

Injury and the Orchestral Environment: Part I

The Role of Work Organisation and Psychosocial Factors in Injury Risk

Dale L. Rickert, BMus, Margaret S. Barrett, PhD, and Bronwen J. Ackermann, PhD

That orchestral musicians are exposed to a high risk of playing-related injury is well established, but despite this, little is known about how work organisation and psychosocial factors may contribute to this risk. Lack of research in this area is surprising considering the importance of these factors in managing occupational health risks in a wide range of other working populations. To address this, we conducted a qualitative study with the following aims: to investigate orchestral musicians' and managers' perceptions of those workplace environmental factors that contribute to injury, and to investigate the potential influence of work organisation and psychosocial factors on injury risk for orchestral musicians. Using a qualitative case-study methodology, in-depth, semi-structured interviews were undertaken with 10 professional orchestral cellists (2 casual and 8 full-time members) from a single Australian orchestra. After initial data analysis, further interviews were undertaken with a set of 5 orchestral management staff as a means of data triangulation. All data were analysed using a "themes-based" analysis of narrative approach. The findings indicate that musicians perceive that stress in the orchestral environment increases injury risk. The perceived stressors were divided into two broad categories: psychosocial injury risks, which included performance stress and interpersonal relationships, and combined psychosocial/physical injury risks such as work organisation and lack of control. This article evaluates the findings in terms of existing literature and makes recommendations for better management of environmental injury risk for orchestral musicians. *Med Probl Perform Art* 2013; 28(4):219–229.

In the 1980s, a new era in performing arts medicine began with the release of a landmark study commissioned by the International Conference of Symphony and Opera Musicians (ICSOM), reporting that an average of 76% of professional orchestral musicians had a health problem that affected their ability to perform.¹ The release of this study triggered a number of reports con-

firmed that playing-related injuries had been plaguing musicians for generations and was a well-kept secret within the music industry.² The report findings coincided with the emergence of the field of performing arts medicine, which in 2013 includes organisations in more than 17 countries, textbooks in multiple languages and, according to the Performing Arts Medicine Association's *Bibliography*,³ more than 13,000 publications related to performing arts healthcare.

While these achievements are significant, leading commentators have noted that as performing arts medicine enters its fourth decade, we offer very little in terms of injury prevention and focus predominantly on the biomechanical elements of disease.^{4,5} This is evidenced by the unchanging high injury rates sustained by professional musicians that have occurred despite increased awareness of the extent of problems in the medical community.^{1,6,7} Efforts to understand and describe the type of health issues occurring in this field are well-established. The authors of this paper suggest that as a next stage, performing arts medicine needs to focus on creating healthy workplace environments where musicians are less likely to become injured. A number of issues contribute to the current situation:

1. Whilst awareness of the health risks of musical performance have increased in the performing arts medicine community, practices in relation to musicians' health have not changed noticeably in the professional music scene.
2. Environmental, psychosocial, and cultural conditions that influence injury risk are underrepresented in models of injury causation and prevention for musicians.

To interrogate these issues, the perceptions of members of the orchestral community who experience these factors on a daily basis are needed to guide the development of prevention strategies. To this end, the research team has undertaken a qualitative case-study utilising in-depth interviews to explore these issues within the setting of an Australian professional orchestra. The result is a set of three articles (see Fig. 1) that are embedded within a larger PhD research project investigating right shoulder injuries in student and professional cellists. The overall aim for the series is to examine how the orchestral workplace environment contributes to injury risk. This study does this by investigating the influence of environmental, psycho-social, behavioural, and cultural factors on injury risks and out-

Dale Rickert is a doctoral candidate and Dr. Barrett is Professor and Head, at the University of Queensland School of Music, Brisbane; and Dr. Ackermann is Lecturer, School of Medical Sciences, at the University of Sydney, Sydney, Australia.

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Address correspondence to: Mr. Dale Rickert, School of Music, University of Queensland, Level 4, Zelman Cowen Bldg., Brisbane, QLD 4072, Australia. Tel +61403546482. dalerickert@gmail.com.

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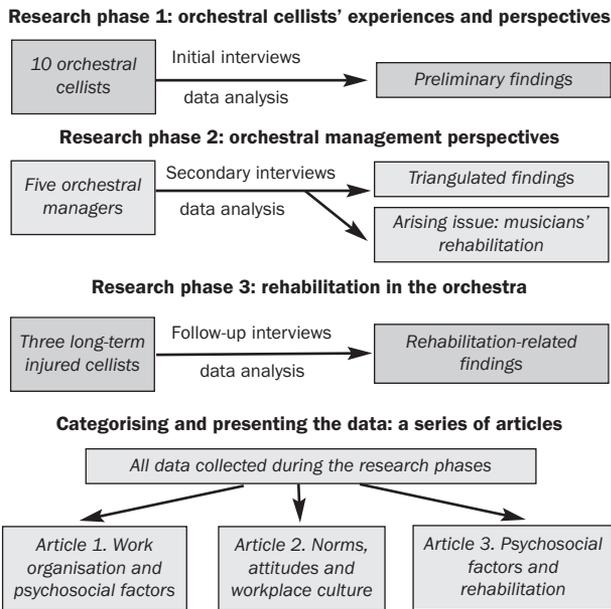


