms. This study therefore also suggests that the potential effectiveness of beta-blockers in stage fright is mainly related to the control of somatic symptoms [15].

Atenolol is another beta-blocker that has been studied directly in musicians. Neftel et al. evaluated the effect of 100 mg atenolol or placebo administered 6.5 hours before performance in 22 string players who performed with or without an audience. Atenolol significantly reduced heart rate compared with placebo, but no clear effect on subjectively experienced stage fright was observed immediately before performance. A reduction in stage fright was reported only in the post-concert assessment referring to the experience during the

performance itself. The authors described beta-blockade as at least partially effective, as reflected in technical-motor performance measures, and suggested that its beneficial effect in stage fright may result mainly from peripheral rather than central action [16].

Taken together, these classic studies are consistent with the pharmacological mechanism of beta-blockers, as they point primarily to the reduction of peripheral symptoms of sympathetic arousal, such as tachycardia and tremor. However, these studies were small, methodologically heterogeneous and often relied on subjective or study-specific assessments of performance. Their findings therefore support a cautious conclusion that beta-blockers may have short-term usefulness in reducing somatic symptoms of stage fright, but they do not provide sufficient evidence to regard propranolol as routine treatment for Music Performance Anxiety [8].

Additional context is provided by reviews of propranolol and beta-blockers in broader anxiety disorders. Steenen et al. concluded that the quality of evidence for propranolol in anxiety disorders was insufficient to support its routine use in these indications [7]. Similarly, Archer et al. did not find strong evidence for the effectiveness of beta-blockers in anxiety disorders when compared with placebo or benzodiazepines [17]. These findings do not exclude the possible usefulness of beta-blockers in selected musicians with dominant somatic symptoms of stage fright, but they argue against presenting propranolol as a general anxiolytic drug or as a comprehensive treatment for performance anxiety [7,17].

Overall, the available evidence suggests that beta-blockers may be useful for the short-term reduction of physical symptoms of stage fright, particularly when tremor, tachycardia or other manifestations of sympathetic arousal interfere with musical performance. Due to the methodological limitations of the available studies, propranolol should be described as a potential symptom-oriented option in selected performance situations, rather than as a universal or routine treatment for Music Performance Anxiety.

3.4. Epidemiology of beta-blocker use among musicians

One of the key studies on the prevalence of beta-blocker use among professional musicians is the survey by Fishbein et al., conducted among members of the International Conference of Symphony and Opera Musicians (ICSOM). The study included 2212 musicians from 47 of the 48 orchestras affiliated with ICSOM, corresponding to a 55% response rate within the defined study population. The authors reported that 27% of respondents had used propranolol

or another beta-blocker. An important aspect of the findings by Fishbein et al. was the way in which beta-blockers were obtained and used. Among beta-blocker users, 19% reported daily prescribed use, 11% reported occasional prescribed use, and 70% were occasional non-prescribed users. Among occasional users, beta-blockers were most commonly taken before auditions, solo recitals, difficult orchestral performances and solo concerts. More than 96% of occasional beta-blocker users reported that these drugs were successful in reducing performance anxiety [13].

More recent data were provided by the cross-sectional survey by Kuwabara et al. in 2024, which included 311 musicians affiliated with organisations such as the American Federation of Musicians, the National Association of Schools of Music, the Regional Orchestra Players Association and the International Conference of Symphony and Opera Musicians. In this study, 57% of respondents reported using beta-blockers when auditioning for a job, 51% during performances and 19% in solo situations. The authors also reported that beta-blockers were used more frequently than benzodiazepines or cannabis-containing products for managing performance anxiety [18].

During the targeted literature search, no studies specifically reporting the prevalence of beta-blocker use among musicians in Poland were identified. The studies discussed above were mainly conducted in populations of musicians affiliated with American professional organisations, and their findings cannot be directly generalised to Polish musicians. This lack of national data represents an important research gap, particularly because propranolol is registered in Poland, among other indications, for the reduction of situational and generalised anxiety, especially of the somatic type [19].

3.5. Ethical and regulatory considerations: parallels with anti-doping regulation in precision sports

The use of beta-blockers by musicians raises ethical questions because these drugs can reduce physical symptoms that may interfere with performance. Saltzstein describes beta-blocker use in classical music as a form of biomedical human enhancement, because these drugs act directly on the body and reduce symptoms such as increased heart rate, tremor and unstable breathing. However, many musicians do not describe beta-blockers as “doping” or unfair

enhancement. Instead, they often understand them as therapy or as a tool that helps them perform as they normally do in practice [10].

