

Musculoskeletal Strain in Professional Violinists: Qualitative Experiences, Impact, and Management Strategies

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DOI: <https://doi.org/10.47772/IJRISS.2026.100900098>

Received: 10 September 2026; Accepted: 15 September 2026; Published: 01 October 2026

ABSTRACT

Musculoskeletal strain is a frequent concern among violinists because violin performance is physically demanding and asymmetrical (Moraes & Antunes, 2012). This study explored the qualitative experiences of physical strain among professional violinists and identified preventive and therapeutic management strategies among professional violinists in Malaysia. Using a qualitative research design, semi-structured interviews were conducted with five professional violinists and one specialized physiotherapist. The transcriptions were evaluated using thematic analysis. The findings revealed recurring experiences of localized strain in the neck, back, shoulders, arms, and fingers. Key preventive practices reported by participants included pre-practice warm-ups, structured stretching, postural adjustments, and ergonomic modifications. Participants also emphasized the value of professional interventions, such as targeted physiotherapy and soft-tissue rehabilitation. Integrating physiological self-care into professional musical education supports physical well-being and long-term career performance.

Keywords: Musculoskeletal strain, professional violinists, qualitative experiences, injury prevention, musician health

INTRODUCTION

Musculoskeletal strain is a prevalent, career-threatening issue among violinists due to the intense physical demands and repetitive, asymmetrical postures required in the performance (Argus et al., 2020). These strains, affecting areas like the neck, shoulders, and wrists, not only cause pain but also jeopardize long-term performance abilities. According to Moraes and Antunes (2012), musculoskeletal strain among violinists is a significant issue in the realm of performing arts medicine. Research shows a high prevalence of musculoskeletal disorders (PRMDs) in musicians, particularly in string players, with incidence rates often between 73% and 87% due to the repetitive and sustained postures required for violin playing. The physical demands on violinists typically result in strain and discomfort in areas such as the cervical spine, shoulders, and wrists, contributing to symptoms like pain, numbness, and muscle weakness, which can disrupt performance quality and endurance (Berque et al., 2016).

As observed by Malek and Amarowicz (2023), professional violinists are especially vulnerable to PRMDs as they often engage in prolonged, intensive practice and performance schedules. Leder et al (2010) clarified that violin players' posture, the asymmetrical nature of holding the instrument, and the repetitive motions involved in playing, place high stress on specific muscle groups, leading to overuse injuries. Additionally, factors like joint hypermobility, gender-based anatomical differences, and specific playing techniques further elevate the risk of musculoskeletal issues for these musicians (Argus et al., 2020). Women may experience higher rates of PRMDs due to differences in muscle mass, hand size, and joint stability, as well as cultural perceptions around pain reporting.

Preventative approaches, such as regular stretching, physiotherapy, and targeted exercise programs, have been identified as effective strategies (Rotter et al., 2020). Many violinists seek professional assistance from physiotherapists, orthopedists, or massage therapists to manage or mitigate symptoms, though self-managed methods like rest and stretching are also common interventions. However, the need for systematic, evidence-based prevention methods is increasingly recognized to support long-term career sustainability for violinists and minimize health-related disruptions in their practice.

Musculoskeletal strain among violinists has constantly been deemed as a critical and complex issue with wide-reaching implications on musicians' health and careers. Despite substantial physical demands on violin players, who engage in repetitive and asymmetrical postures, high prevalence rates of musculoskeletal disorders (MSDs) persist (Argus et al., 2020). While existing research has been addressing these physical challenges, there remains a gap in understanding the long-term effects and the adequacy of current prevention strategies in addressing MSDs within this specific musician group. Additionally, violinists often rely on self-managed interventions, such as stretching and rest, due to limited access to specialized healthcare tailored to musicians. Without comprehensive preventive protocols and professional guidance, many violinists risk sustaining career-threatening injuries, diminishing their capacity to practice and perform.

Moreover, while there is substantial literature on performing arts medicine, a majority of studies on musculoskeletal disorders among musicians are outdated, lacking recent insights into current preventive practices and healthcare advancements. Given the evolving understanding of occupational health and ergonomics, there is a pressing need for up-to-date research that examines both the prevalence of MSDs and the effectiveness of modern intervention strategies.

This study aims to explore and to gain an in-depth understanding of the musculoskeletal challenges that professional violinists frequently experience. Playing the violin requires repetitive movements and static postures that can lead to musculoskeletal strain, often affecting areas like the neck, shoulders, and wrists. This study seeks to examine the specific nature and prevalence of these issues among violinists, exploring how physical demands impact their long-term health and performance capabilities.