FIGURE 1. Understanding the role of the orchestral workplace environment in injury risk: multiple-levelled data collection and analysis.

comes. This article, the first in the series,* focuses on the role of work organisation and psychosocial factors in injury risk for orchestral musicians. The second article will investigate the influence of organisational culture, behavioural norms, and attitudes on injury outcomes,⁸ and the final article will build on findings from the first two papers to investigate the role of psychosocial factors in the experience of orchestral musicians undertaking rehabilitation.⁹

THEORETICAL BACKGROUND

Playing-related injury is a common problem for orchestral musicians, with recent research in Australia finding that, over an 18-month period, 84% of musicians will have an injury that affects their ability to perform.⁷ These injuries are defined as "... pain, weakness, lack of control, numbness, tingling, or other symptoms that interfere with your ability to play your instrument at the level you are accustomed to."^{10(p293)}

Injury causes are seen to be multifactorial and include individual, instrument specific, behavioural, environmental,

*This paper is number 4 in a set of 8 articles arising from an interdisciplinary cross PhD research project administrated by the University of Queensland School of Music and the University of Sydney School of Medicine. The project focuses on causes and prevention strategies for right shoulder injuries in student and professional cellists. The supervisors include Prof. Margaret Barrett (UQ) and Dr. Bronwen Ackermann (USyd). The project follows a mixed-method research methodology and includes significant qualitative and quantitative components. Associated researchers include Dr. Mark Halaki (statistics, programming, and EMG analysis), Assoc. Prof. Tim Driscoll (epidemiology and occupational disease), Prof. Karen Ginn (EMG research manager), and Assoc. Prof. Suzanne Wijnsman (cello advisor).

and psychosocial factors.¹¹ Most research on musicians' injuries to date has focused on the biomechanical and individual physical aspects of disease.⁵ Important environmental and psychosocial factors, such as the organisation of work and the influence of stress, interpersonal relationships, and autonomy, on injury risk are underrepresented in research and are largely missing in models of injury risk.^{4,12,13} Consequently, reviews of risk factors for injury and recommendations for injury prevention have tended to focus primarily on individual physical and biomechanical injury causes.¹¹⁻¹⁴ Considering current models of occupational health recommend that modifications to the workplace environment should occur prior to modifications made at an individual level,¹⁵ such a focus may not be an effective way of dealing with workplace injury for musicians.

We propose two main reasons for the current lack of information on workplace environmental injury risks. Firstly, many of the macro elements of workplace environmental risk, such as scheduling, repertoire choice, and conductor rehearsal technique, are difficult to quantify and modify, and as such pose significant research challenges. Secondly, psychosocial elements have been found to be significant modifiers of risk in other workplaces, and yet they have receive less attention in the field of music medicine. The high injury rates recorded in professional orchestras⁷ and the high insurance premiums required to insure against these injuries¹⁶ suggest a new approach is needed. Injury prevention efforts that focus on changing the work environment or creating healthy work cultures have been shown to maximise worker health and result in increased productivity in a wide range of other working populations.¹⁷⁻²¹ Given these factors and the current high rates of injury among orchestral musicians, developing a more comprehensive approach to injury prevention for orchestral musicians is both critical and timely.

Environmental Injury Risks

Environmental risk factors (extrinsic risks) are potentially harmful exposures that arise from a performer's external practice and performance environment. As Brandfonbrener asserts, "When, where, how, and what musicians play can affect the potential for music-related injuries, as well as their type and frequently their severity."^{11(p45)} Identified environmental risks include the number, duration, and intensity of rehearsals, difficulty of repertoire, concurrent programming, venue acoustics, lighting, temperature, noise exposure, seating and instrument set-up, and psychosocial factors.¹¹ Whilst ergonomic aspects of environmental risk (e.g., seating and instrument set-up) have received some attention,¹¹ much less is published on the role of the environmental risks that result from work organisation. This paper focuses on the influence of work organisation on injury risk for orchestral musicians. For the purpose of this publication work organisation factors include orchestral schedule, programming, and rehearsal style.

It is likely that these environmental factors have physical and psychosocial components that mutually influence

nce.²² The increased physical demands of intense programs, longer playing hours, and decreased rest may interact with the increased stress associated with busier, more difficult playing schedules. Devereux, Vlachonikolis, and Buckle²³ also found that the strongest predictor of musculoskeletal dysfunction is the combination of high physical and high psychosocial work demands. Based on this, the current article categorises risk factors as either psychosocial factors, or psychosocial factors that include a physical component (combined psychosocial/physical).