The comparison with sport is useful because beta-blockers are formally regulated in selected precision sports. The World Anti-Doping Agency lists beta-blockers as substances prohibited in particular sports, including archery, automobile sports, billiards, darts, golf, mini-golf, shooting and selected underwater sports. The list includes, among others, propranolol, atenolol, metoprolol and oxprenolol [9]. In these sports, reducing tremor, heart rate or nervousness may be considered a form of performance enhancement [10].

Saltzstein also shows that the use of beta-blockers in music may create pressure within the profession. If musicians believe that many other candidates use beta-blockers during auditions, they may feel that they also need to use them in order not to be disadvantaged. This resembles one of the ethical problems of doping in sport: when a performance-enhancing drug becomes common, individuals may feel pressured to use it even if they would prefer not to [10].

At the same time, music does not have a formal anti-doping system comparable to sport. Saltzstein notes that beta-blockers have not been banned in competitive musical performance in the way they are banned in some sports. Therefore, the problem is not simply whether musicians break formal rules. The more important question is how the music community should understand the boundary between medical treatment, symptom control and performance enhancement [10].

The role of teachers and institutions is also important. Engelke and Ewell argue that music educators may face ethical, legal and medical concerns when discussing beta-blockers with students, because information about the drug may be interpreted as advice to use it. For this reason, non-physicians should not directly recommend pharmacological treatment. Students or musicians with severe performance anxiety should instead be referred for medical consultation [20].

In summary, beta-blocker use in musicians should not be treated as a simple equivalent of doping in sport. The comparison with precision sports is useful because the same class of drugs is formally prohibited in some athletic contexts. A balanced approach should therefore focus on medical supervision, clear education and careful discussion of the benefits, limits and risks of beta-blocker use, rather than on directly transferring anti-doping rules from sport to music [10,20].

4. Conclusions

This narrative review indicates that beta-blockers may have a limited but clinically relevant role in musicians, mainly by reducing somatic symptoms such as tremor, tachycardia and unstable breathing. Their effect appears to concern primarily peripheral manifestations of sympathetic arousal, rather than the broader cognitive, emotional and behavioural components of Music Performance Anxiety.

The available clinical evidence suggests possible short-term usefulness in selected performance situations, but it remains limited. Many of the key studies are small, relatively old and methodologically heterogeneous. Therefore, beta-blockers should not be presented as a universal or routine treatment for Music Performance Anxiety, but rather as a potential symptom-oriented option for selected musicians.

The review also shows that beta-blocker use among musicians is not uncommon and may occur particularly in auditions and other evaluated performance settings. This raises important questions about safety, medical supervision and informal use. Because beta-blockers have contraindications and may cause adverse effects relevant to performers, their use should be preceded by individual medical assessment.

From an ethical perspective, beta-blocker use in music lies between therapy, symptom control and performance enhancement. The analogy with precision sports is useful because beta-blockers are formally prohibited in selected athletic disciplines, but it should be interpreted cautiously in the context of music. A balanced approach should emphasise medical supervision, clear education and further research into both clinical effectiveness and the professional norms surrounding beta-blocker use in musicians.

Disclosure

Supplementary Materials

Not applicable.

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Funding Statement

The authors received no specific grant, financial support, or other assistance from any funding agency, commercial entity, or non-profit organization for the preparation of this manuscript.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

Not applicable.

Acknowledgements

Not applicable.

Conflicts of Interest

The authors declare that no conflicts of interest exist.

Originality

The submission has not been previously published, nor is it under consideration by another journal.

Use of Artificial Intelligence

During the preparation of this work, the authors used OpenAI's ChatGPT for the purpose of editorial assistance, including language editing, improving clarity and conciseness, and minor stylistic revisions. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the substantive content of the publication.