Additionally, the study also aims to identify the preventive measures and self-management strategies that violinists currently employ to reduce strain and avoid injury. To provide a well-rounded perspective, it will also gather insights from healthcare professionals who specialize in treating musicians, offering expert recommendations on effective prevention and treatment practices.

LITERATURE REVIEW

Musculoskeletal Strain in Violinist

The violin, an asymmetrical instrument, necessitates playing postures that require both stability and precision, often placing unique demands on the body. Violinists must maintain a technical head position while managing repetitive motion and asymmetrical body alignment. When standing, Kok et al (2018) clarified that trunk muscles work harder to stabilize and balance, and asymmetrical weight distribution may strain the lower left limb. However, research has found no direct correlation between violin use and lower limb disorders, shifting focus to upper body musculoskeletal challenges.

As stated by Malek and Amarowicz (2023), playing-related musculoskeletal disorders are frequently reported among musicians, encompassing pain, numbness and weakness that interfere with performance. These conditions often stem from repetitive movements, inappropriate posture, and prolonged practice sessions. For string players like violinists, past researchers explained that musculoskeletal disorders predominantly affected the neck, shoulder, back and hands due to the physical and psychological stress of their work (Che et al., 2019; Kok et al (2018). Studies reveal that such disorders can emerge early in a musician's training and become chronic without proper intervention. Violinists, in particular, experience unique ergonomic challenges requiring optimal posture alignment and body weight distribution in order to maintain precision and motor control during long rehearsals and performances.

It can be perceived that laying the violin requires coordinated movements of the entire upper body, demanding a balance between precision and endurance. According to Researcher Cruder's (2019) study, the physical demands are particularly evident in the positioning of the head, trunk, and upper limbs. For the violinist, the head and trunk alignment serves as the foundation for maintaining posture and stability during performance, while the upper limbs execute intricate, asymmetrical movements that produce sound and melody. Together, these components highlight the interconnected nature of violin ergonomics and the physical strains unique to the instrument, forming the basis for further discussion.

Head and Trunk

When playing the violin, maintaining proper head and trunk alignment is vital for balance, control, and precision (Maric et al., 2019). Personally, it can be perceived that this positioning not only affects performance but also influences long-term musculoskeletal health. On the frontal plane, the violin tilts 20-30 degrees toward the left shoulder, resting between the jaw and neck to ensure stability during playing. In the horizontal plane, players must rotate their heads about 45-50 degrees leftward to see and access the violin effectively (Jacukowicz, 2016). This rotation allows for better control but, in my opinion, places undue stress on the neck if not managed correctly. The head also bends slightly forward in the sagittal plane, aligning the body to optimize posture.

Key muscles such as the sternocleidomastoid (SCOM) play significant roles here, with the right SCOM aiding head rotation and forward bending, and the left assisting with inclination and shoulder elevation (Demaree et al., 2017). Supporting muscles, including the trapezius, stabilize the violin while contributing to the physical demands of playing. I think this shows how a violinist's posture is more than static—it is a dynamic balance of muscle coordination. Argus and Paasuke (2020) highlighted the importance of trunk alignment, tilting slightly leftward and rotating about 10 degrees, which increases spinal load but allows free arm movement. This underscores the complexity of maintaining ergonomic posture during prolonged sessions.

Cervical spine alignment is central to this balance, minimizing strain on the upper body (Argus & Paasuke, 2020). However, it seems that ergonomic interventions, such as customized chin rests or targeted physical therapy, could further mitigate these challenges. Stretching and posture adjustments should be routine for violinists to reduce the physical toll of repetitive movements.

Upper Limbs

The asymmetrical role of the upper limbs in violin playing is another significant contributor to physical strain. For right-handed players, the right arm manages bowing through precise, dynamic movements. This requires about 90 degrees of shoulder flexion and abduction, with the wrist flexing 20-30 degrees for control (Berque et al., 2016). In my view, this intricate coordination is impressive but demanding, particularly during extended practice sessions. Malek and Amarowics (2023) noted that bowing requires smooth integration of shoulder, elbow, and wrist movements, which are essential for creating fluid sounds but place considerable stress on the arm.

The left arm supports the violin and performs string pressing, requiring outward shoulder rotation and forearm supination. Kok et al. (2018) found that this increases strain on the supraspinatus tendon, often leading to overuse injuries. From my perspective, this highlights the importance of educating violinists about proper technique to avoid chronic issues. The left hand also handles vibrato techniques, which demand repetitive flexion and extension, further contributing to forearm and shoulder tension (Cruder et al., 2019).