Psychosocial Factors and Injury Risk

Understanding work-related upper limb disorders (WRULDs) within a purely physical framework has been superseded by views that suggest psychosocial factors play a role in injury causation.^{24,25} “Psychosocial risk factors are things that may affect workers’ psychological response to their work and workplace conditions (including working relationships with supervisors and colleagues...)”²⁶ and also include “high workloads, tight deadlines and lack of control of the work and working methods.”²⁶ The injury mechanisms for psychosocial risk factors included increased muscle tension due to stress as well as changed behaviour due to social pressures.²⁶ Such social pressures can cause people to work beyond their physical limits and take insufficient breaks.²⁶ In workplace health research, studies in a range of working populations have found a significant link between workplace psychosocial factors and injury risk.^{27–32} Known workplace psychosocial injury causes include: high psychological work demands, low autonomy (lack of control over the nature and intensity of work tasks), problems with interpersonal relationships, low job satisfaction, and management styles that do not support employees.^{24,27,29,30,33–35}

Many of the risk factors mentioned above are present to a considerable degree within the orchestral workplace. Stress itself is an issue for orchestral musicians with research finding that many musicians perceive high levels of stress in the workplace³⁶ and have symptoms of anxiety and depression.^{1,37,38} Research into causes of stress in orchestral workplaces has found that a high degree of psychological pressure exists due to the demands of regular live performance^{38,39} and constant professional scrutiny.⁴⁰ Musicians typically have low levels of control over the nature and content of their work.^{36,41} It should be noted that orchestral musicians, both psychologically and physically, work almost entirely to an external locus of control.^{13,37,42} Orchestral managers choose the scheduling, repertoire, and venue, while conductors and section leaders decide how fast, how loud, and how long the musicians play.^{43,44}

Lack of control at work is known to be a significant stressor and is linked with decreased job satisfaction and an increased risk of mental health problems.⁴⁵ Job satisfaction is a problem in orchestras,^{36,46} with one study measuring lower job satisfaction among orchestral musicians than US state prison guards.⁴⁷ Combine these working condi-

tions in a sector where funding pressures and deregulation[†] are placing strains on orchestra-management relationships, and it would seem likely that psychosocial factors play a considerable role in injury causation for musicians.^{13,16}

The research presented above provides evidence that known psychosocial injury risks are present within the orchestra. Some studies with musicians have attempted to measure the influence these factors have on injury risk.^{6,42,48} These studies have correlated increased stress^{48,49} and lower perceived quality of work-tasks with an increased risk of injury.⁴² Moreover, recent research arising from the Australian “Sound Practice” study has found that musicians perceive rehearsal schedule and repertoire choice to be considerable modifiers of injury risk.⁷ More research is needed within the orchestral environment to identify the impact of a broader range of potential influencing psychosocial factors.^{4,12,42}

Australian Orchestral Context

In the 1980s, there was international recognition of the high prevalence of playing-related injury among musicians, with some research into the injury status of Australian professional orchestral musicians.^{50,51} However, this recognition of the extent of the problem did not lead to targeted occupational health measures to address injury prevention and management. This lack of active health support in conjunction with the increasing demands of the orchestral work environment, meant that musculoskeletal injury in these orchestras continued to increase, leading to costly insurance premiums and recommendations to improve health conditions for Australian orchestral musicians.¹⁶

The Australian Government-commissioned “Orchestras Review Report 2005” stated that “the management of occupational health and safety is now an important issue for orchestras world-wide, and there is reason to believe that the practices used by some Australian orchestras could be significantly improved.”^{16(p49)} The report then suggested that investments made in creating healthier working environments would be likely to lead to better working conditions and stronger orchestral balance sheets.¹⁶ In response to this report, the “Sound Practice”[‡]

[†]In 2007, the Australian orchestral funding environment changed dramatically with divestment of orchestras from the Australian Broadcasting Corporation funding to a combined state, federal, and private funding arrangement. These changes led to “deregulation” of the regular working hours as well as the types of environments and concerts required of professional orchestral musicians.

[‡]Sound Practice is a joint initiative between the Australia Council for the Arts, the Australian Research Council (ARC), the University of Sydney and the eight premier state orchestras of Australia, and amounts to AUD\$2m of research funding over 5 years. It is a comprehensive investigation into high-levels of physical and psychological illness in Australia’s professional orchestras. This Australian Research Council Linkage Grant (LP 0989486) is administered by Dr. Bronwen Ackermann, Assoc. Prof. Tim Driscoll, and Prof. Dianna Kenny.

TABLE 1. Age, Experience, and Gender of the Study Participants

Group	No.	Average Age (yrs)	Experience (yrs)	Gender (M/F)
Cellists	10	42±9	32±11	6/4
Management staff	5	48±11	11±8	3/2

project was developed and awarded AUD\$2m of research funding to investigate psychological and physical factors influencing injury rates and their causes in Australia's professional orchestras.

The aims of the current study are:

1. To investigate orchestral musicians' and managers' perceptions of those workplace environmental factors that contribute to injury.
2. To investigate the potential influence of work organisation and psychosocial factors on injury risk for orchestral musicians.