References

- [1] Rowland DL, Moyle G, Cooper SE. Remediation Strategies for Performance Anxiety across Sex, Sport and Stage: Identifying Common Approaches and a Unified Cognitive Model. *Int J Environ Res Public Health* 2021;18:10160. <https://doi.org/10.3390/ijerph181910160>.
- [2] Kenny D. *The Psychology of Music Performance Anxiety*. Oxford University Press; 2011. <https://doi.org/10.1093/acprof:oso/9780199586141.001.0001>.
- [3] Patston T. Teaching stage fright? – Implications for music educators. *Br J Music Educ* 2014;31:85–98. <https://doi.org/10.1017/S0265051713000144>.
- [4] Patston T, Loughlan T. Playing with performance: The use and abuse of beta-blockers in the performing arts. *Vic J Music Educ* 2014;3–10. <https://doi.org/10.3316/informit.006954228695040>.
- [5] American Psychiatric Association, editor. *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision*. 2022. <https://doi.org/https://doi.org/10.1176/appi.books.9780890425787>.
- [6] Fernholz I, Mumm JLM, Plag J, et al. Performance anxiety in professional musicians: a systematic review on prevalence, risk factors and clinical treatment effects. *Psychol Med* 2019;49:2287–306. <https://doi.org/10.1017/S0033291719001910>.
- [7] Steenen SA, van Wijk AJ, van der Heijden GJ, et al. Propranolol for the treatment of anxiety disorders: Systematic review and meta-analysis. *J Psychopharmacol (Oxf)* 2016;30:128–39. <https://doi.org/10.1177/0269881115612236>.
- [8] Szeleszczuk Ł, Frączkowski D. Propranolol versus Other Selected Drugs in the Treatment of Various Types of Anxiety or Stress, with Particular Reference to Stage Fright and Post-Traumatic Stress Disorder. *Int J Mol Sci* 2022;23:10099. <https://doi.org/10.3390/ijms231710099>.
- [9] World Anti Doping Agency. *The Prohibited List* n.d. <https://www.wada-ama.org/en/prohibited-list> (accessed June 23, 2026).

- [10] Saltzstein J. Musical Performance and Biomedical Human Enhancement: Ethnographic Perspectives on Bioethical Questions. *Hastings Cent Rep* 2026;56:32–42. <https://doi.org/10.1002/hast.70031>.
- [11] Giddens CL, Barron KW, Clark KF, et al. Beta-Adrenergic Blockade and Voice: A Double-Blind, Placebo-Controlled Trial. *J Voice* 2010;24:477–89. <https://doi.org/10.1016/j.jvoice.2008.12.002>.
- [12] Packer CD, Packer DM. Beta-Blockers, Stage Fright, and Vibrato: A Case Report. *Med Probl Perform Art* 2005;20:126–30. <https://doi.org/10.21091/mppa.2005.3025>.
- [13] Fishbein M, Middlestadt SE, Ottati V, et al. Medical Problems Among ICSOM Musicians: Overview of a National Survey. *Med Probl Perform Art* 1988;3:1–8.
- [14] James IM, Griffith DNW, Pearson RM, et al. EFFECT OF OXPRENOLOL ON STAGE-FRIGHT IN MUSICIANS. *The Lancet* 1977;310:952–4. [https://doi.org/10.1016/S0140-6736\(77\)90890-X](https://doi.org/10.1016/S0140-6736(77)90890-X).
- [15] Brantigan CO, Brantigan TA, Joseph N. Effect of beta blockade and beta stimulation on stage fright. *Am J Med* 1982;72:88–94. [https://doi.org/10.1016/0002-9343\(82\)90592-7](https://doi.org/10.1016/0002-9343(82)90592-7).
- [16] Neftel KA, Adler RH, Kappeli L, et al. Stage Fright in Musicians: A Model Illustrating the Effect of Beta Blockers. *Biopsychosoc Sci Med* 1982;44:461.
- [17] Archer C, Wiles N, Kessler D, et al. Beta-blockers for the treatment of anxiety disorders: A systematic review and meta-analysis. *J Affect Disord* 2025;368:90–9. <https://doi.org/10.1016/j.jad.2024.09.068>.
- [18] Kuwabara A, Miller Olson E, Stanek JL. Perceptions and Prevalence of Anxiolytic Medication Usage for Performance Enhancement Among Musicians. *Med Probl Perform Art* 2024;39:155–61. <https://doi.org/10.21091/mppa.2024.04018>.
- [19] Rejestr Produktów Leczniczych. Charakterystyka Produktu Leczniczego - Propranolol WZF n.d.
- [20] Ewell LCE and TB. The Ethics and Legality of Beta Blockers for Performance Anxiety: What Every Educator Should Know. *Coll Music Symp* n.d. <https://symposium.music.org/volume-51/articles-1752877057/the-ethics-and-legality-of-beta-blockers-for-performance-anxiety-what-every-educator-should-know> (accessed June 23, 2026).