With practice sessions often lasting five or more hours, fatigue and strain become inevitable. It is my understanding that preventive strategies like structured breaks and ergonomic adjustments, such as using custom shoulder rests, could play a crucial role in reducing injuries. Incorporating physical therapy exercises into regular routines would also benefit players, promoting longevity in their musical careers.

Managing Musculoskeletal Injuries in Violinists

Musculoskeletal injuries are a common concern for violinists, mainly due to the repetitive and asymmetrical movements required during their performances. These repetitive actions place significant strain on specific

muscle groups, particularly in the neck, shoulders, and upper limbs. To address this, ergonomic adaptations like customized chin rests and shoulder pads have been shown to effectively distribute the instrument's weight, alleviating pressure on the body and promoting better posture for long-term comfort and injury prevention (Jacukowicz, 2016).

In my view, incorporating physical therapy alongside targeted exercises tailored to the needs of musicians is essential. Stretching routines enhance flexibility, while strengthening exercises build endurance in muscles subjected to prolonged activity. These practices prepare the body for the physical intensity of violin playing and can help prevent injuries when combined with good practice habits. For instance, taking regular breaks and ensuring proper bow grip and finger placement reduce the likelihood of overuse injuries (Lima et al., 2018; Berque et al., 2016).

Beyond these strategies, I believe that a collaborative approach involving physiotherapists, music educators, and musicians themselves is highly beneficial. Educating violinists about body mechanics and posture equips them with tools to identify and resolve issues early, potentially preventing chronic injuries. Structured breaks, ergonomic enhancements, and professional advice form a comprehensive solution, enabling violinists to sustain peak performance while minimizing risks of long-term musculoskeletal injuries (Mizrahi, 2021).

METHODOLOGY

This research utilizes qualitative research design as it aligns well with the objectives of identifying common musculoskeletal issues among violinists and exploring professional recommendations for preventive measures. Using methods like interviews, it serves as a valuable method for gathering rich, detailed insights into violinists' experiences and their interpretations of physical health challenges. Direct engagement with participants allows for a deeper exploration of the underlying meanings and patterns associated with musculoskeletal discomfort, pain, and performance limitations. By analyzing these experiences, this approach provides a comprehensive understanding of the impact of physical strain on violinists' musical careers, highlighting the ways in which these challenges influence their practice routines, technical adjustments, and overall well-being.

Selection of Case Studies

A purposive sampling strategy was utilized to recruit six participants: five professional violinists (**P1–P5**) and one specialized physiotherapist (**P6**). Inclusion criteria for violinists required:

1. A minimum of 10 years of professional performance and pedagogical experience.
2. Active engagement in professional orchestral, chamber, or solo performance

The physiotherapist was selected based on clinical experience in treating performing artists and managing occupational musculoskeletal disorders.

Participant ID	Role/Specialization	Years of Experience	Weekly Playing/Clinical Hours
P1	Profesional violinist/Educator	27 years	14-21 hours
P2	Professional violinist	35 years	21-35 hours
P3	Professional violinist/Orchestral principal	51 years	28-42 hours
P4	Professional violinist	30 years	14-28 hours
P5	Professional violinist/Soloist	28 years	21-35 hours
P6	Senior Musculoskeletal Physiotherapist	12 years	N/A (Clinical practice)

Table 1: Participant Selection Demographics

Data Collection Methods

For this study, semi-structured interviews were conducted with five violinists and one physiotherapist to explore experiences with musculoskeletal strain and its impact on violin performance. The semi-structured format balances predefined core questions with flexibility to follow up based on participants' responses. Interviews were conducted via Google Meet. Both English and Malay languages were used during the interview session. Before the interviews, participants were briefed to provide clarity on the study's objectives. Sessions were recorded for transcription using tools such as AI recording in the Google Meet. Transcripts were then generated using TurboScribe, an AI transcription service, ensuring accurate data for thematic analysis.