METHODOLOGY

The research reported in this paper sought to understand the psychosocial and work organisation factors that contribute to injury. Consequently, a qualitative approach that sought individual perspectives and experiences of the phenomenon was adopted. Qualitative research is useful for exploring the boundaries of new fields of inquiry and can provide subjective information about the range of possible factors that influence a phenomenon.⁵²⁻⁵⁴ The current project gives background to and frames quantitative research into psychosocial injury risk that is currently underway as part of the large Australian "Sound Practices" research project.

This research project utilised case-study methodology as outlined by Stake.⁵⁵ The research focused on a single "case," an Australian symphony orchestra, in order to investigate the phenomenon of musicians' perceptions of factors that contribute to injury risk.⁵⁵⁻⁵⁷ This study was part of a larger mixed-methods, cross-institutional (University of Queensland School of Music and University of Sydney Faculty of Medicine) PhD research project involving 5 orchestral management staff and a pool of 25 student and 47 professional orchestral cellists. The overall aim of the study was to investigate causes of and prevention strategies for right shoulder injuries in cellists; some of the quantitative data were published in the 2012 June issue of the *MPPA* journal.⁵⁸

The current series of articles reports on the influence of environmental, psychosocial, behavioural, and cultural factors on musicians' injuries (see Fig. 1). Ten cellists and five orchestral management staff (Table 1) from one orchestra were interviewed regarding their beliefs about the role of the workplace environment and psychosocial factors in injury risk.

Ethics approval was granted through the Human Research Ethics Committee at the University of Queensland, School of Music. The identities of the participants were protected throughout the study, and all names used

in this publication are pseudonyms. A list of participants with quoted data in this paper is shown Table 2.

Data Collection and Analysis

The data were collected using semistructured in-depth interviews, which were aimed at eliciting musicians' views on factors that influence injury risk in professional orchestras.^{52,59} All interviews were undertaken by the first-named author and were recorded and later transcribed. Participant member checks of the transcripts were used to increase the trustworthiness of the data.⁶⁰ Participants were sent their transcripts so that they could review these for accuracy, add any additional information they felt was necessary, and remove information that they did not want published.⁵⁵ Two professionals chose to edit their transcripts for grammatical errors and to clarify their meanings. Transcripts were analysed using a themes-based 'analysis-of narrative' approach.⁶¹ Credibility issues were addressed through triangulation of source (cellists and orchestral managers as participants) as well as investigator triangulation with three researchers undertaking the analysis to compare findings.^{62,63}

FINDINGS

The analysis revealed two major themes in the participants' responses. Participants presented a view that stress is a major contributor to injury in the workplace. Further analysis indicated that workplace stressors can be grouped into two broad categories: psychosocial injury factors and combined psychosocial and physical injury factors. In the following, interview data are drawn on to illustrate participants' beliefs concerning stress and injury. The second section builds on this by identifying individual stressors for orchestral musicians and then categorising them as either psychosocial injury risks or combined psychosocial/physical risks.

Role of Stress in Injury Causation

The musicians and orchestral management staff in this study perceived that increased stress leads to a greater risk of injury in the orchestral environment. Musicians Kate and Stephen suggest that increased tension due to stress contributes to injuries.

Interviewer: *Do you think that stress in the workplace plays a role in causing injuries?*

Kate: *Yes, it does, because stress makes you tense and when you tense up, you get injured.*

Stephen: *Yes, if you are stressed, you tend to be tense. If you're tense, you tend to get more injuries.*

John, an orchestral manager, also identified the potential role of stress as an injury risk for musicians:

John: *I can imagine that if somebody is mentally stressed, that will potentially increase the likelihood of them having a physical injury.*

Bridget, an orchestral manager, expanded on this perception by identifying a time in the history of the orchestra when stress coincided with high rates of injury:

Bridget: *There was a period for a number of years when things were very difficult and stressful for the players, and of the people that are still carrying injury, many of them are carrying them from that time. I often notice when people take time off for injury, that it is related to stress.*

Apart from noticing the connection between stress and injury, orchestral managers Sylvia and Michael commented on how they thought stress may affect musicians' physiological response to the workplace:

Sylvia: *... if you're stressed, the back of your neck and shoulder become really tense, so if you're a musician carrying that kind of stress and playing for 6 to 8 hours a day, then it has to have a huge effect on your chance of getting injured.*

Michael: *... if your physical being is being assaulted and you're getting stressed as well, the first thing that goes is your breathing and your muscle tone and everything. Then this can affect your entire technique and stamina.*

Bridget commented on how musicians' experiences of pain are often subjectively influenced by their working environment. In addition, she believes that the few musicians who seem to have no problems with injuries have an entirely different psychological profile to the rest of the orchestra:

Bridget: *Musicians actually feel pain more severely when they're playing in a situation that they don't want to play in, and for the couple of players that seem to never have had an injury related to work, they don't have that same kind of mental attitude. These kinds of people never seem to experience physical problems, but that's not necessarily got anything to do with good technique in sitting or playing. I think it's partly their attitude to music. People like this don't seem to carry stress in the body, they just don't see things that are stressful, and they refuse to be stressed by people and situations around them.*

Bridget's comments suggested an awareness of the interpersonal management skills required to address injury in the orchestra.