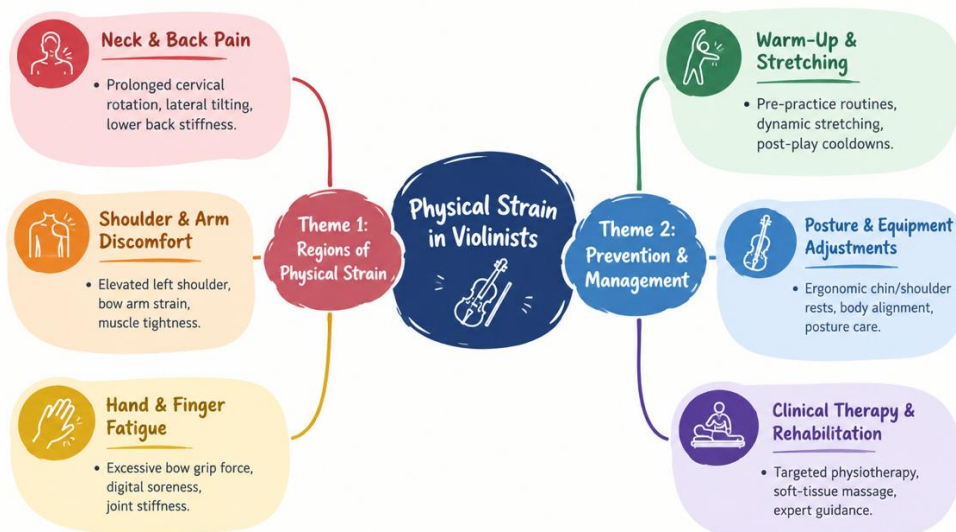
Analytical Approach

A clean verbatim approach were applied for transcribing the interviews, and data were further analysed using thematic analysis. This method ensures a meticulous representation of the interview content by excluding unnecessary elements such as filler words, hesitations, or any irrelevant answers, thereby enhancing the accuracy of subsequent analysis (Tracy, 2013). Additionally, due to the high possibility that most of the participants will respond in both Malay and English, Malay answers were translated and analysed in English. Following transcription, the data were systematically coded and categorized using thematic analysis. This process involves familiarization with the data, generating initial codes, identifying themes, reviewing themes, defining and naming themes, and producing the final report. Through this structured approach, key patterns and insights related to musculoskeletal strain in violinists can be effectively interpreted and analysed.

FINDINGS AND DISCUSSION

The qualitative findings are structured around two central themes: regional physical strain experiences and preventative/therapeutic management strategies.

The Nature and Localization of Musculoskeletal Pain among Violinists



Theme 1: Region of Physical Strain

Violinists consistently described discomfort in the neck and upper back, attributing these experiences to sustained asymmetrical posture and head rotation. Holding the instrument between the jaw and left shoulder over long rehearsals generated focal muscular stiffness. Participant P3 noted, *"If I stand for too long while playing, my lower back starts to ache..."*. Participant P4 further elaborated, *"After years of playing, I started feeling a dull pain in my neck and upper back, especially after long rehearsals. It gets worse if I don't stretch or adjust my position."*. These qualitative reports align with biomechanical literature noting that prolonged cervical rotation

and lateral tilting impose continuous loads on the cervical spine and trapezius muscles (Le et al., 2019).

In addition to spinal stress, participants consistently highlighted shoulder and arm discomfort as a primary consequence of lengthy rehearsals. Participants highlighted strain in the left shoulder and bowing arm. Maintaining left shoulder elevation to support the instrument body, combined with repetitive right-arm bowing movements, contributed to muscular fatigue. Participant P5 stated: *"I felt very uncomfortable at my left shoulder... when we stress our hand with repetitive movements, it can become tense from our shoulders up to our neck."* These observations correspond with previous research describing the high physical endurance demands placed on the upper limb musculature during string performance (Kok et al., 2018; Małek & Amarowicz, 2023).

Building upon the fatigue experienced in the shoulders and arms, hand and finger tension frequently emerges as compensatory physical strain. Fine motor control on the fingerboard and sustained bow grip pressure was reported as key sources of hand and finger soreness. Participants noted joint stiffness and digital fatigue following fast passages or prolonged playing sessions. Participant P3 reflected: *"I had a habit of gripping my bow too hard, and after an hour of playing, my fingers would feel extremely sore..."* Excessive static grip force and digital repetition can strain forearm tendons and small hand joints, emphasizing the importance of bow grip balance and tension release techniques (Pereira & da Silva, 2020; Rotter et al., 2020).

Findings revealed most violinists often experience body pain due to holding the instrument forces them into an awkward, lopsided posture that constantly strains their neck and back. The discomfort experienced by violinists can be exacerbated by the divergent and strenuous activities performed by each arm during play. The left shoulder is engaged in the continuous effort of supporting the violin, while the right arm is predominantly involved in the dynamic motion of bowing. As the larger muscle groups become fatigued, it is common for musicians to inadvertently increase the tension in their grip on the bow, leading to excessive pressure on the fingers. This tension can subsequently result in restricted joint mobility and inflammation of the tendons. Ultimately, the interrelation of these various physical discomforts underscores the necessity for violinists to reevaluate their overall playing techniques and ergonomic setups, thereby safeguarding their musculoskeletal health.