Stressors that Influence Injury Risks

In analysing the data relating to injury-causing stressors that participants perceived to be significant, a number of subthemes emerged, and after further analysis, it became evident that these could be grouped as either psychosocial or combined psychosocial and physical risks (Table 3). The

TABLE 2. List of Participant Pseudonyms*

Professional Cellists	Orchestral Managers
Kate	John
Stephen	Bridget
Gregory	Sylvia
Andrew	Michael
Paul	Kathleen
Heather	
Janine	
Umi	

*While not all participants were quoted in the findings section, all participants' data were used during data analysis.

psychosocial risks included performance stress and interpersonal relationships, and the combined psychosocial and physical risks included issues related to work organisation and lack of control.

The interview responses identified multiple stressors, highlighting the interrelated and multifactorial nature of injury risk in the orchestral environment. For ease of understanding, main themes have been grouped under the major headings identified in Table 3. However, secondary themes that do not apply directly to the headings have been included (marked with brackets).

Performance Stress

The inherent stress of performing was one factor that musicians identified as causing difficulties in the orchestral workplace:

Gregory: *I think the most likely one is just how people cope with performance situations, that would be number one, and that would be affected by their relationship with the section leader and the other players around them and that these things would be interrelated. [Interpersonal relationships]*

Even within this first quote, it can be seen that orchestral musicians perceive stressors within the orchestral workplace to be multifactorial and interrelated. This participant noted how performance stress is influenced by musicians' relationships with their colleagues. It is likely that relationship breakdowns within a section may cause increased perceptions of negative judgments, which in turn could contribute to increased performance stress. Another aspect of performance stress arises from the constant pressure to live up to the high expectations of expert colleagues. This concept is identified by Smith et al.,⁴⁰ and can also be seen in this excerpt from Michael:

Michael: *The orchestral workplace is a field where we are all experts and that means high expectations, in fact sometimes unreasonably high expectations across the board.*

Interpersonal Relationships

Within the orchestral environment, functional interpersonal relationships form the backbone of successful artis-

TABLE 3. Work Organisation and Psychosocial Injury Risks

Psychosocial Risks	Combined Psychosocial/Physical Risks
Performance stress Regular public performances Constant professional scrutiny Interpersonal relationships between: The musicians in the orchestra Orchestral management and musicians Section leaders and section players Conductors and orchestral musicians	Work organisation and lack of control Scheduling and concurrent programming Repertoire and rehearsal style Deregulation of rehearsals/performances

tic outcomes where optimal performance relies on careful balance and collaboration between players.⁶⁴ With many hours a week spent working intensively in this manner, this places significant pressures on working relationships. In these quotes, cellists Andrew and Paul show how relationships between the conductor and orchestra, the principals and sections, and between the section players can all influence stress levels in the workplace:

Andrew: *There have been times in the past, ... there was 1 week when we did a special project ... the music was all hard and we had a conductor that was vicious and everybody knew it, and she had a reputation and I think everybody came to that rehearsal saying: "she is going to shout at us, and it's going to be one of those things," and it was, but it was extremely exciting but it was also really nerve-wracking.* [Performance stress]

Interviewer: *What do you think the contributing factors are for stress in the workplace?*

Paul: *Things to do with principals, principals on your case or conductors on your case, a heavy workload of difficult repertoire, touring, personality problems, people, big capital letters PEOPLE!* [Performance stress: demanding repertoire]

Paul emphasised the way a heavy workload combined with the multiple interpersonal relationships that are central to orchestral playing can be significant stressors. In this setting, relationship breakdowns have the potential to place the company and employees' health in jeopardy, as emphasised by Gregory in the comment below:

Gregory: *If you work in an unhealthy environment, you're not happy with certain things financially, you're not happy with certain things to do with morale psychologically, it can have a huge effect on you, and I think it would have washed-down effect from your mind down into your body. They are intrinsically linked, you just can't deny it.*

Combined Psychosocial and Physical Risks

Combined psychosocial and physical risks for orchestral musicians arise because of the way orchestral work is organised (work organization) and lack of autonomy.