Expert Strategies for Ergonomic Adjustment and Injury Prevention



Theme 2: Prevention and Management Strategies

Proper warm-up and stretching are the most significant routine and exercise to prevent muscle injuries. Participants emphasized incorporating structured pre-performance warm-ups and post-performance stretching to manage physical strain. Light movements and flexibility exercises help prepare upper-body musculature for performance demands. Participant P1 stated: *"First, before I start my practice, I must make sure my body is not stiff. That's why I must do a warmup and also stretching."* Participant P6 (Physiotherapist) corroborated this practice: *"Routine warm-ups enhance local blood circulation and muscle tissue elasticity, which helps attenuate early fatigue and reduces acute strain risks during prolonged practice."*

Alongside daily warm-ups, postural awareness and ergonomic adjustments serve as highly practical strategies for self-managing physical stress. Correcting posture and adjusting instrument setup were cited as practical self-management strategies. Customizing shoulder rest height, chin rest contour, and instrument position helps balance physical loads. Participant P4 noted: *"When I started paying more attention to my posture, keeping my back straight and shoulders relaxed... I noticed less strain in my upper body."* Modifying equipment to match individual anatomical proportions reduces awkward joint angles and alleviates unnecessary static tension (Pereira & da Silva, 2020).

While postural adjustments are helpful, professional clinical consultation becomes necessary when physical strain persists. When physical strain persists despite routine self-care, seeking professional clinical therapy was described as beneficial. Interventions such as targeted physiotherapy, manual therapy, and exercise rehabilitation help manage soft-tissue discomfort and support recovery. Participant P3 shared: *"I saw a physiotherapist after developing wrist pain, and they taught me some exercises that really helped. I also go for occasional massage therapy to relax my muscles."* Participant **P6** (Physiotherapist) highlighted that therapeutic management focuses on restoring movement control, improving postural muscle endurance, and educating musicians on physical strain management. Clinical treatments provide structured guidance tailored to individual playing demands (Argus et al., 2020).

Findings revealed that violinists should always start their practice with warm-ups and end with stretching to keep their muscles flexible and improve blood flow. It is also crucial to maintain good posture and adjust equipment, like the chin and shoulder rests, to comfortably fit the player's body and reduce everyday physical strain. When basic self-care isn't enough and pain persists, musicians should seek help from professionals like physiotherapists for targeted exercises and massages. By combining these daily healthy habits with expert medical guidance, violinists can safely manage the intense physical demands of playing their instrument.

CONCLUSION

This study explored qualitative experiences of musculoskeletal strain among five professional violinists and one physiotherapist. Participants reported localized strain in the neck, back, shoulders, arms, and fingers arising from asymmetrical posture, static holding positions, and repetitive fine motor movements. The findings highlight the value of self-management strategies such as warm-up routines, stretching, postural corrections, and equipment adjustments alongside clinical support like targeted physiotherapy.

Given the small, qualitative sample size ($n = 6$), this narrative insights reflect specific individual experiences and cannot be generalized across the broader musician population. Integrating physiological awareness and body mechanics into music pedagogy supports physical endurance and health management for professional string players.

Limitations And Future Research

This study provides qualitative insights into the physical strain experiences of professional violinists; however, several limitations should be considered. The small sample size ($n = 5$ violinists, $n = 1$ physiotherapist) limits generalizability to broader populations, such as student, amateur, or orchestral musicians with different playing demands. Additionally, reliance on qualitative interviews introduces potential recall bias regarding past injuries and self-reported treatment outcomes.

Future research could build upon these findings through quantitative or mixed-methods studies involving larger participant cohorts across diverse playing backgrounds. Incorporating objective biomechanical assessment such as surface electromyography (sEMG) or motion capture analysis which would provide quantitative data on muscle activation patterns and kinematic adjustments. Longitudinal studies evaluating specific warm-up protocols or specialized bodywork techniques (e.g., Alexander Technique) could further contribute to evidence-based practices in performing arts health.

ACKNOWLEDGEMENTS

The authors thank the editorial team and peer reviewers for their construct feedback. Gratitude is expressed to all participating musicians and the healthcare professional for sharing their time and perspectives. AI-assisted language tools (Gemini) were used solely for proofreading and grammatical refinement.

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