The next excerpts offer insights into how factors such as lack of autonomy and deregulation have caused stress in the orchestral workplace. In the first excerpt, cellist Heather identifies how stress influences injury risk:

Heather: *... it could be just a situation like you're playing really difficult repertoire with a short rehearsal period, with a conductor that is not familiar to you, in a venue that is not ideal. Scheduling can also be really ordinary—not conducive to healthy playing habits. You might have played 4 weeks of back-to-back, difficult programs and you don't feel like you've had a chance to practice properly, and I think definitely then you enter and before you've even played a note you're a bit stressed, and I think I've seen that in action across the whole orchestra...* [Performance stress]

Similarly, orchestral manager John outlines how combined heavy programs and repertoire increase risk of injury for orchestral musicians:

John: *I think that heavy repertoire is a factor in itself, but heavy repertoire combined with other heavy repertoire...and it's not necessarily about technical difficulty, it's about stamina. For example, in the Turangalila Symphony, there is a slow movement which requires string players to play very slow long notes for about 10 minutes and that's an absolute killer. Even though it's not very long, if you have to do a couple of things like this, you're going to have a lot of sore string players. Another example is a Tchaikovsky ballet where everybody is playing continually. That's what I mean by this type of heavy repertoire.*

John expands on this by describing how busy schedules and concurrent difficult programs cause physical problems for orchestral players:

John: *It also comes down to learning the repertoire, and this can be difficult when we have a lot of heavy programs within a short timeframe. Sometimes we actually have to be playing three different programs in a single week. Now if they are three light programs in a single week, then that's not a problem, but if two or three of them are heavy programs, then we know that we are going to have problems.*

Interviewer: *Do you notice any patterns with injury coinciding with particular types of programs or schedules?*

John: *I guess the simplest pattern is that when we have the pit seasons, opera and ballets and other programs close to one another, we clearly have more injuries during these schedules.*

Interestingly, musicians suggest that management are not aware of these difficulties or choose not to account for them:

Paul: *Management has got to think about how they do things. Because in the end they have a lot of control over what we do. And conductors also should think about what they do. They*

need to think more about how they rehearse... [Interpersonal relationships]

The issue of conductors having a lot of control over what musicians do in the workplace was also picked up by Kathleen, one of the orchestral management staff:

Kathleen: *I think our chief conductor is sometimes a bit too hard. Also, you do get some conductors who don't structure their rehearsals very well. A couple of years back, there was a conductor training program where the orchestra had to play three symphonies all the way through repeated one billion times over throughout the week, and playing like that is really hard work, that caused a lot of problems for people. And that's just a good example of where rehearsal technique had an influence on injury rates in the orchestra.*

The data presented thus far demonstrate how lack of control over scheduling, repertoire, and conductor rehearsal technique place significant psychological and physical strains on orchestral musicians. The stress of having low levels of control over the intensity of work or how, when, or where it is carried out is evidently a risk factor for musicians. In the following, Janine indicates how low levels of remuneration in the orchestra may be creating stress for the players:

Janine: *Me and another cellist have talked about these things. We have both struggled. I would have left the job if I'd had the money because I struggled psychologically, not with my body but with the workplace, the workplace is brain-damaging.* [General stress]

Also, Janine expands on this description of the orchestral workplace by referring to practices that have arisen from deregulation. In the last 10 years, funding pressure has meant that orchestras face increasing pressures to deliver a wider variety of concerts for a diversifying market.¹⁶

Janine: *There has been a huge divergence from common practice, from what we had come to know in the past, now we do many different splits and varied programmes ... The scheduling over the last decade has been horrendous ... I've found the new schedule very difficult to cope with and I was on the committees for a long time arguing black and blue about the schedules. Management would say we were not working too many calls in the cycle, exactly what management says now. It's just unbelievable because that was not the point we were trying to make. We were aware that it is regularity and resting that is so important to the orchestral musician.* [Interpersonal relationships]

Musicians lack control over repertoire and scheduling, and the stress that may arise from this is evident in this excerpt from Umi. Umi highlights the importance of respect for the musician "as an artist and not just a note producer:"

Umi: *I think the worst thing is how work is organised these days. The biggest problem is the rostering and the programming. ... Years ago, we were trying to push for not doing a subscription concert and an opera or ballet at the same time, but it's still happening. It's just too much to have to come back the night after an opera and practice a Shostakovich symphony the*

next morning. ... It comes across with management not realising that our prime goal is to create a work of art. I think this all comes down to respect for the musician as an artist and not just a note producer, a note factory. ... The reason I've listed them in this way is that these are the things that are out of our control.

The data presented highlight the various combined physical and psychosocial risk factors for injury in the orchestral profession. These factors included scheduling and programming, rehearsal technique and repertoire choice, and the influence of deregulation. These data often showed how multiple factors combined to create pressures which were "out of the control" of the musicians.

DISCUSSION

The interviews undertaken individually with both professional orchestral cellists and their management highlighted the complex nature of psychosocial factors facing the orchestral musicians and the degree to which the various elements, including physical aspects, influence each other in leading to an increased risk of injury.

A major theme arising from this study is that stress itself may be a significant risk factor for injuries in musicians. Both musicians and managers identified stress as playing a role in injury causation, and increased tension due to stress was outlined as a possible injury mechanism. Further analysis indicated that orchestral musicians and managers perceive a variety of injury-causing stressors arising from the orchestral environment. These were categorised as psychosocial risk factors (performance stress and interpersonal relationships) and combined psychosocial and physical risks (work organisation and level of autonomy).

Role of Stress in Injury Causation

While using *stress* as a term in research can be problematic with implications of a diverse range of physical and psychological variables, for the musicians in this study stress was a useful generic term for the multitude of pressures that they perceived to exist within the orchestral workplace environment. Previously, stress has been cited as a considerable problem for orchestral musicians, with research finding that stress and depression are common in them.^{1,37,38} In this study, stress was perceived as a risk factor for injury. This agrees with the findings of Davies and Kaneko et al.,^{48,49} who found a correlation between increased stress levels and a greater likelihood of sustaining playing-related injuries. Furthermore, the possible link between stress and muscle tension explains previous results from a larger national orchestral musician cohort where musicians reported that increased muscle tension was a significant modifier of injury risk.⁷ The current study builds on these works by offering perspectives on how stress arises in the orchestral workplace and identifies muscular tension as a possible injury mechanism. This is also supported by clinical evidence as experienced health

professionals recognise stress and excess tension as factors that contribute to injuries in musicians.^{11,65}

Earlier in this article, orchestral manager Bridget offered a number of interesting perspectives. She recalled how a stressful period for the orchestra coincided with increased injury rates among the players. Considering she noticed a connection between increased stress and increased injury, future research could be undertaken to track the relationship between perceived work pressure and injury rates over an extended period. Such longitudinal research may validate this observation by establishing correlation between perceived stress and injury.

Bridget's other important contribution was her insight into how musicians' environments can influence perceptions of pain. In noticing this, Bridget then remarked that she felt that musicians who seem to have no problem with playing-related injury have an entirely different psychological profile. As she puts it, "People like this don't seem to carry stress in the body, they just don't see things that are stressful, and they refuse to be stressed by people and situations around them." This issue warrants further investigation.

Psychosocial Risk Factors

A common finding from the interview data was that many performers had multiple sources of workplace stress, both within the environment and as a consequence of the complex interpersonal demands involved in successful orchestral performance. The interaction of performance stress, lack of autonomy, and problematic interpersonal relationships may lead to even more stress. Musicians identified lack of autonomy as a cause of increased performance anxiety, and for some this placed increased strain on their interpersonal relationships. Additionally, interpersonal relationships were reported to be under increased pressure in the orchestral environment as a reported consequence of lack of autonomy, competition for employment, imposed power structures (hierarchy of management, conductors, and section leaders), and high performance demands. Sasso brought up a similar issue when discussing stressors within ensemble environments: "The need for cooperation and interdependence in the artistic endeavor can stand side by side with hierarchy and often intense competition."^{64(p339)} Constant professional scrutiny is an additional stress factor in the orchestral environment which arises due to practicing and performing within the perfectionistic, and hence highly critical, orchestral environment.⁴⁰

This situation of increased stress may contribute to injury risk, further compounded by players who experience pain potentially being unlikely to stop and seek assistance lest they face either real or perceived judgment from their colleagues. This aspect of injury risk relates to attitudes to injury and the influence of organisational culture on injury responses in orchestras and will be investigated in more detail in the second article in this series.⁸

Based on the data analysis, lack of autonomy (control over the nature and intensity of work tasks) seems to be a

major issue for these orchestral musicians. All aspects of autonomy—what, where, how, and when work is done—are under an external locus of control. This confirms the findings of Theorell,⁶⁶ who showed that orchestral musicians have lower levels of autonomy than workers in other high-demand low-control industries such as air traffic controllers. Other commentators have remarked on how lack of control exists in its extreme within the classical orchestra: "During rehearsals or concerts, musicians experience a total lack of control over their environment. They do not control when the music starts, when the music ends, or how the music goes... They are, in essence, rats in a maze, at the whim of the god with the baton."^{46(p20)}

An additional concern may be lack of creative input, with musicians commenting that they felt like "note producers" working in a "note factory" and that there was "lack of respect for musicians as artists." This aligns with an issue brought up by Parasuraman and Purohit: "The authoritarian leadership styles of some conductors and the lack of participation in program selection make many musicians feel that their skills are undervalued and underutilized, and that they are 'anonymous cogs' in the orchestra."^{41(p74)} In Parasuraman and Purohit's study, levels of creative input were negatively correlated with stress.⁴¹ This is an interesting discovery, as researchers in other fields have found that workers who have creative input, as distinguished from working in a creative industry, have much better health profiles.⁶⁷ This aspect of musicians' health may warrant further investigation, especially considering that professional musicians train for significant periods of time in environments where creativity is valued and are then placed in highly constrained workplaces where they have minimal creative input.⁶⁸

Combined Psychosocial and Physical Risks

An emerging consideration for understanding environmental injury risk for orchestral musicians is the blurred distinction between physical risks arising from work organisation and psychosocial risks. In this study, the participants brought up the influence of lack of control over scheduling, repertoire, venue choice, and rehearsal technique as both a stressor and potential modifier of injury risk. On a psychosocial level, having a low-level of control over work intensity, organization, and the way tasks are carried out allows less decision latitude for pacing and taking breaks, and also causes increased stress.²³ Participants mentioned how scheduling, repertoire, venue, and conductor choice could combine to cause the whole orchestra to be "stressed before they even played a single note." On the purely physical level, difficult repertoire, busy schedules, concurrent heavy programs, and intense rehearsals may cause increased physical strain and allow less time for recovery. This is an area of environmental injury risk for orchestral musicians that can be difficult to modify. It stands to reason that heavy schedules or poor conductor rehearsal technique allow less physical recuper-

ation, that difficult programs require more physical effort, and that venues with poor acoustics require players to compensate by “playing out.” It is likely that the physical and psychosocial components arising from these factors are interrelated with increased stress contributing to further physical demands and vice versa.²³ Measuring the influence of these factors and how they interrelate, however, poses significant research challenges.

Researching environmental injury risk in professional orchestras is difficult because of the many constantly changing variables. Schedules and programs are varied, with even a piece of standard repertoire often reappearing on an orchestra’s concert calendar only every 10 years. The lack of research and commentary on this aspect of playing-related injury risk may be in part due to difficulty in being able to quantify this problem. The “Sound Practice” study is currently attempting to investigate the influence of environmental risk factors by measuring the influence of scheduling and repertoire on injury insurance claims and by collecting self-administered injury reports that may be associated with different visiting conductors. In undertaking this research, there have been challenges in achieving compliance from management staff in divulging injury rates associated with different programs and in getting musicians to fill in the injury self-report forms. Due to the paucity of information on this component of injury risk for musicians, more research needs to be undertaken. While the challenges are considerable, targeted mixed-method research (combined qualitative and quantitative methods) may be effective at identifying and measuring the influence of work organisation on injury rates in orchestras.

Recommendations

Addressing the extrinsic psychosocial risk factors is difficult, as these stressors are inherent aspects of orchestral work that are challenging to change⁶⁹ and would require coordinated cooperation with orchestral administration staff. In the first instance, mitigation strategies might focus on arming musicians with proactive coping mechanisms and optimal behaviours for dealing with the challenges of the orchestral workplace.^{13,69} This could be achieved by addressing the individual and group responses to stress. For the individual component, orchestral musicians may benefit from training in techniques for dealing with stress and conflict resolution as well as exploring ways to better cope with the lack of control in the workplace. On the group level, efforts to foster a positive and supportive organisational culture may lead to more positive interpersonal relationships, decreased judgment, less performance pressure, and better performances and could result in positive health outcomes.¹⁹ Apart from the health benefits, such interventions may also lead to stronger balance sheets.^{18,20} Research in orchestras as well as other working populations has shown that increased social support⁴² and the presence of a supportive group culture leads to lower levels of physical and psychological injury and increased productivity.^{17,18,70}

This study aimed to investigate orchestral musicians’ and managers’ perceptions of factors in the workplace environment that contribute to injury and the influence of psychosocial factors on injury risk. Little research has addressed these aspects of injury causation within the orchestral environment, and of those that had, as mentioned by Zaza⁷¹ and Johansson and Theorell,⁴² most were hampered by inadequate study design.

To offer clarity to this aspect of musicians’ health, a qualitative study was undertaken which was useful at uncovering participants’ perceptions of the range of possible factors which influence injury risk. Through the inductive nature of in-depth interviews, this research built on the small body of existing literature by offering interpretations of how and why various aspects of the workplace environment contributed to injury risk. Through this research, it was established that stress was a perceived risk factor for injuries and that increased muscle tension was a possible injury mechanism. Injury-causing stressors were categorised as either psychosocial risks, which included interpersonal relationships and performance stress, or combined psychosocial and physical risks, which arise from work organisation and lack of control. This study provided recommendations for addressing the identified risks; however, further well-designed quantitative research should follow this study to test for the interaction of factors and establish relative risks.

The data arising from this study come from a cello section within a single professional Australian orchestra. While the cello players in this orchestra are likely to share common concerns about the influence of stress and other psychosocial factors on injury risk to other orchestral musicians, it should be remembered that the instrument and orchestra-specific nature of these data may have some influence on its transferability.

CONCLUSION

The findings from this study indicate that psychosocial factors present in the professional orchestra environment are perceived to have an important impact on the health and well-being of the musicians. The perceived health risks in the orchestra are multiple, interrelated, and often out of the control of the musicians. These include psychosocial injury risks (interpersonal relationship and performance stress) and combined psychosocial and physical risks (work organisation and lack of control). Many of these risk factors exist due to the inherent nature of orchestral work and are not easily modified. Education strategies were suggested that may decrease the influence of difficult-to-modify risk factors on individuals and create healthier group responses to workplace stress. Identified in this paper was the potential role of organisational culture on injury risk for orchestral musicians. To build on this, the second article in this series will aim to identify those aspects of organisational culture, behavioural norms, and attitudes to injury that impact on injury outcomes for orchestral musicians.⁸

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